



# Project Report December 8, 2006

## Strategic Plan

### Objectives:

Develop and share applied aquatic scientific and technologic tools with partners.

90 projects found

13210-A-001 - [Technical Assistance to Pacific Region NFHs \(HETs, CHMPs, HGMPs, site visits, etc.\).](#)

Facility	Abernathy Fish Technology Center
Expended	\$115658
Objective	Develop and share applied aquatic scientific and technologic tools with partners.
Primary Benefited Species	Chinook salmon or king salmon ( <a href="#">Oncorhynchus tshawytscha</a> )
Primary Benefited Population	<a href="#">Warm Springs hatchery spring chinook</a>
Plans	Spring Creek NFH Hatchery and Genetic Management Plan Warm Springs Hatchery and Genetic Management Plan (draft) Quinault NFH Cooperative Agreement
Keyword	Fish Technology
Need Number	N-002
Partners	

Accomplishments

Recovery Plan production tasks implemented	3
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Accomplishment Summary

Technical assistance was provided to the Pacific Region NFHs as they continue to address recovery, mitigation, Tribal, and conservation programs using propagated fish.

Description

The importance to the Resource:

The Fisheries Program in the Pacific Region continues to use and refocus its NFHs as tools in the recovery of fish populations and to mitigate for the impacts from hydropower projects, loss of habitat, and harvest.

The problem:

Hatchery Evaluation Teams (HETs) ensure that NFH production programs: comply with the mandates governing that NFH; integrate the needs of local stakeholders; and continue to the Service's mission and goals.

The objective:

To conduct critical, evaluations of the Pacific Region's and CNO's 18 NFHs production programs. HETs are used to ensure scientifically sound production of appropriate stocks for use in tribal trust, mitigation, and recovery programs.

The method:

(PART)		<p>With representatives from Service, tribal groups, and other state and federal agencies, HETs meet to discuss NFH production activities. AFTC staff also participate in CHMP/HGMP development and visit NFHs to address individual concerns and develop specific research studies.</p>
Number of Fishery Management Plan production tasks implemented (PART)	5	

**13210-A-002 - [Pacific Region Hatchery Management Workshop: Meeting the Scientific Needs of NFHs & Their Partners](#)**

<b>Facility</b>	Abernathy Fish Technology Center
<b>Expended</b>	\$53998
<b>Objective</b>	Develop and share applied aquatic scientific and technologic tools with partners.
<b>Primary Benefited Species</b>	Rainbow trout ( <a href="#">Oncorhynchus mykiss</a> )
<b>Primary Benefited Population</b>	Not specified
<b>Plans</b>	Pacific Region Fisheries Outreach Action Plan U.S. Fish and Wildlife Service National Aquatic Animal Health Policy
<b>Keyword</b>	Fish Technology
<b>Need Number</b>	N-002
<b>Partners</b>	

### Accomplishments

Number of other Fishery Management Plan tasks implemented for populations of management concern.	2
Number of applied aquatic scientific and technologic tools shared with partners.	1
Number of applied science and technology tasks implemented as prescribed by Fishery Management Plans. (PART)	1

### Accomplishment Summary

Twenty-two technical presentations by Service and partner (universities, USGS/BRD, Bureau of Reclamation, CNO and Washington Office) employees provided to ~80 Pacific Region Fisheries Program field and Regional Office staff members.

### Description

#### **The importance to the Resource:**

The Pacific Region's conservation, tribal, and mitigation NFH production programs are constantly searching for the latest technical, scientifically sound information for use in a successful production program. This is even more important as these programs work to ensure the continued existence of the resource while providing harvest opportunities.

#### **The problem:**

For NFH Managers and other Pacific Region Project Leaders it is often difficult to find a single source for current technical information of interest and immediate use in successful NFH conservation, tribal, and/or mitigation production programs. This is particularly true in these times of limited funding for technical meeting attendance.

#### **The objective:**

Provide a scientific forum to exchange technical information of interest to Pacific Region NFH Managers, other Project Leaders in the Pacific Region's Fisheries Program, and Regional Office staff.

#### **The method:**

	<p>This Workshop's, funded by Leavenworth NFH Complex, technical presentations are provided by speakers from within and outside the Service. Presentations cover new techniques and/or experimental findings (not production reviews). The annual Workshop is held in WA's Tri-cities region, allowing Pacific Region staff to drive, saving on airfare.</p> <p><b>Further description:</b></p> <p>Each year, in addition to the presentations on various topics, the ~80 Workshop participants also deal with one focal topic. These focal topics have included the use of genetics in NFH management (including a mutli-agency group panel discussion) and producing quality fish by manipulating nutrition, environment, and behavior.</p>
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**13210-A-004 - [Annual Fish Technology Center Meeting: Sharing Scientific Information With Our Partners](#)**

<b>Facility</b>	Abernathy Fish Technology Center
<b>Expended</b>	\$34217
<b>Objective</b>	Develop and share applied aquatic scientific and technologic tools with partners.
<b>Primary Benefited Species</b>	(0) Multiple Species
<b>Primary Benefited Population</b>	Not specified
<b>Plans</b>	Pacific Region Fisheries Outreach Action Plan
<b>Keyword</b>	Fish Technology
<b>Need Number</b>	N-002
<b>Partners</b>	Native Fish Society

### Accomplishments

Number of other Fishery Management Plan tasks implemented for populations of management concern.	2
Number of applied aquatic scientific and technologic tools shared with partners.	1

### Accomplishment Summary

Abernathy FTC hosted the 2006 Annual FTC Meeting with Washington Office, Pacific Regional Office, all Fish Technology Centers, the Olympia Fish Health Center, and Alaska Region Conservation Genetics Lab, and NGO (Native Fish Society) participants to discuss research and issues of concern across all Regions of the USFWS (March 2006).

### Description

#### **The *importance* to the Resource:**

Natural resource conservation demands rigorous, timely, and relevant scientific information. The USFWS' Science Excellence Initiative works to ensure scientific excellence and strict adherence to science in making management decisions. This meeting assists in achieving this goal.

#### **The *problem*:**

To meet the natural resource challenges of tomorrow the USFWS must ensure the availability and use of sound science in making management decisions. One part of this is to ensure the sharing of resource information needs and scientifically robust information.

#### **The *objective*:**

The purpose of the meeting was to discuss issues important to the research needs of the Fisheries Program and to brief ARDs, WO, RO, and FTC staffs and their partners on items of national significance such as: Future Challenges Initiative; USFWS Scientific Policy; updates on current activities of FTCs; and shared national FONS projects.

	<p><b>The <i>method</i>:</b></p> <p>In March 2006 a meeting of the seven FTCs, the Alaska Region Conservation Genetics Lab, two Assistant Regional Directors for Fisheries, Pacific Regional Office staff, an NGO (the Native Fish Society), and Washington Office staff, was held in Vancouver, WA. Scientific information needs and current data were shared.</p>
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**13210-A-005 - [Participation in Washington State Hatchery Reform Group: A Model for Cooperative Hatchery Reform](#)**

<b>Facility</b>	Abernathy Fish Technology Center
<b>Expended</b>	\$43097
<b>Objective</b>	Utilize appropriate scientific and technologic tools in formulating and executing fishery management plans and policies.
<b>Primary Benefited Species</b>	Chinook salmon or king salmon ( <a href="#">Oncorhynchus tshawytscha</a> )
<b>Primary Benefited Population</b>	<a href="#">Puget Sound ESU/Dosewallips River Independent Population</a>
<b>Plans</b>	Puget Sound and Coastal Washington Hatchery Reform Project
<b>Keyword</b>	Fish Technology
<b>Need Number</b>	N-002
<b>Partners</b>	Long Live the Kings (\$1200) Washington Department of Fish and Wildlife (\$5000)

## Accomplishments

Number of other Fishery Management Plan tasks implemented for populations of management concern.	3
Number of training session to support Tribal fish & wildlife conservation.	10
Number of applied aquatic scientific and technologic tools shared with partners.	2

## Accomplishment Summary

Computer models have been developed and continue to be refined to implement long-range goals for hatcheries, habitat, and harvest. A manuscript describing the hatchery reform process was published in a peer-reviewed journal. Several technical workshops with co-managers were conducted. Progress report has been submitted to Congress.

## Description

### The *importance* to the Resource:

Hatcheries are one of several tools available for recovering wild salmon and supporting sustainable fisheries. They represent the most effective tool for achieving established goals for salmon populations. Hatchery reform means designing and operating hatchery programs in concert with the needs of wild salmon and steelhead populations.

### The *problem*:

Hatchery operations began in the Pacific Northwest more than 100 years ago, with the primary purpose of producing fish for harvest. Recent findings have made it clear that hatchery operations contribute to the decline of wild salmon populations, requiring us to fundamentally change the way we think about hatcheries.

### The *objective*:

To conduct a systematic, science-driven approach to rethinking how to use hatcheries to achieve two goals: help recover wild salmon and steelhead populations; and provide sustainable fisheries.

Number of techniques and culture technology tools developed.	2	<p><b>The <i>method</i>:</b></p> <p>The Hatchery Scientific Review Group (HSRG), between 2000 and 2006, reviewed all salmon and steelhead state, federal, and tribal hatchery programs in western Washington for their compliance with scientific principles, fishery and conservation goals.</p> <p><b>Further description:</b></p> <p>Hatchery Reform</p>
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**13210-A-006 - [Integrated Hatchery Management: Scientific Review of NFHs in the Columbia River Basin.](#)**

<b>Facility</b>	Abernathy Fish Technology Center	<p><b>Accomplishment Summary</b></p> <p>In FY2006 the Hatchery Review Team completed its review of the Warm Springs NFH and Leavenworth NFH Complex (Leavenworth, Winthrop, and Entiat) production programs for Chinook salmon and steelhead. Recommendations have been produced for these production programs to assist in meeting short term and long term goals for Pacific salmon resources to meet future, conservation and harvest needs.</p> <p><b>Description</b></p> <p><b>The <i>importance</i> to the Resource:</b></p> <p>USFWS proactively initiated a series of hatchery reviews in May 2005 to assure that programs at 12 NFHs are part of a holistic and integrated strategy-consistent with state, tribal, and federal strategies-for conserving wild stocks and managing fisheries in watersheds within the Columbia River Basin.</p> <p><b>The <i>problem</i>:</b></p> <p>In the past 150 years, habitat alterations, hydroelectric development, and consumptive fisheries have impacted salmon and steelhead populations in the Pacific NW. Mitigation hatcheries have been used to increase the fish available for harvest. Conservation needs of natural populations require review of NFH use in management/conservation strategies.</p> <p><b>The <i>objective</i>:</b></p> <p>The goal of these reviews is to ensure an integrated holistic approach to the long-term conservation and management of salmonid resources in the Columbia River Basin while supporting tribal and non-tribal harvest and</p>
<b>Expended</b>	\$64648	
<b>Objective</b>	Utilize appropriate scientific and technologic tools in formulating and executing fishery management plans and policies.	
<b>Primary Benefited Species</b>	Chinook salmon or king salmon ( <a href="#">Oncorhynchus tshawytscha</a> )	
<b>Primary Benefited Population</b>	<a href="#">Wind River spring Chinook</a>	
<b>Plans</b>	<p>Federal Columbia River Power System 2002 Biological Opinion</p> <p>Conservation of Columbia Basin Fish, Final Basinwide Salmon Recovery Strategy, 12/2000 (All H Paper)</p> <p>1999 NMFS Biological Opinion on Artificial Propagation in the Columbia River Basin.</p>	
<b>Keyword</b>	Fish Technology	
<b>Need Number</b>	N-002	
<b>Partners</b>	<p>Confederated Tribes of The Warm Springs</p> <p>Confederated Tribes of the Colville Reservation</p> <p>Long Live the Kings</p> <p>Oregon Trout</p> <p>Washington Trout</p>	

	Yakima Indian Nation	<p>mitigation objectives.</p> <p><b>The <i>method</i>:</b></p> <p>The Pacific Region is conducting a scientific review of all Columbia River Basin NFHs. Chaired by a Regional Coordinator and Senior Scientist, the Hatchery Review Team uses current tools (HETs, CHMPs, HGMPs, spreadsheet models, multi-agency work groups, etc.) and develops others, to review all Service funded programs in the Columbia River Basin.</p> <p><b>Further description:</b></p> <p>Hatchery Reform</p>
<b>Accomplishments</b>		
Recovery Plan production tasks implemented (PART)	2	
Number of other Recovery Plan tasks implemented for T&E populations	10	
Number of applied aquatic scientific and technologic tools shared with partners.	1	
Number of techniques and culture technology tools developed.	1	
Number of applied science and technology tasks implemented as prescribed by Recovery Plans. (PART)	1	

**13210-A-009 - [Effects of Natural Prey on the Ability of NFH Fish to Successfully Forage After Release](#)**

<b>Facility</b>	Abernathy Fish Technology Center	<h2>Accomplishment Summary</h2> <p>Preliminary feed trials with insects have been initiated to determine if use of more natural prey items in the feed for NFH salmon will increase prey recognition and foraging ability of NFH fish post release.</p> <h2>Description</h2> <p><b>The <i>importance</i> to the Resource:</b></p> <p>The rearing environment of NFH fish is significantly different from the conditions in the wild which could have an effect on post-release growth and survival. The feed is quite dissimilar from a wild fish diet with nutrient content, taste, mouth feel, and movement considerably different from what NFH fish will experience in the wild.</p> <p><b>The <i>problem</i>:</b></p> <p>Newly released NFH fish need to acclimate to the environment before they begin to eat. Pellet-fed NFH fish may not recognize natural prey or find natural prey unpalatable. For pellet-fed NFH fish to forage efficiently post-release they need to learn how to recognize and capture prey.</p> <p><b>The <i>objective</i>:</b></p> <p>Determine if introduction of a more natural prey item in addition to NFH salmon fish feeds will increase prey recognition, foraging ability of the fish, and ultimately improve survival.</p> <p><b>The <i>method</i>:</b></p> <p>Work has been started as part of a peer-reviewed study to introduce NFH fish to prey items prior to release to determine if the fish</p>
<b>Expended</b>	\$15648	
<b>Objective</b>	Develop and share applied aquatic scientific and technologic tools with partners.	
<b>Primary Benefited Species</b>	Chinook salmon or king salmon ( <a href="#">Oncorhynchus tshawytscha</a> )	
<b>Primary Benefited Population</b>	<a href="#">Wild Warm Springs River Spring Chinook</a>	
<b>Plans</b>	Warm Springs Hatchery and Genetic Management Plan (draft) Eagle Creek NFH Winter Steelhead Hatchery and Genetic Management Plan Little White NFH Coho Salmon Hatchery and Genetic Management Plan	
<b>Keyword</b>	Fish Technology	
<b>Need Number</b>	N-002	
<b>Partners</b>		

<h2>Accomplishments</h2>	
Recovery Plan production tasks implemented (PART)	1
Number of techniques and culture technology tools developed.	1
Number of applied science and technology tasks implemented as prescribed by Recovery Plans. (PART)	1

	<p>can be conditioned to improve post-release foraging ability. Chinook, steelhead, and coho will be used in this study. First feeding trial showed fish, after a period of learning, did recognize and consume prey items.</p> <p><b>Further description:</b></p> <p>Nutrition</p>
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**13210-A-010 - [Use of Vegetable Protein Diet to Lower Contaminant Levels in NFH Reared Fish.](#)**

<b>Facility</b>	Abernathy Fish Technology Center
<b>Expended</b>	\$14648
<b>Objective</b>	Develop and share applied aquatic scientific and technologic tools with partners.
<b>Primary Benefited Species</b>	Lahontan cutthroat trout ( <a href="#"><i>Oncorhynchus clarkii henshawi</i></a> )
<b>Primary Benefited Population</b>	<a href="#">LNFH - Lahontan cutthroat trout Pilot Peak Broodstock</a>
<b>Plans</b>	Lahontan Cutthroat Trout Recovery Plan Conservation of Columbia Basin Fish, Final Basinwide Salmon Recovery Strategy, 12/2000 (All H Paper)
<b>Keyword</b>	Fish Technology
<b>Need Number</b>	N-002
<b>Partners</b>	

### Accomplishments

Number of other Recovery Plan tasks implemented for T&E populations	2
Number of techniques and culture technology tools developed.	1

### Accomplishment Summary

Completed a feeding trial to determine whether contaminant levels (i.e. PCBs and dioxins) could be reduced in NFH reared fish by developing and testing a vegetable protein fish feed. Fish and feed are being analyzed for contaminants.

### Description

**The *importance* to the Resource:**

Palatable and nutritious feeds containing little or no fish products, therefore low contaminant loads are needed for use at NFHs. Use of vegetable protein diets should reduce tissue contaminant concentrations in NFH fish, because vegetable oils and meals (e.g. soybean meal) contain low levels of contaminants.

**The *problem*:**

Fish meal and oil, major components in feed, often contain contaminants such as PCBs and dioxins. NFH-reared fish will store these compounds when fed most commercial diets. Diets containing moderate levels of plant products of low contaminant load are often unpalatable to carnivorous fish, particularly salmon and trout.

**The *objective*:**

The objective of this study is to determine what level of vegetable protein can be included in the feed and still maintain good palatability.

**The *method*:**

Vegetable protein diets must be evaluated in feeding trials to determine whether they will produce an acceptable level of feed

	<p>consumption and growth rate in NFH fish. At the conclusion of the feeding trial, weight gain and feed efficiency will be determined. Contaminant levels in the diets and fish will be analyzed.</p>
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**13210-A-011 - [Identification of Contaminants in Commercially Produced Fish Feeds Used at NFHs](#)**

<b>Facility</b>	Abernathy Fish Technology Center	<h2>Accomplishment Summary</h2> <p>Using data from feed samples collected over 2 years from 11 NFHs nationwide, and analyzed by USFWS and USGS staffs, a final report and manuscript have been generated and submitted to both USFWS and USGS for final review. The final report for the project has been accepted by USFWS and USGS. The manuscript is currently under review for publication.</p> <h2>Description</h2> <p><b>The <i>importance</i> to the Resource:</b></p> <p>Contaminated commercial fish feed pose both fish and human health hazards. Exposure to contaminants can adversely affect the health and viability of declining, threatened, and endangered fish species reared at NFHs.</p> <p><b>The <i>problem</i>:</b></p> <p>Contaminated fish feed can negatively affect the quality of fish destined for human consumption. Fish feeds from various suppliers are used at Pacific Region NFH. Some of the same brands of fish feed were found to have elevated levels of heavy metals in the feeds used at Southwestern Region NFHs.</p> <p><b>The <i>objective</i>:</b></p> <p>The objective of this study was to determine if contaminants were wide spread in fish feeds used by the USFWS.</p> <p><b>The <i>method</i>:</b></p> <p>Feeds were sampled from Coleman, Spring Creek, Hagerman, Quilcene, Leavenworth, Garrison Dam(R6), Ennis(R6), Jordan</p>
<b>Expended</b>	\$17500	
<b>Objective</b>	Develop and share applied aquatic scientific and technologic tools with partners.	
<b>Primary Benefited Species</b>	Chinook salmon or king salmon ( <a href="#"><i>Oncorhynchus tshawytscha</i></a> )	
<b>Primary Benefited Population</b>	Not specified	
<b>Plans</b>	Leavenworth Hatchery Genetics Management Plan Conservation of Columbia Basin Fish, Final Basinwide Salmon Recovery Strategy, 12/2000 (All H Paper) Comprehensive Hatchery Management Plan - Spring Creek NFH	
<b>Keyword</b>	Fish Technology	
<b>Need Number</b>	N-002	
<b>Partners</b>	National Oceanic and Atmospheric Administration, Northwest Fisheries Science Center U.S. Geological Survey, Columbia River Research Lab Western Washington Fish and Wildlife Office	
<b>Accomplishments</b>		

Number of Fishery Management Plan production tasks implemented (PART)	2	<p>River(R3), Genoa(R3), North Attleboro(R5), and White Sulphur Springs(R5) NFHs were for tested. Abernathy FTC staff processed feed samples, conducted proximate analyses and sent samples to USGS/BRD for contaminants analyses.</p> <p><b>Further description:</b></p> <p>Nutrition</p>
Number of applied aquatic scientific and technologic tools shared with partners.	5	



**13210-A-012 - [Quality Control of Fish Feeds Used at Pacific Region National Fish Hatcheries](#)**

<b>Facility</b>	Abernathy Fish Technology Center
<b>Expended</b>	\$118429
<b>Objective</b>	Develop and share applied aquatic scientific and technologic tools with partners.
<b>Primary Benefited Species</b>	Rainbow trout ( <a href="#">Oncorhynchus mykiss</a> )
<b>Primary Benefited Population</b>	<a href="#">Northern California ESU</a>
<b>Plans</b>	Warm Springs Hatchery and Genetic Management Plan (draft) Carson NFH Spring Chinook Salmon Hatchery and Genetic Management Plan
<b>Keyword</b>	Fish Technology
<b>Need Number</b>	N-002
<b>Partners</b>	

### Accomplishments

Recovery Plan production tasks implemented (PART)	2
Number of applied aquatic scientific and technologic tools shared with partners.	1

### Accomplishment Summary

Analyzed 67 samples of commercially produced fish feeds used at Pacific Region National Fish Hatcheries for use in propagating fish for mitigation and restoration of declining, threatened, and endangered species.

### Description

**The *importance* to the Resource:**

Abernathy FTC's Applied Research Program in Nutrition operates a Fish Feed Quality Control (FFQC) Program to monitor the quality of commercial fish feeds used at Region 1 NFHs. The information provided by the Center is critical to both contracting negotiations and to the quality and survivability of fish produced by the Pacific Region's NFHs.

**The *problem*:**

Commercial fish feeds do not always contain the specified concentrations of protein, fat, ash, moisture and vitamins. Such diets can result in poor growth and health when fed to NFH - reared fish.

**The *objective*:**

The objective of the FFQC Program is to determine whether commercial feeds fall within approved specifications. An additional objective is to determine the chemical composition and quality (via proximate, rancidity, vitamin and mineral analyses) of commercial feeds. Staff provide feed-related technical assistance to NFHs as well as feed mills.

**The *method*:**

In FY06, 67 commercially produced feed

	<p>samples were analyzed for proximate composition (protein, lipid, moisture, and ash). Rancidity, vitamin, and mineral level analyses were also done. Industry partners who produce these feeds use analysis results to improve the quality of subsequent batches and/or replace feed already delivered to NFHs.</p> <p><b>Further description:</b></p> <p>Here are examples of two FFQC issues dealt with at AFTC.</p> <p>In early Spring, increased mortalities were observed in fish fed Skretting Starter feeds at Makah and Quilcene NFH's. Additional testing was done (rancidity, aflatoxins, vitamin) to determine whether the mortalities resulted from a problem with the diets. It was later determined that the problem was related to poor quality soy protein used in the diets. Skretting has since indicated it will no longer use soy protein in its starter feeds.</p> <p>BioOregon announced that its popular moist fish feed called BioDiet Starter would no longer be manufactured as the company was undergoing a merger with Skretting. No other companies are capable of producing a similar high moisture fish feed. BioDiet Starter was particularly popular at Chinook salmon hatcheries as many salmon culturists have observed that this species would accept only a moist feed when the fry begin to feed for the first time. Therefore, AFTC initiated a conference call with representatives of four feed companies to discuss alternative feeds for first-feeding Chinook. Personnel from numerous Region 1 hatcheries participated in the call and had a chance to talk to feed company representatives about alternative feeds.</p>
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**13210-A-014 - [Identify Critical Nutrient Requirements for Listed Broodstock](#)**

<b>Facility</b>	Abernathy Fish Technology Center
<b>Expended</b>	\$68235
<b>Objective</b>	Develop and share applied aquatic scientific and technologic tools with partners.
<b>Primary Benefited Species</b>	Lahontan cutthroat trout ( <a href="#">Oncorhynchus clarkii henshawi</a> )
<b>Primary Benefited Population</b>	<a href="#">LNFH - Lahontan cutthroat trout Pilot Peak Broodstock</a>
<b>Plans</b>	Lahontan Cutthroat Trout Recovery Plan
<b>Keyword</b>	Fish Technology
<b>Need Number</b>	N-002
<b>Partners</b>	

### Accomplishments

Number of other Recovery Plan tasks implemented for T&E populations	1
Number of applied aquatic scientific and technologic tools shared with partners.	1

### Accomplishment Summary

Broodstock diets from Lahontan NFH, Mora FTC, Bears Bluff NFH were analyzed for key nutrients. One cutthroat trout broodstock feeding trial has been completed and a second trial has been started as parts of a study to to develop and formulate broodstock diets to improve condition and reproduction for species held in refugia. This accomplishment is associated with FONS project 13210-2003-004.

### Description

**The *importance* to the Resource:**

More threaten and endangered fish are being held in refugia at NFHs as captive broodstock. Although there are broodstock diets available commercially, questions still remain on the nutritional adequacy of these feeds.

**The *problem*:**

Nutrition affects survival, fecundity, egg size, composition, egg hatchability and fry viability. Analysis of the fish and their reproductive products have identified nutrients needed by broodstock. This method is a start but needs to be fined tuned. Culture and fecundity problems are seen in some captive stocks which could be related to nutrition.

**The *objective*:**

But few well-structured feeding trials have been conducted to determine species specific nutritional requirements. Abernathy FTC, Mora NFH&TC, and Lahontan NFH staffs examined feeds currently in use to gain nutritional need information.

	<p><b>The <i>method</i>:</b></p> <p>Feeds of of the listed captive cutthroat trout broodstock in Pacific Region, Gila trout in the Southwest Region and sturgeon in the Southeast Region were examined. A feeding trial has been initiated with cutthroat trout broodstock. This accomplishment is associated with FONS project 13210-2003-004.</p> <p><b>Further description:</b></p> <p>Nutrition</p>
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**13210-A-015 - [Fish Feed Development for the Captive Propagation of Threatened and Endangered Species](#)**

<b>Facility</b>	Abernathy Fish Technology Center
<b>Expended</b>	\$23148
<b>Objective</b>	Develop and share applied aquatic scientific and technologic tools with partners.
<b>Primary Benefited Species</b>	Coho salmon or silver salmon ( <a href="#">Oncorhynchus kisutch</a> )
<b>Primary Benefited Population</b>	Not specified
<b>Plans</b>	Hood Canal Salmon Management Plan (Quilcene NFH) Conservation of Columbia Basin Fish, Final Basinwide Salmon Recovery Strategy, 12/2000 (All H Paper)
<b>Keyword</b>	Fish Technology
<b>Need Number</b>	N-002
<b>Partners</b>	

**Accomplishments**

Number of Fishery Management Plan production tasks implemented (PART)	2
Number of techniques and culture technology tools developed.	1
Number of applied science and technology tasks implemented as prescribed by Recovery Plans. (PART)	1

**Accomplishment Summary**

Preliminary feeding trials with coho and steelhead were conducted evaluating the use of different lipid (fat) sources on fish feed used in captive propagation of threatened and endangered species. Data analysis and report writing are underway. One peer-reviewed paper was published examining the performance of bonytail chub fed different diets.

**Description**

**The importance to the Resource:**

Good nutrition is essential for wild fish when they are placed in NFHs, used as refuges, to protect and increase their numbers. Habitat destruction has brought about the realization that there will be a greater dependence on maintaining stocks to replenish the numbers in the wild.

**The problem:**

As more declining, threatened, and endangered species are moved into captive environments, it will be crucial to have feeds developed to meet their needs.

**The objective:**

Diets will be developed that are specific for the each species and will enhance the survival and maintain the health of the fish.

**The method:**

As diets are developed they will be fed to the fish using standard nutrition study protocols in controlled tank studies to determine which formulations perform optimally.

	<b>Further description:</b>  Nutrition
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**13210-A-016 - [Effects of Beta Glucans on Reducing Stress in Vaccinated Summer Steelhead at Hagerman NFH](#)**

<b>Facility</b>	Abernathy Fish Technology Center
<b>Expended</b>	\$7650
<b>Objective</b>	Develop and share applied aquatic scientific and technologic tools with partners.
<b>Primary Benefited Species</b>	Rainbow trout ( <a href="#">Oncorhynchus mykiss</a> )
<b>Primary Benefited Population</b>	Not specified
<b>Plans</b>	Hagerman NFH Steelhead HGMP
<b>Keyword</b>	Fish Technology
<b>Need Number</b>	N-002
<b>Partners</b>	

### Accomplishments

Number of Fishery Management Plan production tasks implemented (PART)	1
Number of applied aquatic scientific and technologic tools shared with partners.	1
Number of techniques and culture technology tools developed.	1

### Accomplishment Summary

The final report has been reviewed and edited. Communication and coordination with USGS and the USFWS Idaho FRO are continuing to finalize the results section. Additional analysis of the data is being done.

### Description

#### The *importance* to the Resource:

During rearing hatchery fish undergo various stress events, giving the fish a higher probability of contracting disease. Reducing stress in hatchery reared fish is important to keep disease outbreaks low.

#### The *problem*:

Hagerman NFH vaccinates juvenile steelhead against enteric redmouth and furunculosis, major sources of mortality, after the fish are transferred from indoor tanks to outdoor raceways. Both of these events are stressful to the fish and may cause elevated mortalities.

#### The *objective*:

Beta-glucans are one of a group of substances which stimulate and thereby enhance the immune response system in fish (thus providing additional protection against disease). Positive results have been achieved by adding beta-glucans to the feed.

#### The *method*:

Beta-glucans enhanced feed was fed to Hagerman NFH production steelhead for two consecutive years just prior to vaccination. A report is in final preparation. Information gained from this work can be applied across the NFH

	<p>System.</p> <p><b>Further description:</b></p> <p>Nutrition</p>
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**13210-A-017 - [NFH Effluent Management Through Nutrition](#)**

<b>Facility</b>	Abernathy Fish Technology Center
<b>Expended</b>	\$32400
<b>Objective</b>	Develop and share applied aquatic scientific and technologic tools with partners.
<b>Primary Benefited Species</b>	Chinook salmon or king salmon ( <a href="#"><i>Oncorhynchus tshawytscha</i></a> )
<b>Primary Benefited Population</b>	Not specified
<b>Plans</b>	Eagle Creek NFH Coho Salmon Hatchery and Genetic Management Plan Kooskia National Fish Hatchery HGMP Hagerman NFH Steelhead HGMP
<b>Keyword</b>	Fish Technology
<b>Need Number</b>	N-002
<b>Partners</b>	

### Accomplishments

Number of applied aquatic scientific and technologic tools shared with partners.	1
Number of techniques and culture technology tools developed.	1

### Accomplishment Summary

A peer reviewed study plan is in place and initial testing has started for a study to develop low-polluting fish feeds for use at NFHs. Mora & Abernathy Fish Technology Centers have completed the first feeding trial. Feed is being made for the other partners, Lamar & Bozeman Fish Technology Centers. The goal is to assist NFHs in meeting new and more stringent EPA and state effluent guidelines and standards. This project is associated with FONS project 13210-2005-016.

### Description

**The *importance* to the Resource:**

The Environmental Protection Agency (EPA) is developing new effluent standards and guidelines for aquaculture facilities, including NFHs. New requirements include development of treatment technologies and best management practices for reducing the discharge of total suspended solids and excess feed.

**The *problem*:**

Feeds are needed that produce less waste via the fish or as excess feed. This project proposes to develop and test low polluting diets to be used at hatcheries to assist in the management of solids and excess feed.

**The *objective*:**

This project will develop and test low-polluting fish feeds for use at NFHs to assist these facilities in meeting new and more stringent EPA and state effluent guidelines and standards.

	<p><b>The <i>method</i>:</b></p> <p>The feed would be highly palatable, highly digestible, and low in excreted phosphorous. Also, non-friable fecal material would be produced making the solids easier to remove. As diets are developed they will be fed to the fish using standard nutrition study protocols in controlled tank studies to determine which formulations perform optimally.</p> <p><b>Further description:</b></p> <p>Nutrition</p>
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13210-A-019 - [Development of a Native Broodstock for Use in Restoration and Recovery](#)

<b>Facility</b>	Abernathy Fish Technology Center
<b>Expended</b>	\$395251
<b>Objective</b>	Recover fish and other aquatic resource populations protected under the Endangered Species Act.
<b>Primary Benefited Species</b>	Rainbow trout ( <a href="#">Oncorhynchus mykiss</a> )
<b>Primary Benefited Population</b>	Not specified
<b>Plans</b>	Conservation of Columbia Basin Fish, Final Basinwide Salmon Recovery Strategy, 12/2000 (All H Paper) National Broodstock Policy and Implementation Guidelines
<b>Keyword</b>	Fish Technology
<b>Need Number</b>	N-002
<b>Partners</b>	Washington Department of Fish and Wildlife (\$70000)

### Accomplishments

Recovery Plan production tasks implemented (PART)	1
Number of Fishery Management Plan production tasks implemented (PART)	3
Number of techniques and culture technology	3

### Accomplishment Summary

We have evaluated the behavior, morphology, physiology, genetic diversity, and reproductive success of hatchery and wild steelhead. 20,000 steelhead have been released from AFTC yearly since 2003. Wild smolt production has not been effected. Hatchery and wild fish differ morphologically and physiologically. We have maintained genetic diversity among the broodstock and progeny. Hatchery returns have reproduced naturally. Hatchery and wild fish produced equivalent numbers of offspring.

### Description

#### **The importance to the Resource:**

To meet Service goals and a NMFS BiOp, Abernathy Fish Technology Center (AFTC) staff are establishing a native broodstock of natural spawning steelhead to recover wild steelhead populations. The study is evaluating the effects of integrated hatchery practices on wild ESA populations for application throughout the Columbia River basin.

#### **The problem:**

Many hatchery programs for steelhead pose genetic or ecological risks to natural populations because those programs release or outplant fish from non-native stocks. As a result, the USFWS and the NOAA Fisheries have recommended a policy that discourages the use of non-native hatchery stocks and encourages development of native broodstocks.

#### **The objective:**

We are developing methods to produce hatchery fish that do not involve the use of ESA-listed adults that in turn will be used to

tools developed.	
Number of applied science and technology tasks implemented as prescribed by Recovery Plans. (PART)	1
<p>develop a native broodstock. Results should produce a means to produce self-sustaining stocks of steelhead that have applicability for use in salmon recoveries throughout the Pacific Region.</p> <p><b>The <i>method</i>:</b></p> <p>We initiated our steelhead broodstock program by captively rearing wild juveniles to sexual maturity. 20,000 juveniles have been released from AFTC yearly since 2003. We have been monitoring hatchery and wild smolt and returning adult steelhead behavior, morphology, physiology, genetic diversity, and reproductive success since 2003.</p> <p><b>Further description:</b></p> <p>Five hundred naturally spawned juvenile steelhead from the locally adapted population were collected over 3 years (1999-2001). Progeny produced from these fish are being released, monitored, and evaluated. The number of wild steelhead smolts migrating out of the treatment (1) and control (2) creeks has been consistent among years. Emigration date between hatchery and wild fish were similar and did not vary among years. However, hatchery and wild steelhead differed morphologically and physiologically. After genotyping and parentage analysis it appears that we have been successful, thus far at maintaining genetic diversity among our broodstocks as well as within the progeny produced at the hatchery. In addition, the individuals that we have passed upstream of the hatchery have been able to reproduce naturally. To date it appears that wild fish produced equivalent numbers of offspring as hatchery fish.</p> <p>Ecological Physiology</p>	

**13210-A-022 - [Field Identification and Genetic Validation of Steelhead, Cutthroat Trout, and Their Hybrids](#)**

<b>Facility</b>	Abernathy Fish Technology Center	<h2>Accomplishment Summary</h2> <p>Maximize field biologist's ability to classify juvenile steelhead, coastal cutthroat trout, and their hybrids. We determined morphometric measurements, genotyping completed for steelhead, cutthroat trout and hybrids. We are currently completing a manuscript for peer-reviewed publication.</p> <h2>Description</h2> <p><b>The importance to the Resource:</b></p> <p>Conservation of native species depends on accurate estimates of population demographics, including population abundance, survival, recruitment, and migration. Often these estimates are based on the identification of individual organisms in the field using one or more phenotypic characters and the assumption of a simple breeding structure.</p> <p><b>The problem:</b></p> <p>In systems where native species are closely related or known to hybridize field-based identifications may be inaccurate. This inaccuracy can lead to erroneous conclusions on basic life history characters and population demographics, causing poor decisions on species listings, critical habitat designations, and conservation plans.</p> <p><b>The objective:</b></p> <p>We are attempting to maximize field biologist's abilities to classify juvenile steelhead, coastal cutthroat trout, and their hybrids.</p> <p><b>The method:</b></p>					
<b>Expended</b>	\$33148						
<b>Objective</b>	Restore declining fish and other aquatic resource populations before they require listing under the Endangered Species Act.						
<b>Primary Benefited Species</b>	Cutthroat trout ( <a href="#">Oncorhynchus clarkii</a> )						
<b>Primary Benefited Population</b>	Not specified						
<b>Plans</b>	Conservation of Columbia Basin Fish, Final Basinwide Salmon Recovery Strategy, 12/2000 (All H Paper) Lower Columbia Salmon Recovery and Subbasin Plan						
<b>Keyword</b>	Fish Technology						
<b>Need Number</b>	N-002						
<b>Partners</b>							
<h2>Accomplishments</h2> <table><tr><td>Recovery Plan production tasks implemented (PART)</td><td>1</td></tr><tr><td>Number of other Fishery Management Plan tasks implemented for populations of management concern.</td><td>1</td></tr><tr><td>Number of applied aquatic scientific and technologic tools shared with partners.</td><td>1</td></tr></table>		Recovery Plan production tasks implemented (PART)	1	Number of other Fishery Management Plan tasks implemented for populations of management concern.	1	Number of applied aquatic scientific and technologic tools shared with partners.	1
Recovery Plan production tasks implemented (PART)	1						
Number of other Fishery Management Plan tasks implemented for populations of management concern.	1						
Number of applied aquatic scientific and technologic tools shared with partners.	1						

	<p>We have collected juvenile steelhead, coastal cutthroat trout, and their hybrids during outmigration and classified individuals using phenotypic and genotypic methods.</p> <p><b>Further description:</b></p> <p>Ecological Physiology and Genetics</p>
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**13210-A-023 - [Evaluation of Electro-Anesthesia To Sort Adult Spawning Chinook Salmon at NFHs](#)**

<b>Facility</b>	Abernathy Fish Technology Center
<b>Expended</b>	\$14700
<b>Objective</b>	Develop and share applied aquatic scientific and technologic tools with partners.
<b>Primary Benefited Species</b>	Chinook salmon or king salmon ( <a href="#">Oncorhynchus tshawytscha</a> )
<b>Primary Benefited Population</b>	Not specified
<b>Plans</b>	National Broodstock Policy and Implementation Guidelines Carson NFH Spring Chinook Salmon Hatchery and Genetic Management Plan
<b>Keyword</b>	Fish Technology
<b>Need Number</b>	N-002
<b>Partners</b>	Carson National Fish Hatchery Smith-Root, inc

## Accomplishments

Number of Fishery Management Plan production tasks implemented (PART)	1
Number of applied aquatic scientific and technologic tools shared with partners.	1
Number of techniques and culture technology tools developed.	1

## Accomplishment Summary

Electro-anesthesia was determined to be an effective alternative to chemical treatment for surplus and sorting Chinook salmon, providing labor savings and reduced chemical use. A manuscript detailing our findings was submitted for peer reviewed publication.

## Description

### **The importance to the Resource:**

Hatchery spawning activities have traditionally used carbon dioxide and a compound known as MS-222 as anesthetics. Given their large size adult salmon must be anesthetized prior to handling. This prevents undue stress and injury to the fish (which is key to fish health) as well as being a physical necessity on the part of the hatchery worker.

### **The problem:**

Currently used methods for anesthetizing adult salmon have significant drawbacks. Carbon dioxide can cause spasms injuring fish, and MS-222 requires a 21-day waiting period before treated fish can be released to the wild (due to carcinogen concerns).

### **The objective:**

This study evaluated an alternative treatment: the use of electrical anesthesia to calm fish during spawning activities. Abernathy FTC staff compared the efficiency of traditional compounds versus electro-anesthesia on Spring Chinook salmon at Carson NFH.

### **The method:**

Adult salmon at Carson NFH were exposed to

	<p>electro-anesthesia or MS-222 and monitored for visible injuries, muscle hemorrhaging, fertilization rate, gamete quality, and egg survival to hatching.</p> <p><b>Further description:</b></p> <p>Ecological Physiology</p>
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**13210-A-024 - [Development of PIT Tag Interrogation Units for Imperiled Columbia River Basin Salmon and Trout](#)**

<b>Facility</b>	Abernathy Fish Technology Center	<p><b>Accomplishment Summary</b></p> <p>Twelve remote PIT tag monitoring sites were upgraded, maintained, and monitored to examine the demographics, movements, and behavior of listed salmon and trout.</p> <p><b>Description</b></p> <p><b>The <i>importance</i> to the Resource:</b></p> <p>Various management plans and ESA-related Biological Opinions have stressed the need to evaluate the distribution, freshwater habitat use and migrations of imperiled populations of bull trout, cutthroat trout and other salmonids.</p> <p><b>The <i>problem</i>:</b></p> <p>Traditional monitoring methods (fixed traps, mark-recapture, and radio telemetry) are limited by high and low water flows, labor costs, and excessive handling effects.</p> <p><b>The <i>objective</i>:</b></p> <p>Construct, install, monitor, and upgrade PIT tag antenna arrays that enable the evaluation of imperiled trout and salmon distribution, freshwater habitat use, and migration patterns.</p> <p><b>The <i>method</i>:</b></p> <p>In cooperation with the Columbia River Fisheries Program Office and other partners this project has implemented PIT tag interrogation units at Columbia River basin monitoring sites established in Washington and Oregon.</p> <p><b>Further description:</b></p>
<b>Expended</b>	\$97281	
<b>Objective</b>	Develop and share applied aquatic scientific and technologic tools with partners.	
<b>Primary Benefited Species</b>	Bull trout ( <a href="#">Salvelinus confluentus</a> )	
<b>Primary Benefited Population</b>	<a href="#">Walla Walla River core area Bull Trout</a>	
<b>Plans</b>	<p>1999 NMFS Biological Opinion on Artificial Propagation in the Columbia River Basin.</p> <p>Conservation of Columbia Basin Fish, Final Basinwide Salmon Recovery Strategy, 12/2000 (All H Paper)</p> <p>Draft Columbia River Basin Research Plan</p>	
<b>Keyword</b>	Fish Technology	
<b>Need Number</b>	N-002	
<b>Partners</b>	<p>Bonneville Power Administration</p> <p>Columbia River Fisheries Program Office</p> <p>Oregon Department of Fish and Wildlife</p> <p>U. S. Army Corps of Engineers</p> <p>U. S. Forest Service</p> <p>U.S. Bureau of Reclamation</p>	

	Utah State University Washington Department of Fish and Wildlife	Ecological Physiology
<b>Accomplishments</b>		
Number of other Recovery Plan tasks implemented for T&E populations	1	
Number of mitigation tasks implemented as prescribed in approved plans. (PART)	1	
Number of applied aquatic scientific and technologic tools shared with partners.	1	
Number of techniques and culture technology tools developed.	1	
Number of mitigation applied sci & tech tasks implemented as prescribed in approved plans.	1	

**13210-A-025 - [Bioenergetics of Genetically Distinct Populations of Bull Trout in Relation to Fish Passage](#)**

<b>Facility</b>	Abernathy Fish Technology Center	<h3>Accomplishment Summary</h3> <p>Respirometry equipment was built and successfully tested. Oxygen maximum consumption rate experiments on wild bull trout have been completed. Experiments to determine resting and active metabolic rates have been completed. Currently a final report is being compiled and should be available in late 2006.</p> <h3>Description</h3> <p><b>The importance to the Resource:</b></p> <p>Bull trout has been listed by the USFWS. As such it is imperative to determine and describe basic metabolic needs of bull trout for use in making management decisions, specifically on such issues as culvert design.</p> <p><b>The problem:</b></p> <p>Basic metabolic needs of bull trout are unknown thus making management decisions, specifically on such issues as culvert design difficult.</p> <p><b>The objective:</b></p> <p>We intend to determine the resting and active metabolic rate for wild bull trout at several temperatures and sizes and respective maximum consumption rates. In addition we intend to develop a bioenergetics model for wild bull trout using data on life history, swim speed, activity, and water temperature.</p> <p><b>The method:</b></p> <p>We have determined the resting and active metabolic rate for wild bull trout at several temperatures and sizes and respective</p>			
<b>Expended</b>	\$55591				
<b>Objective</b>	Utilize appropriate scientific and technologic tools in formulating and executing fishery management plans and policies.				
<b>Primary Benefited Species</b>	Bull trout ( <a href="#">Salvelinus confluentus</a> )				
<b>Primary Benefited Population</b>	<a href="#">Walla Walla River core area Bull Trout</a>				
<b>Plans</b>	Bull Trout Draft Recovery Plan, Chapter 23				
<b>Keyword</b>	Fish Passage				
<b>Need Number</b>	N-002				
<b>Partners</b>	National Oceanic and Atmospheric Administration, Northwest Fisheries Science Center Oregon Fish and Wildlife Office U.S. Geological Survey, Columbia River Research Lab				
<h3>Accomplishments</h3> <table><tr><td>Number of other Recovery Plan tasks implemented for T&amp;E populations</td><td>1</td></tr><tr><td>Number of applied aquatic scientific and technologic tools shared with partners.</td><td>1</td></tr></table>		Number of other Recovery Plan tasks implemented for T&E populations	1	Number of applied aquatic scientific and technologic tools shared with partners.	1
Number of other Recovery Plan tasks implemented for T&E populations	1				
Number of applied aquatic scientific and technologic tools shared with partners.	1				

	<p>maximum consumption rates. We have developed a bioenergetics model for wild bull trout using data on life history, swim speed, and activity, and water temperature.</p> <p><b>Further description:</b></p> <p>Annual report is currently being prepared and will be available late 2006.</p> <p>Ecological Physiology</p>
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13210-A-027 - [Evaluation of Water Diversion Screen Criteria for Pacific Lamprey](#)

<b>Facility</b>	Abernathy Fish Technology Center
<b>Expended</b>	\$17650
<b>Objective</b>	Utilize appropriate scientific and technologic tools in formulating and executing fishery management plans and policies.
<b>Primary Benefited Species</b>	Pacific lamprey ( <a href="#">Lampetra tridentata</a> )
<b>Primary Benefited Population</b>	<a href="#">Columbia River Pacific Lamprey</a>
<b>Plans</b>	Salmon Subbasin Summary Lower Columbia Salmon Recovery and Subbasin Plan
<b>Keyword</b>	Fish Passage
<b>Need Number</b>	N-002
<b>Partners</b>	Columbia River Fisheries Program Office Oregon Fish and Wildlife Office

### Accomplishments

Number of other Fishery Management Plan tasks implemented for populations of management concern.	2
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### Accomplishment Summary

Behavioral experiments to protect the declining Pacific Lamprey at water diversion structures were initiated and completed. Data was analyzed and a final report was prepared and submitted to the USFWS Oregon FWO for use in management decisions.

### Description

**The *importance* to the Resource:**

Effective screening criteria are essential to prevent impingement and entrainment of petitioned Pacific lamprey in water diversion structures at the Pacific Region's NFHs, agricultural drainage ditches, and hydropower facilities.

**The *problem*:**

Existing criteria were based on and developed for salmon species, such as Chinook, and questions have arisen as to whether existing criteria could protect the declining Pacific Lamprey from impingement and entrainment at fishery facilities in Pacific Northwest watersheds.

**The *objective*:**

To determine if existing fish screen criteria protect Pacific Lamprey from impingement and entrainment.

**The *method*:**

Using current generic salmon screening criteria as a baseline, Tte Center's Applied Research Program in Ecological Physiology conducted experiments to determine what risks, if any, the current water diversion screens pose to Pacific lamprey petitioned under the Endangered

	<p>Species Act. The study and fianl report has been completed and submitted.</p> <p><b>Further description:</b></p> <p>Ecological Physiology</p>
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**13210-A-028 - [The Utility of Volitional Release Strategies at Winthrop National Fish Hatchery, Winthrop, WA](#)**

<b>Facility</b>	Abernathy Fish Technology Center
<b>Expended</b>	\$17650
<b>Objective</b>	Utilize appropriate scientific and technologic tools in formulating and executing fishery management plans and policies.
<b>Primary Benefited Species</b>	Rainbow trout ( <a href="#">Oncorhynchus mykiss</a> .)
<b>Primary Benefited Population</b>	<a href="#">Methow River (UCMET-s) population, part of the Upper-Columbia River steelhead ESU.</a>
<b>Plans</b>	Winthrop Hatchery Genetics Management Plan (Steelhead) Methow Subbasin Plan
<b>Keyword</b>	Fish Technology
<b>Need Number</b>	N-002
<b>Partners</b>	Leavenworth National Fish Hatchery U.S. Bureau of Reclamation

## Accomplishments

Number of Fishery Management Plan production tasks implemented (PART)	1
Number of techniques and culture technology tools developed.	1
Number of applied science and technology tasks implemented as prescribed by Fishery Management Plans. (PART)	1

## Accomplishment Summary

Data from both 2004 and 2005 study years were compiled and analyzed. Results indicate few if any differences between volitionally and force released fish. Additional samples were collected to determine whether a specific male hormone level is associated with precocious maturation. Project results were presented at the USFWS Region 1 Hatchery Management Workshop (Nov 2005) and the Annula Meeting of the American Fisheries Society, Oregon Chapter (Feb 2006). A manuscript is in preparation.

## Description

### **The importance to the Resource:**

Given the apparent untenable status of many wild Pacific salmon populations, the role of hatchery stocks as a conservation tool has been increasingly debated. Numerous reviews of hatchery practices have recommended new practices concerning everything from release strategies to feeding methods that might improve the performance of NFH programs.

### **The problem:**

One criticism of hatchery programs is that they release juvenile fish which are not fully ready to undergo downstream migration, this can lead to low post release survival and increased levels of precocious maturation in juvenile fish.

### **The objective:**

The study objective is to determine if the use of volitional release for NFH juvenile fish results in the release of more physiologically and behaviorally competent smolts. The steelhead production program at Winthrop NFH was

	<p>chosen as a case study.</p> <p><b>The <i>method</i>:</b></p> <p>Volitionally released juvenile steelhead were compared to force released and non-migrating individuals. Factors compared include smolt physiology, reproductive physiology, and migratory behavior (using PIT tag monitoring technology). A manuscript is being prepared for submission to a peer reviewed journal.</p> <p><b>Further description:</b></p> <p>Ecological Physiology</p>
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**13210-A-029 - [Emigration and Smolting of Net-Pen Reared Spring Chinook Salmon From Youngs Bay, OR](#)**

<b>Facility</b>	Abernathy Fish Technology Center	<h2>Accomplishment Summary</h2> <p>Completed final study report examining emigration rate and its relationship to smolt development in spring Chinook salmon. The final report has been submitted to Oregon Fish and Wildlife Departments Recreation and Enhancement Board. In addition the results have been shared with regional partners concerned with monitoring and restoration of the Columbia River estuary.</p> <h2>Description</h2> <p><b>The <i>importance</i> to the Resource:</b></p> <p>Terminal fisheries extend the hatchery rearing period and are used to increase commercial and sport fishing opportunities. These programs can have negative impacts on wild fish by increasing competition for food and habitat. The results of this study will provide information to determine whether this program can be expanded or should be curtailed.</p> <p><b>The <i>problem</i>:</b></p> <p>The Columbia River estuary is known to be an important nursery and rearing area for a number of threatened and endangered wild salmon stocks. Whether there are negative interactions between the hatchery fish released for this terminal fishery program and wild fish is unknown.</p> <p><b>The <i>objective</i>:</b></p> <p>Project objectives are to determine: 1) the emigration rate of juvenile net-pen reared salmon; and 2) if there is a correlation between gill ATPase (a hormone used as a physiological measure of smolting) and emigration rate.</p>	
<b>Expended</b>	\$15500		
<b>Objective</b>	Restore declining fish and other aquatic resource populations before they require listing under the Endangered Species Act.		
<b>Primary Benefited Species</b>	Chinook salmon or king salmon ( <a href="#">Oncorhynchus tshawytscha</a> )		
<b>Primary Benefited Population</b>	<a href="#">Lower Columbia River</a>		
<b>Plans</b>	Conservation of Columbia Basin Fish, Final Basinwide Salmon Recovery Strategy, 12/2000 (All H Paper)  Lower Columbia Salmon Recovery and Subbasin Plan		
<b>Keyword</b>	Fish Technology		
<b>Need Number</b>	N-002		
<b>Partners</b>	Battelle Pacific Northwest National (\$1500) Clatsop Economic Development Council (\$1000) Oregon Department of Fish and Wildlife (\$1500) Salmon for All (\$500)		
<h2>Accomplishments</h2> <table><tr><td>Number of other Fishery Management Plan</td><td>1</td></tr></table>		Number of other Fishery Management Plan	1
Number of other Fishery Management Plan	1		

tasks implemented for populations of management concern.		<p><b>The <i>method</i>:</b></p> <p>Chinook physiology and emigration route and speed were measured using radio-telemetry techniques. This was a cooperative project, and including Salmon for All, Clatsop County, OR, Columbia River Estuary Study Team, and Oregon Department of Fish &amp; Wildlife Recreation and Enhancement Board.</p> <p><b>Further description:</b></p> <p>Ecological Physiology</p>
Number of applied aquatic scientific and technologic tools shared with partners.	1	
Number of techniques and culture technology tools developed.	1	

**13210-A-030 - Using Low Densities Instead of Medicated Feed as a Control for the Salmonid Disease Furunculosis.**

<b>Facility</b>	Abernathy Fish Technology Center
<b>Expended</b>	\$32257
<b>Objective</b>	Develop and share applied aquatic scientific and technologic tools with partners.
<b>Primary Benefited Species</b>	Rainbow trout ( <a href="#">Oncorhynchus mykiss</a> )
<b>Primary Benefited Population</b>	Not specified
<b>Plans</b>	U.S. Fish and Wildlife Service National Aquatic Animal Health Policy
<b>Keyword</b>	Fish Technology
<b>Need Number</b>	N-002
<b>Partners</b>	

## Accomplishments

Number of techniques and culture technology tools developed.	1
Number of applied science and technology tasks implemented as prescribed by Fishery Management Plans. (PART)	1

## Accomplishment Summary

Data collection and analysis have been completed. The manuscript has been reviewed and has been accepted for publication in the North American Journal of Aquaculture.

## Description

### **The importance to the Resource:**

Furunculosis is a major source of mortalities in salmon and trout production programs. Treatments for this bacterial disease in fish are limited to two expensive antibiotics, Terramycin and Romet-30. Alternative, less expensive treatments are needed to allow flexibility when faced with bacterial fish health problems.

### **The problem:**

Terramycin and Romet-30 are the only antibiotics cleared for treatment of bacterial fish diseases, including furunculosis a major source of mortality in salmon and trout. Medicated feed is expensive and some bacterial fish pathogens have developed resistance to the two antibiotics available.

### **The objective:**

To look at population thinning as an alternative treatment for reducing fish mortality due to bacterial infection caused by furunculosis disease in salmon and trout production programs.

### **The method:**

Steelhead undergoing an outbreak of furunculosis were divided into high and low density groups and stocked into wet-lab tanks. Results indicate that lowering fish density

	<p>statistically reduced mortality due to furunculosis. Observational studies, although anecdotal, also support use of density reduction to reduce mortality.</p> <p><b>Further description:</b></p> <p>Pathology</p> <p>Salmon and trout reared at NFHs are commonly provided terramycin treated fish feed to prevent outbreaks of furunculosis, a common cause of mortalities. However, if the disease control benefits are produced by lowering raceway densities, this could potentially provide a substantial financial savings in feed costs, reduce antibiotic resistance of the pathogen, and avoid the introduction of drugs into NFH fish potentially available for human consumption. Steelhead undergoing an outbreak of furunculosis were divided into high and low density groups and stocked into experimental wet-lab tanks. Mortality was noted for all test groups. Result indicate that lowering fish density statistically reduced mortality due to furunculosis. Preliminary studies in a raceway, although anecdotal, also supported the use of density reduction to reduce furunculosis mortality. Data from the initial wet-lab study and two raceway studies has been analyzed. A publication has been prepared and is in "in house" review. It will be submitted to the North American Journal of Aquaculture for publication.</p>
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**13210-A-031 - [Quantitative PCR Assay Development for Identification and Enumeration of 3 Fish Pathogens.](#)**

<b>Facility</b>	Abernathy Fish Technology Center
<b>Expended</b>	\$58827
<b>Objective</b>	Develop and share applied aquatic scientific and technologic tools with partners.
<b>Primary Benefited Species</b>	Chinook salmon or king salmon ( <a href="#">Oncorhynchus tshawytscha</a> )
<b>Primary Benefited Population</b>	Not specified
<b>Plans</b>	U.S. Fish and Wildlife Service National Aquatic Animal Health Policy
<b>Keyword</b>	Fish Health
<b>Need Number</b>	N-002
<b>Partners</b>	Lower Columbia Fish Health Center (\$2500)

## Accomplishments

Number of applied aquatic scientific and technologic tools shared with partners.	1
Number of techniques and culture technology tools developed.	1
Number of applied science and technology tasks implemented as prescribed by Fishery Management Plans. (PART)	1

## Accomplishment Summary

Pathogen test protocols for enteric redmouth disease have been completed and are currently being tested under clinical and field conditions. Pathogen testing protocols for furunculosis and bacterial coldwater disease have presented some problems and are being refined for use.

## Description

### The *importance* to the Resource:

Rapid and accurate diagnosis of fish diseases is imperative in any fish management program. Not only is actual pathogen identification important, but knowing the quantity of pathogen or extent of the infection is also of paramount importance to the clinician.

### The *problem*:

Current pathogen identification methods require culturing of the pathogen which can be very slow (days). A more rapid method would greatly benefit the: 1) diagnostician in making treatment recommendations; and 2) hatchery production program by allowing a faster (hours) and more responsive treatment regime thus lowering mortality.

### The *objective*:

To further develop and refine the quantitative polymerase chain reaction assay (QPCR) that will not only identify the pathogen but also give the quantity of pathogen in the diagnostic sample. This assay would take hours to perform instead of days as do the current methods.

	<p><b>The <i>method</i>:</b></p> <p>Nucleic acid (DNA) primers and probes will be further developed and refined for 3 of the major salmon and trout pathogens (Furunculosis, Enteric Remouth disease, and Bacterial Cold Water Disease). Appropriate assay protocols will be developed and tested for these the pathogens. The Lower Columbia FHC has begun field testing on clinical samples .</p> <p><b>Further description:</b></p> <p>Pathology</p> <p>In disease diagnosis it is imperative to identify the causative agent (bacterial, virus, etc.), and to also determine pathogen quantity. Information on pathogen quantity allows the diagnostician to differentiate between a carrier state with no disease observed and an actual disease outbreak. This is especially true when rearing fish for use in restoration and recovery programs. Abernathy Fish Technology Center staff have already developed a polymerase chain reaction assay (PCR) for 3 fish pathogens that is rapid, sensitive, and provides positive identification of the target pathogen. However, this assay is not capable of determining actual quantity of the target pathogen in a sample. Development of a quantitative PCR (QPCR) would solve this problem. This project will develop the necessary protocols to expand the existing PCR assays to a QPCR assay for the detection and quantification of the pathogens causing bacterial cold water disease, furunculosis, and enteric redmouth, three of the primary salmon and trout pathogens. Field tests have begun on clinical samples submitted to the Lower Columbia Fish Health Center.</p>
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13210-A-032 - [Establishment of a Regional Repository for Fish Pathogens](#)

<b>Facility</b>	Abernathy Fish Technology Center
<b>Expended</b>	\$25600
<b>Objective</b>	Develop and share applied aquatic scientific and technologic tools with partners.
<b>Primary Benefited Species</b>	(0) Multiple Species
<b>Primary Benefited Population</b>	Not specified
<b>Plans</b>	U.S. Fish and Wildlife Service National Aquatic Animal Health Policy
<b>Keyword</b>	Fish Health
<b>Need Number</b>	N-002
<b>Partners</b>	

## Accomplishments

Number of applied aquatic scientific and technologic tools shared with partners.	1
Number of techniques and culture technology tools developed.	1
Number of applied science and technology tasks implemented as prescribed by Fishery Management Plans. (PART)	1

## Accomplishment Summary

Collected more than 20 bacterial and viral fish pathogen samples from a number of fish health laboratories. Supplied pathogen samples to University of Idaho, Warm Springs FHC, Lamar FHC, and Auburn USDA Lab. Continued to characterize and catalogue samples already in the repository collection.

## Description

### The *importance* to the Resource:

Ongoing research in fish health often requires viable pathogen isolates to pursue research questions. Often the required isolate is not available from any source or has been lost after initial isolation. Lack of appropriate isolates precludes important research critical to fish health diagnostic, treatment, management, and policy development.

### The *problem*:

Maintainence of viable fish pathogens is usually done by culturing the isolates which can be labor intensive. Also cultured isolates are often no longer viable after prolonged storage.

### The *objective*:

To create a repository for bacterial and viral fish pathogens using lyophilization technology to preserve viable pathogens. Lyophilization preserves bacteria and viruses and allows for long-term storage (years) of viable isolates.

### The *method*:

Bacteria and virus isolates will be submitted by the Service's Fish Health Centers and partner laboratories. Isolates will be lyophilized,

	<p>catalogued, and be made available in response to researcher requests.</p> <p><b>Further description:</b></p> <p>Pathology</p> <p>Viable fish pathogens for research and development purposes are not always readily available. Most research facilities retain a small selection of pathogens in active culture or frozen samples. However, samples stored this way require excessive labor to maintain and often lose viability and are lost. By using a freeze-drying technique, bacterial and viral samples can be retained without excessive labor and with preservation of viability over long periods of time (years). This would assure researchers of a reliable source for bacterial and viral fish pathogens for future research and development needs. This project collects and preserves viable bacterial and viral fish pathogens from a variety of sources such as USFWS and State Fish Health Labs, University Labs, and the commercial sector. Samples will be identified biochemically and serologically, and then stored for future dissemination. The availability of the different strains of various fish pathogens will allow critical research to be done independent of the strain's availability at the original source. This is particularly important in the rearing of species used in the restoration and recovery of declining, threatened and endangered species.</p>
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13210-A-033 - [Identification of Previously Unknown Lesions in White Sturgeon Liver.](#)

<b>Facility</b>	Abernathy Fish Technology Center
<b>Expended</b>	\$15660
<b>Objective</b>	Recover fish and other aquatic resource populations protected under the Endangered Species Act.
<b>Primary Benefited Species</b>	White sturgeon ( <a href="#">Acipenser transmontanus</a> )
<b>Primary Benefited Population</b>	Not specified
<b>Plans</b>	U.S. Fish and Wildlife Service National Aquatic Animal Health Policy
<b>Keyword</b>	Fish Health
<b>Need Number</b>	N-002
<b>Partners</b>	Dr. Charlie Smith (USFWS retired) Idaho FHC

## Accomplishments

Number of applied aquatic scientific and technologic tools shared with partners.

1

## Accomplishment Summary

Manuscript on polycystic lesions in the liver of white sturgeon is in preparation to be submitted to the Journal of Aquatic Animal Health.

## Description

### The *importance* to the Resource:

Very little is known about disease in white sturgeon. The lesions described in this study are a new pathology and seem to be 100% fatal for the fish that display them. Because some populations of sturgeon are endangered and other populations are in jeopardy, this pathology may have important consequences in recovery efforts.

### The *problem*:

A new, polycystic lesion has been discovered in juvenile white sturgeon. This lesion appears to be 100% fatal in those fish that display the condition. This condition needs to be studied further and its origin determined.

### The *objective*:

This study describes a new, polycystic lesion found in the liver and kidney of juvenile white sturgeon.

### The *method*:

Infected sturgeon will be examine by histopathological techniques to describe the general nature of this lesion. Information gathered on this pathogen can be used in developing diagnostic techniques and treatment methods.

	<p><b>Further description:</b></p> <p>Pathology</p> <p>In July 2003, Abernathy FTC staff noted that a number of juvenile white sturgeon had severely distended abdomens. Initial necropsy revealed a large, jelly-like mass in the peritoneal cavity of the fish. Histopathological samples were taken of the tumor and the mass was identified as a polycystic lesion of the liver. In order to detect transmissibility of the condition, samples of the tumor were prepared for injection into healthy fish. Infected fish were also cohabitated with healthy fish to determine horizontal transmission. None of the test groups showed any signs of the condition after 3 months of observation. This is a new, undescribed condition in white sturgeon and is believed to be a genetic anomaly. An oral presentation was delivered on this study at the 9th Biennial Fish Diagnosticians Conference in Biloxi, MS, with an additional poster presented at the Western Fish Disease Workshop in Juneau, AK, and at the Annual Meeting of the American Fisheries Society, Fish Health Section, Shepards town, WV.</p>
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13210-A-034 - [Safety of Standard Therapeutic Compounds in Three Species of Salmonids](#)

<b>Facility</b>	Abernathy Fish Technology Center
<b>Expended</b>	\$32257
<b>Objective</b>	Utilize appropriate scientific and technologic tools in formulating and executing fishery management plans and policies.
<b>Primary Benefited Species</b>	Chinook salmon or king salmon ( <a href="#">Oncorhynchus tshawytscha</a> )
<b>Primary Benefited Population</b>	Not specified
<b>Plans</b>	U.S. Fish and Wildlife Service National Aquatic Animal Health Policy
<b>Keyword</b>	INAD
<b>Need Number</b>	N-002
<b>Partners</b>	

### Accomplishments

Number of applied aquatic scientific and technologic tools shared with partners.	1
Number of applied science and technology tasks implemented as prescribed by Fishery Management Plans. (PART)	1

### Accomplishment Summary

A manuscript has been prepared and submitted to the North American Journal of Aquaculture, a peer-reviewed publication.

### Description

**The *importance* to the Resource:**

Efficacious treatment is imperative in the prevention and elimination of disease in hatcheries. Treatments must be safe, effective, and cost effective. Improvements in treatment regimes are highly desirable both to reduce mortality and cost.

**The *problem*:**

Existing treatment recommendations for salmonids are based on safety and efficacy data generated using rainbow trout. Little is known about the actual safe limits for other species of salmonids.

**The *objective*:**

This study looked at five treatment compounds to improve understanding of the safety limits of those compounds on three species of salmonids.

**The *method*:**

Two sizes of coho and Chinook salmon and rainbow trout were exposed to different levels of 5 different chemotherapeutants. Compounds tested were copper sulfate, formalin, potassium permanganate, acetic acid, and hydrogen peroxide. Safe treatment levels for each compound were determined for each species and size of fish.

	<p><b>Further description:</b></p> <p>Pathology</p> <p>Copper sulfate, potassium permanganate, formalin, acetic acid, and hydrogen peroxide have long been used as chemotherapeutants to treat fish pathogens. However, information on the actual toxicity levels of these compounds is not available in the published literature. Little is known about the toxicity to different species of fish. Differences in toxicity between different species of fish could present problems in treatment regimes, especially when dealing with endangered or threatened species. This study will look at the toxicity (expressed as LD50 concentrations) of these compounds in two different sizes (2 gm and 12 gm) rainbow trout, coho salmon, and Chinook salmon.</p>
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**13210-A-035 - [Development and Maintenance of the Abernathy FTC Pathology Program Database.](#)**

<b>Facility</b>	Abernathy Fish Technology Center
<b>Expended</b>	\$18450
<b>Objective</b>	Develop and share applied aquatic scientific and technologic tools with partners.
<b>Primary Benefited Species</b>	(0) Multiple Species
<b>Primary Benefited Population</b>	Not specified
<b>Plans</b>	U.S. Fish and Wildlife Service National Aquatic Animal Health Policy
<b>Keyword</b>	Fish Technology
<b>Need Number</b>	N-002
<b>Partners</b>	

### Accomplishments

Number of applied aquatic scientific and technologic tools shared with partners.	1
Number of applied science and technology tasks implemented as prescribed by Fishery Management Plans. (PART)	1

### Accomplishment Summary

Created database to handle complex relationships between bacteria, fish, water, and invertebrate samples. Has been tied together as to keep track of repository specimens, steelhead project tissue samples, QPCR tissue samples, and a watershed assessment applied research project.

### Description

#### **The *importance* to the Resource:**

Scientific research requires the ability to store information on observations, tests performed, results, and the ability to assess and tie those results together for the understanding of complex relationships that exist between aquatic organisms and between aquatic organisms and their ecological habitats.

#### **The *problem*:**

Due to the number of samples that are being collected across sreaerch projects and the need to discern patterns and relationships between organisms; the Pathology Program needs a database that can track sampling data, storage, test results, data analysis, aquatic relationships, and provide a platform to view information as simply as possible.

#### **The *objective*:**

To develop a database that can track sampling data, testre sults, data analysis, aquatic relationships, and provied aplatform to view information as simply as possible.

#### **The *method*:**

The database will be created on a Microsoft

	<p>Access platform and will be created to allow ongoing changes to allow the addition of new projects and to tie results together, when necessary.</p> <p><b>Further description:</b></p> <p>Pathology</p>
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**13210-A-039 - [Genetic and Geographic Origins of Threatened Bull Trout Trapped at Dams in the Clark Fork River, MT.](#)**

<b>Facility</b>	Abernathy Fish Technology Center	<p><b>Accomplishment Summary</b></p> <p>Standardized genetic protocols were developed for identifying geographic origin of bull trout in the Lower Clark Fork River / Lake Pend Oreille. Fifty adults captured at the base of Cabinet Gorge Dam were genotyped in a rapid response mode as part of a selective passage program that involves three dams in the Clark Fork River Basin of ID and MT. This passage allows fish to reach their spawning grounds. 500 bull trout were genotyped to supplement the genetic baseline used to assigning fish.</p> <p><b>Description</b></p> <p><b>The <i>importance</i> to the Resource:</b></p> <p>Genetic information is used to assist with the selective passage of bull trout over three dams in the Clark Fork River Basin of Idaho and Montana. This passage allows fish to reach their spawning grounds. More fish spawning decreases the demographic risk of extinction for this bull trout core area.</p> <p><b>The <i>problem</i>:</b></p> <p>Bull trout are currently listed as threatened under the U.S. Endangered Species Act. In the Clark Fork River three large hydropower dams prevent upstream migration of adult fish back to their natal spawning areas. The reduction in the number of spawners reaching their natal streams has resulted in rapid population declines.</p> <p><b>The <i>objective</i>:</b></p> <p>To genetically identify the sub-basin of origin of trapped adults prior to their release downstream or passage upstream using a</p>
<b>Expended</b>	\$75285	
<b>Objective</b>	Recover fish and other aquatic resource populations protected under the Endangered Species Act.	
<b>Primary Benefited Species</b>	Bull trout ( <a href="#">Salvelinus confluentus</a> )	
<b>Primary Benefited Population</b>	<a href="#">Bull trout - Clark Fork (3) Cabinet Gorge Reservoir</a>	
<b>Plans</b>	Chapter 3, Clark Fork River Recovery Unit, Montana, Idaho, and Washington. 285 p. U.S. Fish and Wildlife Service. Bull Trout ( <i>Salvelinus confluentus</i> ) Draft Recovery Plan. Portland, Oregon.	
<b>Keyword</b>	Genetics	
<b>Need Number</b>	N-002	
<b>Partners</b>	<p>Avista Corporation (\$10000)</p> <p>Confederated Salish Kootenai Tribes (\$5000)</p> <p>Idaho Fish and Game (\$5000)</p> <p>Montana Department of Fish, Wildlife &amp; Parks (\$5000)</p> <p>Mountain Prairie Region Ecological Services Field Office (\$5000)</p>	

## Accomplishments

Number of other Recovery Plan tasks implemented for T&E populations	2
Number of applied aquatic scientific and technologic tools shared with partners.	1
Number of techniques and culture technology tools developed.	1

"rapid response" methodology.

### **The *method*:**

This project identified and developed a suite of DNA markers to genetically identify the sub-basin (or population) of origin of bull trout trapped at the base of main stem dams during their upstream spawning migrations.



**13210-A-050 - [Genetic Distinction of Threatened Summer-Run and Winter-Run Steelhead in the Hood River, OR.](#)**

<b>Facility</b>	Abernathy Fish Technology Center
<b>Expended</b>	\$19071
<b>Objective</b>	Develop and share applied aquatic scientific and technologic tools with partners.
<b>Primary Benefited Species</b>	Rainbow trout ( <a href="#">Oncorhynchus mykiss</a> )
<b>Primary Benefited Population</b>	<a href="#">Hood River Winter Steelhead</a>
<b>Plans</b>	Conservation of Columbia Basin Fish, Final Basinwide Salmon Recovery Strategy, 12/2000 (All H Paper) 1999 NMFS Biological Opinion on Artificial Propagation in the Columbia River Basin.
<b>Keyword</b>	Genetics
<b>Need Number</b>	N-002
<b>Partners</b>	Confederated Tribes of The Warm Springs (\$10000) Oregon Department of Fish and Wildlife (\$10000)

### Accomplishments

Number of population assessments completed	4
Number of other Recovery Plan tasks implemented for T&E populations	1

### Accomplishment Summary

A rapid response protocol was developed to identify summer and winter-run steelhead in the Hood River, OR. This protocol was used to identify 120 broodstock for the summer and winter-run hatchery programs. These results are critical for maintaining the integrity of these two ESA listed populations.

### Description

**The *importance* to the Resource:**

Two distinct races of steelhead are native to the Hood River, OR. Oregon Dept. of Fish & Wildlife hatchery broodstocks have been developed for winter and summer run steelhead trout to assist with recovery of these ESA-listed stocks and to support Hood River recreational and Tribal fisheries.

**The *problem*:**

Significant temporal overlap exists between summer and winter run steelhead when adults are trapped for broodstock. Consequently, the hatchery programs pose significant genetic risk of inadvertently crossbreeding adults from the two races.

**The *objective*:**

This project uses genetic markers to distinguish between summer-run and winter-run steelhead in the Hood River, OR, using a suite of DNA markers.

**The *method*:**

A set of genetic markers were isolated for their powers to distinguish individual fish of the two races. The genetic race of each of 120 adult

Number of technical assistance requests fulfilled to support Tribal fish and wildlife conservation	2	fish trapped in the Hood River was genetically identified in a rapid response mode prior to spawning for broodstock. An additional 150 fish of "known" origin were added to the genetic baseline.
Number of applied aquatic scientific and technologic tools shared with partners.	1	
Number of techniques and culture technology tools developed.	1	
Number of applied science and technology tasks implemented as prescribed by Recovery Plans. (PART)	1	

**13210-A-051 - [Genetic Analyses of Resident and Migratory Coastal Cutthroat Trout in the Lower Columbia River](#)**

<b>Facility</b>	Abernathy Fish Technology Center
<b>Expended</b>	\$27350
<b>Objective</b>	Restore declining fish and other aquatic resource populations before they require listing under the Endangered Species Act.
<b>Primary Benefited Species</b>	Rainbow trout ( <a href="#">Oncorhynchus mykiss</a> )
<b>Primary Benefited Population</b>	<a href="#">lower Columbia River Steelhead</a>
<b>Plans</b>	Lower Columbia Salmon Recovery and Subbasin Plan Coastal Cutthroat Trout Framing Document (draft)
<b>Keyword</b>	Genetics
<b>Need Number</b>	N-002
<b>Partners</b>	

### Accomplishments

Number of population assessments completed	2
Number of other Fishery Management Plan tasks implemented for populations of management concern.	2
Number of techniques and culture technology tools developed.	1

### Accomplishment Summary

Genetic data was used to determine if the migratory and resident forms of coastal cutthroat trout represent distinct populations or if both life history types descended from a single random mating population in two Lower Columbia River streams. Two-hundred samples were genotyped at 21 microsatellite loci. Data analysis will be completed in FY07.

### Description

**The *importance* to the Resource:**

Understanding the genetic relationship between resident and migratory groups within and among streams is critical to properly managing and conserving coastal cutthroat trout populations. For example, genetic data can help determine whether the resident form can potentially assist with recovery of the migratory form.

**The *problem*:**

Do the migratory and resident forms represent distinct coastal cutthroat trout populations or do both life history types descended from a single random mating population? This information is critically needed to assess the true status of the migratory form in the lower Columbia River.

**The *objective*:**

This study addresses the genetic relationship of sympatric migratory and resident coastal cutthroat trout in Aberrantly Creek and the Chinook River in Washington State.

**The *method*:**

DNA markers were used to compare genetic

	<p>profiles of resident and migratory forms in each of two tributaries in the lower Columbia River. Those results will determine whether the two life history forms represent two genetically-distinct populations or simply represent alternative life history strategies of a single population within each stream.</p>
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**13210-A-052 - [Conservation Genetics of the Endangered Oregon Chub Over the Species Range](#)**

<b>Facility</b>	Abernathy Fish Technology Center
<b>Expended</b>	\$9731
<b>Objective</b>	Recover fish and other aquatic resource populations protected under the Endangered Species Act.
<b>Primary Benefited Species</b>	Oregon chub ( <a href="#">Oregonichthys crameri</a> )
<b>Primary Benefited Population</b>	Not specified
<b>Plans</b>	Recovery Plan for the Oregon Chub (Oregonichthys crameri)
<b>Keyword</b>	Genetics
<b>Need Number</b>	N-002
<b>Partners</b>	Columbia River Fisheries Program Office (\$1000) Ecological Services (\$1000) Oregon Department of Fish and Wildlife (\$1000)

### Accomplishments

Number of population assessments completed	21
Number of other Recovery Plan tasks implemented for T&E populations	3
Number of applied aquatic scientific and technologic tools shared with partners.	1

### Accomplishment Summary

A range wide population genetics study was completed that included 21 populations of Oregon Chub. Fourteen DNA markers (microsatellite loci) were used to examine 1200 fish. This new genetic information will be used to estimate the level of inbreeding within populations, identify genetically distinct groups of Oregon chub, and identify historic migration patterns among the populations. Final report will be completed in FY07.

### Description

**The *importance* to the Resource:**

Oregon chub are an endangered fish found only in the Willamette Valley of western Oregon. Currently, only 23 locations contain Oregon chub. Most of the remaining populations are isolated and contain low numbers of fish. This isolation and low abundance creates a high risk for demographic and genetic extinction.

**The *problem*:**

Currently new populations are being established and transfer of fish among populations is being considered. However, no genetic data are available on oregon chub to help guide these important restoration efforts.

**The *objective*:**

This basic genetic information will allow us to estimate the level of inbreeding within populations, identify genetically distinct groups of Oregon chub, and identify historic migration patterns among the populations. These results will aid in the restoration of this highly endangered species.

	<p><b>The <i>method</i>:</b></p> <p>Using 14 newly developed DNA markers, we determined the amount of within and among population genetic diversity present over the Oregon chub's range by examining at least 1200 fish from 21 populations.</p>
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**13210-A-053 - [Evolutionary Genetic Relationships Between Threatened Foscett Springs and Warner Basin Speckled Dace](#)**

<b>Facility</b>	Abernathy Fish Technology Center
<b>Expended</b>	\$8879
<b>Objective</b>	Recover fish and other aquatic resource populations protected under the Endangered Species Act.
<b>Primary Benefited Species</b>	Speckled dace ( <a href="#">Rhinichthys osculus</a> )
<b>Primary Benefited Population</b>	<a href="#">Speckled dace - Warner Basin and Alkali Subbasin</a>
<b>Plans</b>	Recovery Plan for the Threatened and Rare Native Fishes of the Warner Basin and Alkali Subbasin: Warner sucker, Hutton tui chub, Foscett speckled dace.
<b>Keyword</b>	Genetics
<b>Need Number</b>	N-002
<b>Partners</b>	Ecological Services (\$1000)

### Accomplishments

Number of population assessments completed	8
Number of applied aquatic scientific and technologic tools shared with partners.	1
Number of applied science and technology tasks implemented as prescribed by Recovery Plans. (PART)	1

### Accomplishment Summary

Evolutionary genetic relationships between threatened Foscett Springs speckled dace and speckled dace populations in the adjacent Warner and Goose Lake Basins were determined. 120 dace were examined.

### Description

#### The *importance* to the Resource:

Foscett Spring speckled dace (*Rhinichthys osculus* ssp.) were listed as threatened in 1985 under the U.S. Endangered Species Act. It is an isolated population of speckled dace inhabiting Foscett Spring along the western margin of Coleman Lake, a hydrologically separated sub-basin approximately 10 km south of the Warner Basin in southeast Oregon.

#### The *problem*:

Coleman Lake became isolated hydrologically from the Warner Basin 12,000 years ago. Speckled dace is the only fish native to Foscett Springs. The close proximity of Coleman Lake and the Warner Basin raises questions regarding the amount of evolutionary genetic divergence between populations of speckled dace in those two basins.

#### The *objective*:

To determine if Foscett speckled dace be considered a distinct subspecies relative to the more abundant populations in the Warner Basin?

#### The *method*:

To test the null hypothesis that Foscett Spring

	and Warner Basin populations of speckled dace have not diverged evolutionary from each other, we compared mtDNA sequences at the CytB and ND2 genes and resulting haplotype frequencies for 30 Foscett speckled dace to those of 100 speckled dace inhabiting the adjacent Warner and Goose Lake basins.
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**13210-A-057 - Development of Native Broodstock Techniques for Conservation, Harvest, and Recovery of Steelhead**

<b>Facility</b>	Abernathy Fish Technology Center	<h2>Accomplishment Summary</h2> <p>New technologies will be developed for developing native, hatchery broodstock programs for steelhead that can provide fish for harvest and contribute to the recovery of naturally spawning populations</p> <h2>Description</h2> <p><b>The <i>importance</i> to the Resource:</b></p> <p>To meet Service goals and a NMFS BiOp, Abernathy Fish Technology Center (AFTC) staff are establishing a native broodstock of natural spawning steelhead to recover wild steelhead populations. The study is evaluating the effects of integrated hatchery practices on wild ESA populations for application throughout the Columbia River basin.</p> <p><b>The <i>problem</i>:</b></p> <p>Many hatchery programs for steelhead pose genetic or ecological risks to natural populations because those programs release or outplant fish from non-native stocks. As a result, the USFWS and the NOAA Fisheries have recommended a policy that discourages the use of non-native hatchery stocks and encourages development of native broodstocks.</p> <p><b>The <i>objective</i>:</b></p> <p>We are developing methods to produce hatchery fish that do not involve the use of ESA-listed adults that in turn will be used to develop a native broodstock. Results should produce a means to produce self-sustaining stocks of steelhead that have applicability for use in salmon recoveries throughout the Pacific Region.</p>
<b>Expended</b>	\$62468	
<b>Objective</b>	Develop and share applied aquatic scientific and technologic tools with partners.	
<b>Primary Benefited Species</b>	Rainbow trout ( <a href="#">Oncorhynchus mykiss</a> )	
<b>Primary Benefited Population</b>	<a href="#">lower Columbia River Steelhead</a>	
<b>Plans</b>	Conservation of Columbia Basin Fish, Final Basinwide Salmon Recovery Strategy, 12/2000 (All H Paper)  National Broodstock Policy and Implementation Guidelines	
<b>Keyword</b>	Fish Technology	
<b>Need Number</b>	N-002	
<b>Partners</b>	Bonneville Power Administration Washington Department of Fish and Wildlife	

<b>Accomplishments</b>	
Recovery Plan production tasks implemented (PART)	1
Number of Fishery Management Plan production tasks implemented (PART)	3

<p>Number of applied science and technology tasks implemented as prescribed by Recovery Plans. (PART)</p>	<p>1</p>	<p><b>The <i>method</i>:</b></p> <p>We initiated our steelhead broodstock program by captively rearing wild juveniles to sexual maturity. 20,000 juveniles have been released from AFTC yearly since 2003. We have been monitoring hatchery and wild smolt and returning adult steelhead behavior, morphology, physiology, genetic diversity, and reproductive success since 2003.</p> <p><b>Further description:</b></p> <p>Five hundred naturally spawned juvenile steelhead from the locally adapted population were collected over 3 years (1999-2001). Progeny produced from these fish are being released, monitored, and evaluated. The number of wild steelhead smolts migrating out of the treatment (1) and control (2) creeks has been consistent among years. Emigration date between hatchery and wild fish were similar and did not vary among years. However, hatchery and wild steelhead differed morphologically and physiologically. After genotyping and parentage analysis it appears that we have been successful, thus far at maintaining genetic diversity among our broodstocks as well as within the progeny produced at the hatchery. In addition, the individuals that we have passed upstream of the hatchery have been able to reproduce naturally. To date it appears that wild fish produced equivalent numbers of offspring as hatchery fish.</p> <p>Ecological Physiology</p>
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**13210-A-059 - [Epidemiologic Study of Enteric Redmouth Disease in Spring Creek NFH Fall Chinook Salmon.](#)**

<b>Facility</b>	Abernathy Fish Technology Center
<b>Expended</b>	\$29257
<b>Objective</b>	Develop and share applied aquatic scientific and technologic tools with partners.
<b>Primary Benefited Species</b>	Chinook salmon or king salmon ( <a href="#">Oncorhynchus tshawytscha</a> )
<b>Primary Benefited Population</b>	Not specified
<b>Plans</b>	National Wild Fish Health Survey
<b>Keyword</b>	Fish Health
<b>Need Number</b>	N-002
<b>Partners</b>	Lower Columbia Fish Health Center (\$2000)

### Accomplishments

Number of applied aquatic scientific and technologic tools shared with partners.	1
Number of techniques and culture technology tools developed.	1

### Accomplishment Summary

Some preliminary sampling has been done at Spring Creek NFH. QPCR protocols for Enteric Redmouth Disease are being refined to meet the requirements of this project using the preliminary samples.

### Description

#### **The importance to the Resource:**

The reduction of mortalities due to disease is extremely important in the propagation of salmonids. Good health of production fish at time of release is also important, not only for the survival of production fish, but also to prevent the spreading of disease to other critical salmonid stocks in the release environment.

#### **The problem:**

Enteric Redmouth Disease is endemic in Chinook at Spring Creek NFH. Mortality begins in January and is constant until release in May. Additional stress during fin-clipping in February magnifies the disease. Upon release the population is still carrying the disease which potentially could be spread to other salmonid stocks in the river system.

#### **The objective:**

This study will document the presence and intensity of Enteric Redmouth Disease in Chinook during the entire production cycle from egg through juvenile fish at time of release. Better understanding of the levels of disease in fish over production cycle will allow for the development of more efficient treatment regimes to minimize the disease.

	<p><b>The <i>method</i>:</b></p> <p>Three production lots will be sampled weekly from fertilized egg through release of juveniles. After fin-clipping each lot will be split into two ponds. Samples will be analysed for presence and intensity of infection using standard culture methods, fluorescent antibody assay, nested PCR assay, and quantitative PCR assay.</p>
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13210-A-060 - [Fish Feed Development and Manufacture for Research Partners](#)

<b>Facility</b>	Abernathy Fish Technology Center
<b>Expended</b>	\$28335
<b>Objective</b>	Develop and share applied aquatic scientific and technologic tools with partners.
<b>Primary Benefited Species</b>	(0) Multiple Species
<b>Primary Benefited Population</b>	Not specified
<b>Plans</b>	Southeast Aquatic Resources Partnership Strategic Plan
<b>Keyword</b>	Fish Technology
<b>Need Number</b>	N-002
<b>Partners</b>	Canadian University Partners (\$2000) Kentucky State University (\$2000) U.S. Geological Survey, Western Fisheries Research Center (\$2000) University of Arkansas, Pine Bluff (\$2000)

## Accomplishments

Number of other Fishery Management Plan tasks implemented for populations of management concern.	1
Number of applied aquatic scientific and technologic tools shared with partners.	1

## Accomplishment Summary

New and experimental feeds were made for partners, USGS; Department of Fisheries and Oceans, Canada; Kentucky State University; University of Arkansas, Pine Bluff, throughout the year. This year one paper was accepted to Aquaculture Research (Gill, Higgs, Skura, Rowshandeli, Dosanjh, Mann & Gannam. accepted. Nutritive value of partially dehulled and extruded sunflower meal for post-smolt Atlantic salmon (*Salmo salar* L.) in sea water. Aquaculture Research).

## Description

### **The importance to the Resource:**

Abernathy FTC has a small scale feed extruder that can produce small batches of experimental diets to be used in diet development exploring the use of alternative proteins and oils; to feed new captive species; to improve current diets.

### **The problem:**

New diet development with novel ingredients can not be supported by feed mills due to the small volume of feed needed for feeding studies and the ingredients used.

### **The objective:**

The objective of this project is to provide expertise and equipment to produce small batches of experimental feeds for end users.

### **The method:**

Either formulations are provided by partners or Abernathy FTC formulates the experimental diets that are then extruded using the X85 cooker-extruder on station. Data is collected concerning the parameters under which the

<div>Number of techniques and culture technology tools developed.</div> <div>1</div>	<p>feeds were extruded to give additional information about the feed manufacture and for possible scale-up to a commercial mill.</p> <p><b>Further description:</b></p> <p>Nutrition</p>
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13210-A-061 - [Investigation of the Effects of Carcass Analog Use in Small Streams](#)

<b>Facility</b>	Abernathy Fish Technology Center
<b>Expended</b>	\$4130
<b>Objective</b>	Utilize appropriate scientific and technologic tools in formulating and executing fishery management plans and policies.
<b>Primary Benefited Species</b>	Chinook salmon or king salmon ( <a href="#">Oncorhynchus tshawytscha</a> )
<b>Primary Benefited Population</b>	<a href="#">Mill Creek fall run Chinook</a>
<b>Plans</b>	2000 NMFS FCRPS Biological Opinion - December 21, 2000
<b>Keyword</b>	Fish Technology
<b>Need Number</b>	N-002
<b>Partners</b>	

## Accomplishments

Number of other Recovery Plan tasks implemented for T&E populations	1
Number of techniques and culture technology tools developed.	1

## Accomplishment Summary

A study plan was written and submitted for funding to analyze the effects of using carcass analogs (a fish carcass substitute) in small streams. Information from this study will provide insight into the contribution of carcass analogs to the nutrient load of the habitat.

## Description

### The importance to the Resource:

There is a large body of work available in the area of stream enrichment with various nutrients, i. e. raw or processed salmon carcasses and commercially produced organic or inorganic fertilizers. Researchers reiterate the need for marine-derived nutrients and energy to maintain salmon stocks.

### The problem:

In considering every aspect of stream enrichment, the use of carcass analogs appears to be very promising. Pathogens would not be introduced to streams as may happen with fish carcasses. Water quality would not be degraded as may happen with the addition of fertilizers. Possible introduction of contaminants to the stream would be minimized.

### The objective:

The objective of this project is to increase knowledge concerning supplementing streams with carcass analogs.

### The method:

The analogs will be made and dispersed into streams as per the work done by Pearsons et

	<p>al. 2003. To determine the impact of nutrient supplementation, fish will be sampled from the treatment and control stream. Differences in fatty acid profiles between the groups will be determined. Fish numbers will be monitored via a smolt trap.</p> <p><b>Further description:</b></p> <p>Nutrition</p>
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13210-A-062 - [Tryptophan Use In Diets to Reduce Aggression in Endangered Bull Trout](#)

<b>Facility</b>	Abernathy Fish Technology Center
<b>Expended</b>	\$4130
<b>Objective</b>	Develop and share applied aquatic scientific and technologic tools with partners.
<b>Primary Benefited Species</b>	Bull trout ( <a href="#">Salvelinus confluentus</a> )
<b>Primary Benefited Population</b>	<a href="#">Lower Deschutes River core area Bull Trout</a>
<b>Plans</b>	Bull Trout Draft Recovery Plan, Chapter 23
<b>Keyword</b>	Fish Technology
<b>Need Number</b>	N-002
<b>Partners</b>	

## Accomplishments

Number of other Recovery Plan tasks implemented for T&E populations	1
Number of techniques and culture technology tools developed.	1

## Accomplishment Summary

As part of a larger bull trout project, a literature search was conducted to determine if additional tryptophan in the diet was a viable solution to use to reduce aggressive behavior in bull trout. Analytical methods for tryptophan detection were also investigated.

## Description

### The *importance* to the Resource:

Bull trout were federally listed as threatened in 1998. Recovery efforts are underway, including rearing at NFHs and at Fish Technology Centers.

### The *problem*:

Bull trout, by nature, are territorial and aggressive and rearing them in numbers may prove difficult. Even though several diverse production programs for bull trout have been developed over the last 35 years (Montana Bull Trout Scientific Group 1996), the success of these programs is unknown.

### The *objective*:

The goal of this project is to evaluate new rearing techniques of bull trout as a part of a larger study to determine if artificial propagation from captively-reared, natural-origin, Deschutes or Lewis River juveniles is a viable method of restoring bull trout to the Clackamas River.

### The *method*:

In an effort to reduce aggression, diets will be formulated with graded levels of tryptophan. As diets are developed they will be fed to the fish using standard nutrition study protocols in

	<p>controlled tank studies. Tryptophan levels in fish and feed will be determined and behavior during and after the trial will be monitored.</p> <p><b>Further description:</b></p> <p>Nutrition</p>
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**13210-A-063 - [Appropriate Clove Oil Concentration for PIT Tag Field Procedures on Juvenile Rainbow Trout.](#)**

<b>Facility</b>	Abernathy Fish Technology Center	<h2>Accomplishment Summary</h2> <p>Our results suggest that a 50mg/l clove oil concentration is the most effective for fish processing during field sampling or research given fishes' response to sedation, high survival as well as its ability to reduce processing time potentially resulting in labor cost savings. A manuscript detailing all of our findings is in preparation and will be submitted to a scientific journal for peer reviewed publication.</p> <h2>Description</h2> <p><b>The <i>importance</i> to the Resource:</b></p> <p>Anaesthetics such as clove oil are widely used because of the strong effect that handling has on a fishes' physiology and behavior when they are not anaesthetized. A range of studies on clove oil recommend collectively that it is an effective option for fish sedation and may provide additional benefits over other methods including low cost.</p> <p><b>The <i>problem</i>:</b></p> <p>Although dose responses for clove oil sedation of salmonids have been widely examined, no studies have related it directly to in situ biosampling procedures and long term survival. This information is needed to enable rapid recovery, and maximize survival of fish while at the same time ensuring efficient field processing.</p> <p><b>The <i>objective</i>:</b></p> <p>Our objective was to compare the effect that low (12.5 mg/l), medium (25 mg/l) and high (50 mg/l) clove oil concentrations had on fish induction, recovery, and mortality, as well as</p>			
<b>Expended</b>	\$24600				
<b>Objective</b>	Develop and share applied aquatic scientific and technologic tools with partners.				
<b>Primary Benefited Species</b>	Rainbow trout ( <a href="#">Oncorhynchus mykiss</a> )				
<b>Primary Benefited Population</b>	Not specified				
<b>Plans</b>	1999 NMFS Biological Opinion on Artificial Propagation in the Columbia River Basin.				
<b>Keyword</b>	Fish Technology				
<b>Need Number</b>	N-002				
<b>Partners</b>					
<h2>Accomplishments</h2> <table><tr><td>Recovery Plan production tasks implemented (PART)</td><td>1</td></tr><tr><td>Number of other Recovery Plan tasks implemented for T&amp;E populations</td><td>1</td></tr></table>		Recovery Plan production tasks implemented (PART)	1	Number of other Recovery Plan tasks implemented for T&E populations	1
Recovery Plan production tasks implemented (PART)	1				
Number of other Recovery Plan tasks implemented for T&E populations	1				

	<p>the handling time and ease of PIT tag (23mm) insertion.</p> <p><b>The <i>method</i>:</b></p> <p>The effect of clove oil (three levels) was compared during standard hatchery sampling and tagging procedures. Standard scientific and statistical methods were utilized throughout this study.</p> <p><b>Further description:</b></p> <p>Ecological Physiology</p>
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**13210-A-064 - [Relationship Between Fish Physiology and Migration Date to the Risk of Predation](#)**

<b>Facility</b>	Abernathy Fish Technology Center	<h2>Accomplishment Summary</h2> <p>Overall findings from this three year study indicate that smolt physiology and migration date were negatively related to the probability of being eaten by avian predators but fish size, rearing type (hatchery or wild), and migration year were not. Findings from this project were presented at a regional scientific meeting (Annual meeting Oregon chapter of the American Fisheries Society). Furthermore a manuscript for submission to a peer-reviewed scientific journal is currently in preparation.</p> <h2>Description</h2> <p><b>The <i>importance</i> to the Resource:</b></p> <p>Survival of juvenile salmonids during their migration from freshwater rearing areas to the ocean environment is a key determinant of later adult return rates. Especially important is movement through the estuary, an area of high risk for avian predation.</p> <p><b>The <i>problem</i>:</b></p> <p>It has been theorized that avian predation risk is inversely related to the physiological readiness of smolts to enter the ocean. The validity of this theoretical relationship has not been tested and is a key data gap in our understanding of the factors that may be limiting the survival of hatchery and wild reared salmon in the Columbia river.</p> <p><b>The <i>objective</i>:</b></p> <p>Our objective was to determine if avian predation risk is related to the physiological readiness and migration timing of a genetically similar wild and hatchery steelhead from Abernathy creek (a tributary to the Columbia</p>	
<b>Expended</b>	\$15300		
<b>Objective</b>	Develop and share applied aquatic scientific and technologic tools with partners.		
<b>Primary Benefited Species</b>	Rainbow trout ( <a href="#">Oncorhynchus mykiss</a> )		
<b>Primary Benefited Population</b>	Not specified		
<b>Plans</b>	Lower Columbia Salmon Recovery and Subbasin Plan Conservation of Columbia Basin Fish, Final Basinwide Salmon Recovery Strategy, 12/2000 (All H Paper)		
<b>Keyword</b>	Monitoring and Assessment		
<b>Need Number</b>	N-002		
<b>Partners</b>			
<h2>Accomplishments</h2> <table><tr><td>Number of other Fishery Management Plan tasks implemented for populations of management concern.</td><td>1</td></tr></table>		Number of other Fishery Management Plan tasks implemented for populations of management concern.	1
Number of other Fishery Management Plan tasks implemented for populations of management concern.	1		

	<p>river).</p> <p><b>The <i>method</i>:</b></p> <p>We compared gill Na<sup>+</sup>, K<sup>+</sup>-ATPase activity, length, date of migration, and performance in seawater challenges between wild and hatchery reared steelhead and assessed the relationship between these factors and avian mortality. Avian mortality risk was determined based on the detection of PIT tags in select bird colonies in the Columbia river estuary.</p> <p><b>Further description:</b></p> <p>Ecological Physiology</p>
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13210-A-065 - [Construction of Remote Monitoring Antenna for Trout Unlimited in Rush Creek, WA.](#)

<b>Facility</b>	Abernathy Fish Technology Center
<b>Expended</b>	\$1246
<b>Objective</b>	Develop and share applied aquatic scientific and technologic tools with partners.
<b>Primary Benefited Species</b>	Bull trout ( <a href="#">Salvelinus confluentus</a> )
<b>Primary Benefited Population</b>	Not specified
<b>Plans</b>	Bull Trout Recovery Plan (Draft)
<b>Keyword</b>	Monitoring and Assessment
<b>Need Number</b>	N-002
<b>Partners</b>	Washington Department of Fish and Wildlife (\$1000)

### Accomplishments

Number of applied aquatic scientific and technologic tools shared with partners.	1
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### Accomplishment Summary

We constructed and supplied Trout Unlimited and Washington Department of Fish and Wildlife a PIT tag antenna to track movement and population size of bull trout in Rush Creek, WA

### Description

**The *importance* to the Resource:**

In order to enumerate or track bull trout populations invasive techniques are often applied. However, the use of PIT tag technology allows these measurements to be made with adverse effects on endangered fishes.

**The *problem*:**

Trout Unlimited and Washington Department of Fish and Wildlife are evaluating a population of bull trout; however, conditions preclude them from constantly handling individuals. As a result PIT tag technology was employed to meet their study objectives.

**The *objective*:**

We constructed and trained personal how to utilize PIT tag technology for use on an endangered bull trout population within Rush Creek WA.

**The *method*:**

We constructed a consulted with Washington State biologists regarding the proper installation and use of PIT tag technology.

**Further description:**

	Ecological Physiology
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**13210-A-066 - [Evaluation of Alternative Screen Technology for Carson NFH Water Diversion Structures.](#)**

<b>Facility</b>	Abernathy Fish Technology Center
<b>Expended</b>	\$3480
<b>Objective</b>	Develop and share applied aquatic scientific and technologic tools with partners.
<b>Primary Benefited Species</b>	Chinook salmon or king salmon ( <a href="#">Oncorhynchus tshawytscha</a> )
<b>Primary Benefited Population</b>	Not specified
<b>Plans</b>	Carson NFH Spring Chinook Salmon Hatchery and Genetic Management Plan
<b>Keyword</b>	Fish Technology
<b>Need Number</b>	N-002
<b>Partners</b>	

### Accomplishments

Recovery Plan production tasks implemented (PART)	1
Number of other Recovery Plan tasks implemented for T&E populations	1

### Accomplishment Summary

We have evaluated the fish screens at Carson NFH and have initiated a study in order to determine an appropriate pore size for replacement screens to exclude brook trout from entering the hatchery.

### Description

#### **The importance to the Resource:**

Brook trout have been found within the primary water source for Carson NFH. As a result production and stocking goals may be restricted in order to minimize the spread of brook trout to other aquatic systems.

#### **The problem:**

The fish screens at Carson NFH have been slated for replacement; however, the pore size must not allow brook trout a means for entry into the hatchery.

#### **The objective:**

To examine brook trout just after hatch, when they are the smallest size, to determine the most appropriate sized screen to be used at Carson NFH.

#### **The method:**

Hatch fertilized brook trout eggs and take morphometric measurements on the emergent fish to determine the smallest pore size for fish screens that will effectively exclude brook trout from the Carson NFH.

#### **Further description:**

Ecological Physiology

**13210-A-067 - [Steelhead Take Caused by BOR Surface Water Diversion Structures in the Umatilla River.](#)**

<b>Facility</b>	Abernathy Fish Technology Center
<b>Expended</b>	\$75718
<b>Objective</b>	Develop and share applied aquatic scientific and technologic tools with partners.
<b>Primary Benefited Species</b>	Rainbow trout ( <a href="#">Oncorhynchus mykiss</a> )
<b>Primary Benefited Population</b>	<a href="#">Umatilla River Steelhead</a>
<b>Plans</b>	1999 NMFS Biological Opinion on Artificial Propagation in the Columbia River Basin.
<b>Keyword</b>	Fish Technology
<b>Need Number</b>	N-002
<b>Partners</b>	U.S. Bureau of Reclamation

### Accomplishments

Number of applied aquatic scientific and technologic tools shared with partners.	1
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### Accomplishment Summary

We have constructed, maintained and monitored PIT tag antenna arrays at two BOR operated water surface diversion structures as well as one at Three Mile Fall dam. The antenna arrays have allowed us to quantify and evaluate how to reduce incidental at water surface diversion structures.

### Description

**The *importance* to the Resource:**

Quantification and minimization of incidental take of Mid-Columbia River steelhead at Bureau of Reclamation water surface diversion structures.

**The *problem*:**

In 2004, NOAA issued a Biological Opinion for ongoing operations and maintenance of Umatilla Basin Project. The biological opinion directs the Bureau of Reclamation to conduct its activities at all federal diversion structures in the Umatilla Basin to avoid or minimize incidental take of Mid-Columbia River steelhead.

**The *objective*:**

Design, construct, install, and maintain systems for continuous monitoring of PIT tagged juvenile steelhead at Reclamation Canal facilities on the Umatilla River. To determine "take" including delay, residualism, survival, and mortality at surface diversion structures.

**The *method*:**

Install and monitor PIT tag antenna array

	<p>systems at Feed and Maxwell canals and Three Mile Falls dam.</p> <p><b>Further description:</b></p> <p>Ecological Physiology</p>
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**13210-A-068 - [Genetic Identification of Species and Origin of Missouri and Yellowstone Rivers YOY Sturgeon.](#)**

<b>Facility</b>	Abernathy Fish Technology Center
<b>Expended</b>	\$7133
<b>Objective</b>	Recover fish and other aquatic resource populations protected under the Endangered Species Act.
<b>Primary Benefited Species</b>	Pallid sturgeon ( <a href="#">Scaphirhynchus albus</a> )
<b>Primary Benefited Population</b>	<a href="#">RPA 1-3 Upper Missouri River per Recovery Plan (above Gavins Point) Pallid Sturgeon -</a>
<b>Plans</b>	Pallid Sturgeon Recovery Plan
<b>Keyword</b>	Genetics
<b>Need Number</b>	N-002
<b>Partners</b>	Montana Department of Fish, Wildlife & Parks (\$20000) U.S. Geological Survey, Biological Resources Division (\$20000)

## Accomplishments

Number of population assessments completed	2
Number of applied aquatic scientific and technologic tools shared with partners.	1
Number of techniques and culture technology tools developed.	1
Number of applied science and technology tasks implemented as prescribed by	6

## Accomplishment Summary

Tissue samples from young-of-year sturgeon sampled in the Upper Missouri and Yellowstone Rivers during 2004 (78 individuals) and 2005 (179 individuals) were genetically classified as pallid sturgeon, shovelnose sturgeon, or hybrids. Fish were also classified as hatchery or natural origin based on genetic tagging information.

## Description

### The *importance* to the Resource:

Intensive sampling for young-of-year sturgeon in the Missouri River and Yellowstone River is occurring to quantify reproductive success of shovelnose sturgeon and pallid sturgeon. This study provides a genetic method for distinguishing larvae and young-of-year sturgeon as pallid sturgeon, shovelnose sturgeon, or hybrids.

### The *problem*:

Accurate field and laboratory identification of young-of-year sturgeon as pallid sturgeon, shovelnose sturgeon, hybrids, hatchery or natural origin is difficult due to the close similarity of *Scaphirhynchus* sp., the small size (16 – 140 mm) of individuals, and incomplete development of several key characteristics of individuals at small sizes.

### The *objective*:

Provide a genetic method for distinguishing larvae and young-of-year sturgeon as pallid sturgeon, shovelnose sturgeon, or hybrids. In addition, the genetic information will also allow of the origin of the fish to be determined (hatchery or natural).

Number of applied science and technology tasks implemented as prescribed by Recovery Plans. (PART)	6	<p><b>The <i>method</i>:</b></p> <p>The DNA profiles at 17 microsatellite loci for unmarked YOY fish will be compared to those of natural pallid, shovelnose, and hatchery-spawned adults in the genetic database. Parentage and assignment based methods will be used to classify fish.</p>
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13210-A-069 - [Developing a Genetic Baseline for Pend Oreille River Basin Bull Trout](#)

<b>Facility</b>	Abernathy Fish Technology Center
<b>Expended</b>	\$17931
<b>Objective</b>	Recover fish and other aquatic resource populations protected under the Endangered Species Act.
<b>Primary Benefited Species</b>	Bull trout ( <a href="#">Salvelinus confluentus</a> )
<b>Primary Benefited Population</b>	<a href="#">Pend Oreille Bull Trout</a>
<b>Plans</b>	Chapter 3, Clark Fork River Recovery Unit, Montana, Idaho, and Washington. 285 p. U.S. Fish and Wildlife Service. Bull Trout (Salvelinus confluentus) Draft Recovery Plan. Portland, Oregon.
<b>Keyword</b>	Genetics
<b>Need Number</b>	N-002
<b>Partners</b>	Kalispel Tribe of Indians (\$25000) Washington Department of Fish and Wildlife (\$1000)

### Accomplishments

Number of population assessments completed	6
Number of other Recovery Plan tasks implemented for T&E populations	2
Number of technical assistance requests	1

### Accomplishment Summary

Kalispel Tribe of Indians and USFWS added 450 bull trout from the Pend Oreille River Basin to a genetic baseline to determine the geographic origins of bull trout trapped below Albeni Falls, Boundary or Cabinet Gorge Dams. Having these populations in the baseline allows for the transport of Lake Pend Oreille, Priest River, or Clark Fork River bull trout above Albeni Falls Dam, thereby allowing these fish the opportunity to reach their natal spawning grounds.

### Description

**The *importance* to the Resource:**

The results of this study assists the Kalispel Tribe of Indians in their extensive bull trout recovery efforts in the Pend Oreille River Basin by allowing for a better understanding of the movement / habitat requirements of these populations and knowing the geographic origins of fish collected at the base of Albeni Falls Dam.

**The *problem*:**

Fish can pass downstream at Albeni Falls Dam but no upstream passage is provided. The geographic origins of adult bull trout found below Albeni Falls Dam during the fall spawning migration are unknown.

**The *objective*:**

Bull trout populations were added from the Pend Oreille River Basin (i.e., the Salmo and Priest River drainages) to the larger Clark Fork and Lake Pend Oreille genetic baseline to determine the source of bull trout trapped below Albeni Falls, Boundary or Cabinet Gorge Dams.

fulfilled to support Tribal fish and wildlife conservation		<p><b>The <i>method</i>:</b></p> <p>Abernathy FTC has developed microsatellite DNA markers for distinguishing Clark Fork River and Lake Pend Oreille bull trout populations. Fish from the Pend Oreille River Basin were added to this baseline. This allows biologists to transport captured fish into the appropriate region of the system so they can continue their spawning migrations.</p> <p><b>Further description:</b></p>
Number of applied aquatic scientific and technologic tools shared with partners.	1	
Number of techniques and culture technology tools developed.	1	

13210-A-070 - [Genetic Analysis of Kootenai River Basin Bull Trout in MT, ID and Canada](#)

<b>Facility</b>	Abernathy Fish Technology Center
<b>Expended</b>	\$16425
<b>Objective</b>	Recover fish and other aquatic resource populations protected under the Endangered Species Act.
<b>Primary Benefited Species</b>	Bull trout ( <a href="#">Salvelinus confluentus</a> )
<b>Primary Benefited Population</b>	<a href="#">Bull trout - Kootenai (4) Kootenai River</a>
<b>Plans</b>	Bull trout recovery Plan, Ch. 4, Kootenai River Chapter 4, Kootenai River Recovery Unit, Oregon. 89 p. In: U.S. Fish and Wildlife Service. Bull Trout ( <i>Salvelinus confluentus</i> ) Draft Recovery Plan.
<b>Keyword</b>	Genetics
<b>Need Number</b>	N-002
<b>Partners</b>	Idaho Department of Fish and Game (\$1000) Montana Department of Fish, Wildlife & Parks (\$20000)

### Accomplishments

Number of population assessments completed	15
Number of other Recovery Plan tasks implemented for T&E populations	1

### Accomplishment Summary

Levels of genetic diversity were quantified within and among 15 bull trout populations from the Kootenai River Basin in MT, ID and Canada. 458 fish from the basin were entered in to a range wide genetic database for bull trout. A set of genetic markers was identified to assign fish of unknown origin captured within the basin to their population of origin. This population assignment tool will be used to determine the geographic origins of fish captured at the base of Libby Dam.

### Description

**The *importance* to the Resource:**

The Kootenai River Sub-basin is an international watershed that encompasses parts of British Columbia (B.C), Montana, and Idaho. The river flows south within the Rocky Mountain Trench into Koocanusa Reservoir created by Libby Dam in MT. It contains an important metapopulation of bull trout.

**The *problem*:**

Upstream fish passage structures do not exist at Libby Dam. However, Skaar et al. (1996) documented downstream bull trout passage through the turbines at Libby Dam. This raises the possibility of sub-adult fish passing through the dam and not being able to return to their natal populations to spawn.

**The *objective*:**

Examine genetic diversity within and among 15 populations in the Kootenai R. basin to determine if genetic tests can be used to assign the geographic origins of adult bull trout collected at the base of Libby Dam during the fall spawning migration period.



Number of applied aquatic scientific and technologic tools shared with partners.	1
Number of techniques and culture technology tools developed.	1
<p><b>The <i>method</i>:</b></p> <p>Montana FWP collected approximately 30 juvenile bull trout tissue samples from 15 tributaries located in British Columbia and Montana for analysis at 12 microsatellite loci to develop a noninvasive genetic technique to determine the geographic or genetic origin of bull trout located below Libby Dam and Kootenai Falls.</p>	

**13210-A-072 - [Genetic Analysis of Hybridization Between Bull and Brook Trout in the Swan River Basin, Montana.](#)**

<b>Facility</b>	Abernathy Fish Technology Center
<b>Expended</b>	\$3825
<b>Objective</b>	Recover fish and other aquatic resource populations protected under the Endangered Species Act.
<b>Primary Benefited Species</b>	Bull trout ( <a href="#">Salvelinus confluentus</a> )
<b>Primary Benefited Population</b>	<a href="#">Bull trout - Clark Fork (3) Swan Lake</a>
<b>Plans</b>	Chapter 3, Clark Fork River Recovery Unit, Montana, Idaho, and Washington. 285 p. U.S. Fish and Wildlife Service. Bull Trout (Salvelinus confluentus) Draft Recovery Plan. Portland, Oregon.
<b>Keyword</b>	Genetics
<b>Need Number</b>	N-002
<b>Partners</b>	Ecological Services, Region 6 (\$5000) Montana Department of Fish, Wildlife & Parks (\$5000) U. S. Forest Service (\$5000)

### Accomplishments

Number of population assessments completed	3
Number of other Recovery Plan tasks	1

### Accomplishment Summary

Genetic analysis of hybridization between bull and brook trout was initiated in three creeks located in the Swan River Basin, Montana. Fin clips were collected from 375 fish. Genetic identification of each fish as bull, brook or hybrid will be accomplished in FY07. Field and genetic identifications will be compared with the hope of developing a field protocol for the identification of hybrids.

### Description

**The importance to the Resource:**

Bull trout are native to Swan Lake and the Swan River drainage in Montana and have historically represented one of the healthiest remaining populations of the species anywhere across the range. Hybridization between bull trout and non-native brook trout represents one of the potential factors responsible for decline of bull trout in the basin.

**The problem:**

More information is needed on the system wide implications of bull trout x brook trout hybridization within the Swan River drainage.

**The objective:**

Examine distribution and abundance of bull trout, brook trout, and hybrids. Genetic and field identifications will be compared with the hope of developing a field identification protocol for the identification of hybrids.

**The method:**

13 microsatellite loci will be used to distinguish bull trout, brook trout, and individuals of hybrid

implemented for T&E populations		ancestry. A photo box and digital photos were used to document the physical appearance of all fish sampled. Long-term population index sites were sampled to obtain population estimates. Fish from three creeks were examined (n=125/creek).
Number of applied aquatic scientific and technologic tools shared with partners.	1	
Number of techniques and culture technology tools developed.	1	

13210-A-074 - [Evaluation of Steelhead Egg Box Outplanting via Parentage Analysis](#)

<b>Facility</b>	Abernathy Fish Technology Center
<b>Expended</b>	\$28293
<b>Objective</b>	Provide technical assistance to Tribes.
<b>Primary Benefited Species</b>	Rainbow trout ( <a href="#">Oncorhynchus mykiss</a> )
<b>Primary Benefited Population</b>	<a href="#">Salmon River upper mainstem.</a>
<b>Plans</b>	1999 NMFS Biological Opinion on Artificial Propagation in the Columbia River Basin. Conservation of Columbia Basin Fish, Final Basinwide Salmon Recovery Strategy, 12/2000 (All H Paper)
<b>Keyword</b>	Genetics
<b>Need Number</b>	N-002
<b>Partners</b>	Shoshone-Bannock Tribes (\$20000)

### Accomplishments

Number of population assessments completed	1
Recovery Plan production tasks implemented (PART)	1
Number of technical assistance requests fulfilled to support Tribal fish and wildlife conservation	1

### Accomplishment Summary

A study plan was developed and samples collected to evaluate steelhead trout egg hatch-box supplementation activity on Shoshone-Bannock Tribal land in the Yankee Fork of the Salmon River in Idaho. In FY07, genetic parentage analysis will be used to evaluate the proportion on 1+ steelhead in the Yankee Fork that were egg box origin or natural origin. In future years, the same process will be used to identify the proportion of unmarked / tagged returning adults that were egg-box outplants.

### Description

**The importance to the Resource:**

Steelhead trout are a cultural, social, and subsistence based resource of historical significance for the Shoshone-Bannock Tribes. Each year the tribe outplants over 100,000 steelhead eggs into the Yankee Fork. Genetic marking of the outplanted eggs will allow for an evaluation of the survival of these fish to the smolt and adult stages.

**The problem:**

Because fish outplanted as eggs have not yet developed into fish they cannot be physically marked / tagged which means the outplanted fish cannot be differentiated from natural-origin fish. The inability to differentiate these two groups has limited information about the contribution of the egg outplant program to the population and fishery.

**The objective:**

Develop a genetic tagging protocol for hatchery origin steelhead trout outplanted as eggs into the Yankee Fork River of the Salmon River in

Number of applied aquatic scientific and technologic tools shared with partners.	1	<p>Idaho.</p> <p><b>The <i>method</i>:</b></p> <p>The method uses DNA markers to "tag" all released egg box fish by DNA-typing their parents. "DNA tags" are recovered from sampled fish by removing a very small piece of fin tissue and then processing the DNA in a laboratory to determine origin (egg box or natural) via parentage analysis.</p>
Number of techniques and culture technology tools developed.	1	

**13210-A-075 - [Simulated Natural Rearing \(NATURES\) Using Altered Feeding Strategies at Warm Springs NFH, OR.](#)**

<b>Facility</b>	Abernathy Fish Technology Center
<b>Expended</b>	\$16265
<b>Objective</b>	Develop and share applied aquatic scientific and technologic tools with partners.
<b>Primary Benefited Species</b>	Chinook salmon or king salmon ( <a href="#">Oncorhynchus tshawytscha</a> )
<b>Primary Benefited Population</b>	<a href="#">Warm Springs hatchery spring chinook</a>
<b>Plans</b>	Warm Springs Hatchery and Genetic Management Plan (draft)
<b>Keyword</b>	Fish Technology
<b>Need Number</b>	N-002
<b>Partners</b>	

### Accomplishments

Recovery Plan production tasks implemented (PART)	1
Number of technical assistance requests fulfilled to support Tribal fish and wildlife conservation	1
Number of applied aquatic scientific and technologic tools shared with partners.	1
Number of applied science and technology tasks implemented as prescribed by Recovery Plans. (PART)	1

### Accomplishment Summary

Warm Springs NFH fish were analyzed for proximate composition throughout rearing as part of a study to determine if altered feeding methods & modified feeds can be used to produce NFH fish resembling their wild counterparts in size and body composition. A planning meeting was convened to identify further tasks for the cooperators. This accomplishment is associated with FONS project 13210-2004-025.

### Description

**The *importance* to the Resource:**

The conditions under which the fish are raised could have a great effect on their growth and morphology. A study plan outlining work to match fish growth rates in a NFH setting with growth rates of wild fish at the same location has been put into place and a literature search has been done.

**The *problem*:**

The rearing environment of NFH fish is significantly different from conditions in the wild. At some NFHs very little water temperature fluctuation occurs during the rearing period. Even if the NFH experiences fluctuating water temperature, the feeding regimes and the food used is quite different from a wild fish diet.

**The *objective*:**

The data collected will consist of fish from the stream and the hatchery for body composition and size comparison. Also, temperature profiles from the stream and hatchery will be monitored and compared. This data will give

	<p>the basis for changes in the NFH feeding regimes to produce fish more like their wild counterparts.</p> <p><b>The <i>method</i>:</b></p> <p>Spring Chinook salmon samples are being collected at the Warm Springs NFH with the assistance of the Lower Columbia FHC and the Columbia River FPO. Fish are monitored in the Warm Springs River, with NFH and in-river water temperatures being recorded. Fish were analyzed for proximate composition throughout the rearing period at Warm Springs NFH.</p> <p><b>Further description:</b></p> <p>Nutrition</p>
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**13210-A-092 - [Project Development: Potential Reduction in Bull Trout Reproduction From Changing Water Temperatures](#)**

<b>Facility</b>	Abernathy Fish Technology Center
<b>Expended</b>	\$6500
<b>Objective</b>	Develop and share applied aquatic scientific and technologic tools with partners.
<b>Primary Benefited Species</b>	Bull trout ( <a href="#">Salvelinus confluentus</a> )
<b>Primary Benefited Population</b>	Not specified
<b>Plans</b>	<p>Bull Trout Recovery Plan, Ch 1 Introduction</p> <p>Fisheries Restoration and Irrigation Mitigation Act of 2000 (PL 106-502)</p> <p>Bull Trout Recovery Plan, Ch 24 Snake River Washington RU</p>
<b>Keyword</b>	Fish Technology
<b>Need Number</b>	N-002
<b>Partners</b>	

## Accomplishments

Number of other Recovery Plan tasks implemented for T&E populations	3
Number of other Fishery Management Plan tasks implemented for populations of management concern.	1

## Accomplishment Summary

A research proposal and study plan was developed and submitted for potential funding to the Bonneville Power Administration competitive grants program.

## Description

### **The importance to the Resource:**

Hydropower, forestry, and agricultural practices can often lead to substantial increases in the maximum daily temperature in streams and rivers. These increases in stream water temperature can still have significant effects on the development and physiology of cold water fishes.

### **The problem:**

Bull trout, a federally listed (threatened) species, is especially susceptible to the effects of increased temperature due to their low thermal requirements.

### **The objective:**

The goal of this project is to identify the effects of elevated summer water temperatures on egg development and reproduction in female bull trout. Critical water temperatures can then be managed via water flow manipulation thus ensuring temperatures conducive to successful wild bull trout reproduction.

### **The method:**

In controlled laboratory experiments, fish will be exposed to high temperatures through different stages of ovarian development and spawning. We will use physiological (vitellogenin and hormone levels), physical



	<p>(egg size and weight), and performance (fertilization and hatching success) indicators to determine reproductive success.</p> <p><b>Further description:</b></p> <p>Ecological Physiology</p>
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**13310-A-118 - [StreamNet Activities](#)**

<b>Facility</b>	Columbia River Fisheries Program Office
<b>Expended</b>	\$13092
<b>Objective</b>	Develop and share applied aquatic scientific and technologic tools with partners.
<b>Primary Benefited Species</b>	Chinook salmon or king salmon ( <a href="#">Oncorhynchus tshawytscha</a> )
<b>Primary Benefited Population</b>	Not specified
<b>Plans</b>	Conservation of Columbia Basin Fish, Final Basinwide Salmon Recovery Strategy, 12/2000 (All H Paper)
<b>Keyword</b>	Interjurisdictional
<b>Need Number</b>	N-002
<b>Partners</b>	<p>Bonneville Power Administration</p> <p>Columbia River Inter Tribal Fish Commission</p> <p>Idaho Department of Fish and Game</p> <p>Oregon Department of Fish and Wildlife</p> <p>Pacific States Marine Fisheries Commission</p> <p>Washington Department of Fish and Wildlife</p>

**Accomplishments**
**Accomplishment Summary**

Provided Service hatchery facility, fish return and age composition information to the StreamNet database, and participated in StreamNet Steering and Technical Committee meetings. The data is used by managers to monitor populations.

**Description**
**The *importance* to the Resource:**

StreamNet was established to meet the data needs of the Northwest Power Planning Council's Fish and Wildlife Program and related activities that complement the Program.

**The *problem*:**

A multitude of agencies collect data on Columbia River basin fish and wildlife. Lack of coordination and a common database is ineffective and inefficient.

**The *objective*:**

StreamNet provides decision makers and fish and wildlife managers with essential baseline data to aid in their efforts to protect and restore the region's fish and wildlife resources.

**The *method*:**

Columbia River Fisheries Program Office provided Service hatchery facility, fish return and age composition information to the StreamNet database, and participated in StreamNet Steering and Technical Committee meetings.

**Further description:**

StreamNet is a cooperative venture of the

Number of other Recovery Plan tasks implemented for T&E populations	1	<p>region's fish and wildlife agencies and tribes. The StreamNet project receives funding from the Bonneville Power Administration and is authorized under the Fish and Wildlife Program of the Northwest Power and Conservation Council. StreamNet 's mission is: To create, maintain, and enhance high quality, regionally consistent data on fish and related aquatic resources that are directly applicable to regional policy, planning, management, and research; and to provide data and information services in an efficient and timely manner and in a format that meets the needs of users.</p>
Number of applied aquatic scientific and technologic tools shared with partners.	1	
Number of techniques and culture technology tools developed.	1	

**13310-A-120 - [Evaluate Spawning and Rearing Habitat for Fall Chinook and Chum Salmon in the Columbia River.](#)**

<b>Facility</b>	Columbia River Fisheries Program Office	<p><b>Accomplishment Summary</b></p> <p>Described habitat use/requirements for Chinook and chum salmon in Lower Columbia River near Bonneville Dam; initiated new research on habitat use near The Dalles, John Day, and McNary dams and in the lower Columbia near Vancouver. Results used to configure hydro operations for benefit of species</p> <p><b>Description</b></p> <p><b>The <i>importance</i> to the Resource:</b></p> <p>Populations of ESA-listed chum and fall Chinook salmon affected by operation of The Federal Columbia River Power System (FCRPS) must be protected and enhanced.</p> <p><b>The <i>problem</i>:</b></p> <p>Quantify the location and level of spawning and rearing activity by chum and fall Chinook salmon in the Columbia River near Bonneville, The Dalles, John Day, and McNary dams. The extent of spawning, and conditions needed to provide successful spawning and rearing below the mainstem dams, and the measures needed to protect those fish, are required.</p> <p><b>The <i>objective</i>:</b></p> <p>Describe physical habitat use and requirements for fall Chinook salmon in the Columbia River downstream from The Dalles, John Day, and McNary dams and for chum salmon downstream from Bonneville Dam. These data will be used to help configure the hydrosystem, operation of the FCRPS, for the long term benefit of these species.</p> <p><b>The <i>method</i>:</b></p>
<b>Expended</b>	\$0	
<b>Objective</b>	Develop and share applied aquatic scientific and technologic tools with partners.	
<b>Primary Benefited Species</b>	Chum salmon ( <a href="#">Oncorhynchus keta</a> )	
<b>Primary Benefited Population</b>	<a href="#">Lower Gorge Chum Salmon</a>	
<b>Plans</b>	<p>2000 NMFS FCRPS Biological Opinion - December 21, 2000</p> <p>Columbia River Basin Fish and Wildlife Program (NPPC 2000)</p> <p>Lower Columbia Salmon Recovery And Fish &amp; Wildlife Subbasin Plan: Volume II, Chapter A – Lower Columbia Mainstem and Estuary for Washington State - 2004</p> <p>Columbia Gorge Subbasin Plan</p> <p>Lower Mid-Columbia Mainstem Subbasin Plan - 2004</p> <p>Conservation of Columbia Basin Fish, Final Basinwide Salmon Recovery Strategy, 12/2000 (All H Paper)</p>	
<b>Keyword</b>	Monitoring and Assessment	
<b>Need</b>	N-002	

Number		Conducted boat deployed field surveys with survey grade instrumentation to precisely map the bathymetric surfaces of previously unmapped spawning sites. Conducted deep water redd surveys using a 2-man boat mounted underwater videography system equipped with on the fly GIS/GPS mapping capabilities. Collate data with in-season flows.
Partners	Bonneville Power Administration (\$59842) Oregon Department of Fish and Wildlife U.S. Geological Survey Washington Department of Fish and Wildlife	
Accomplishments		
Number of population assessments completed	2	The purpose of this project is to quantify the location and level of spawning activity by chum and fall Chinook salmon in the Columbia River near Bonneville, The Dalles, John Day, and McNary dams. These data will be used to help configure they hydrosystem for the long term benefit of these species. Research continued to determine day/night spawning and movement patterns by ESA-listed chum salmon. We also collected geographic and hydrologic data at chum spawning sites in the lower Columbia in preparation for a habitat assessment at these new locations. Work continued to quantify fall Chinook spawning activity downstream from The Dalles, John Day, and McNary dams. Mapping of spawning areas continued for all three locations, and collection of habitat use data continued. Hydrodynamic modeling was used to determine the effect of hydrosystem operations on the availability of spawning habitat for fall Chinook. Hydrophones were used to detect day/night spawning below The Dalles, John Day and McNary dams.
Number of other Recovery Plan tasks implemented for T&E populations	3	
Number of other Fishery Management Plan tasks implemented for populations of management concern.	16	
Number of applied science and technology tasks implemented as prescribed by Fishery Management Plans. (PART)	2	

13310-A-142 - [Smolt Monitoring Program Tagging](#)

<b>Facility</b>	Columbia River Fisheries Program Office	<p><b>Accomplishment Summary</b></p> <p>Tagged and released 14,987 spring Chinook salmon, 5,996 summer Chinook salmon, and 2,989 fall Chinook salmon with Passive Integrated Transponder tags (PIT) at Leavenworth NFH and Wells and Priest Rapids State Hatcheries in the mid-Columbia River.</p> <p><b>Description</b></p> <p><b>The importance to the Resource:</b></p> <p>The Smolt Monitoring Program is a long term, basin wide assessment program of smolt passage survival of salmonids migrating out of the Columbia and Snake River Basins. Smolt migration data are collected each year to aid the fisheries agencies and tribes in making water management decisions to enhance juvenile fish passage through the hydrosystem.</p> <p><b>The problem:</b></p> <p>Annual tagging is needed to track the timing and survival of juvenile fish through the hydrosystem so that decisions on the best use of limited flow manipulations to enhance juvenile fish passage can be made.</p> <p><b>The objective:</b></p> <p>The objective is to maintain an annual cooperative program of fish tagging of index stocks throughout the upper basin and monitoring at mainstem Columbia and Snake River dams for the purpose of making in-season water management decisions that benefit juvenile fish passage.</p> <p><b>The method:</b></p> <p>Fish are PIT tagged and data are collected at the mainstem dams for the purpose of in-</p>
<b>Expended</b>	\$0	
<b>Objective</b>	Utilize appropriate scientific and technologic tools in formulating and executing fishery management plans and policies.	
<b>Primary Benefited Species</b>	Chinook salmon or king salmon ( <a href="#">Oncorhynchus tshawytscha</a> )	
<b>Primary Benefited Population</b>	Not specified	
<b>Plans</b>	Columbia River Basin Fish and Wildlife Program (NPPC 2000) 2000 NMFS FCRPS Biological Opinion - December 21, 2000	
<b>Keyword</b>	Monitoring and Assessment	
<b>Need Number</b>	N-002	
<b>Partners</b>	Bonneville Power Administration (\$39154) Columbia River Inter Tribal Fish Commission Fish Passage Center Idaho Department of Fish and Game National Marine Fisheries Service Oregon Department of Fish and Wildlife Washington Department of Fish and Wildlife	

## Accomplishments

Number of other Fishery Management Plan tasks implemented for populations of management concern.	4
Number of applied science and technology tasks implemented as prescribed by Fishery Management Plans. (PART)	3

season management of flows and spills and the post-season evaluation of the effect of that year's management actions on migrating salmonids.

### Further description:

This cooperative tagging program provides information critical to the overall flow management assessment and is a reimbursable project funded by the Bonneville Power Administration.

13310-A-145 - [Warm Springs National Fish Hatchery Passage System Evaluation](#)

<b>Facility</b>	Columbia River Fisheries Program Office
<b>Expended</b>	\$9498
<b>Objective</b>	Maintain diverse, self-sustaining fish and other aquatic resource populations.
<b>Primary Benefited Species</b>	Chinook salmon or king salmon ( <a href="#">Oncorhynchus tshawytscha</a> )
<b>Primary Benefited Population</b>	Not specified
<b>Plans</b>	Warm Springs Hatchery and Genetic Management Plan (draft) 2000 NMFS FCRPS Biological Opinion - December 21, 2000
<b>Keyword</b>	Fish Technology
<b>Need Number</b>	N-002
<b>Partners</b>	Confederated Tribes of The Warm Springs Warm Springs National Fish Hatchery

## Accomplishments

Number of other Recovery Plan tasks implemented for T&E populations	2
Number of techniques and culture technology tools developed.	1
Number of applied science and technology tasks implemented as prescribed by Recovery Plans. (PART)	1

## Accomplishment Summary

CRFPO collected and assessed biological data and consulted with other groups to improve performance of passage operations and brood stock collection of hatchery and wild fish for hatchery reform.

## Description

### The *importance* to the Resource:

Collect hatchery brood stock and protect wild salmon.

### The *problem*:

Handling of wild fish can cause mortalities.

### The *objective*:

Use state of the art technology to reduce handling on wild fish.

### The *method*:

An adult fish passage system was installed at Warm Springs NFH (WSNFH) in 1996 to improve survival of wild and listed fish passed upstream of the hatchery.

### Further description:

Initial testing from 1997 to 2001 suggested improvements to the passage system were needed. Problems immediately identified were mortality from fish jumping from the passage corridor, estimating wild fish passage, and estimating unintentional passage of hatchery adults upstream. WSNFH was given responsibility for making physical improvements to the system and operations. The Columbia River Fisheries Program Office (CRFPO) collates and collects data for



	monitoring and evaluation.
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**13310-A-148 - [Bonneville Power Administration Funded Marking Program for Annual Stock Assessment](#)**

<b>Facility</b>	Columbia River Fisheries Program Office	<p><b>Accomplishment Summary</b></p> <p>Tagged a total of 175,281 spring Chinook and coho for monitoring and evaluation purposes.</p> <p><b>Description</b></p> <p><b>The importance to the Resource:</b></p> <p>Marking and tagging of hatchery stocks is critical to west coast fisheries management and wild stock protection and recovery.</p> <p><b>The problem:</b></p> <p>West coast salmon fisheries catch a variety of ESA listed and other stocks of concern as they target abundant hatchery and other productive wild stocks. A coast wide tagging and stock assessment program to monitor and evaluate status of stocks and impacts of fisheries on various stocks of concern is critical to wild stock protection and recovery.</p> <p><b>The objective:</b></p> <p>The Bonneville Power Administration (BPA) and the Northwest Power and Conservation Council recognized the need to have annual evaluations of production facilities throughout the Columbia River Basin and BPA has supplied funding to meet this annual need for programs that are not marked under other funding sources.</p> <p><b>The method:</b></p> <p>CRFPO staff tagged 175,281 spring Chinook and coho at Service facilities that had no ongoing evaluation program. Fish are marked to evaluate hatchery performance, survival, and contribution to fisheries. Results are reported in an annual stock assessment report</p>
<b>Expended</b>	\$0	
<b>Objective</b>	Utilize appropriate scientific and technologic tools in formulating and executing fishery management plans and policies.	
<b>Primary Benefited Species</b>	Chinook salmon or king salmon ( <a href="#">Oncorhynchus tshawytscha</a> )	
<b>Primary Benefited Population</b>	Not specified	
<b>Plans</b>	<p>Carson NFH Spring Chinook Salmon Hatchery and Genetic Management Plan</p> <p>Little White NFH Spring Chinook Salmon Hatchery and Genetic Management Plan</p> <p>Eagle Creek NFH Coho Salmon Hatchery and Genetic Management Plan</p> <p>2005-2007 Interim Management Agreement for Upriver Chinook, Sockeye, Steelhead, Coho, and White Sturgeon</p> <p>2000 NMFS FCRPS Biological Opinion - December 21, 2000</p> <p>Columbia River Basin Fish and Wildlife Program (NPPC 2000)</p> <p>1999 NMFS Biological Opinion on Artificial Propagation in the Columbia</p>	

	River Basin. Conservation of Columbia Basin Fish, Final Basinwide Salmon Recovery Strategy, 12/2000 (All H Paper)
<b>Keyword</b>	Monitoring and Assessment
<b>Need Number</b>	N-002
<b>Partners</b>	Bonneville Power Administration (\$84099)

### Accomplishments

Number of marking and tagging targets met, as prescribed by Recovery plans	3
Number of post-stocking survival tasks met, as prescribed by Recovery plans for hatchery propagated listed species. (PART)	1
Number of other Recovery Plan tasks implemented for T&E populations	1
number of marking and tagging targets met, as prescribed by Fishery management plans. (PART)	2
Number of other Fishery Management Plan tasks implemented for populations of management concern.	1

and are used to recommend improvements in hatchery practices and fisheries management.

**Further description:**

In addition, the Service provides the monitoring and evaluation assessments of these annual tagging programs.

**13310-A-150 - Ecological Interactions between Hatchery and Wild Fish - Deschutes River, Oregon**

<b>Facility</b>	Columbia River Fisheries Program Office	<p><b>Accomplishment Summary</b></p> <p>We have established cooperative and inter-agency agreements &amp; gathered information to be used in management decisions at National Fish Hatcheries to minimize the risk to wild and listed fish that lead to hatchery reform.</p> <p><b>Description</b></p> <p><b>The <i>importance</i> to the Resource:</b></p> <p>Minimize impact of hatchery fish on wild and ESA listed fish, assist with recovery while providing sport and tribal harvest opportunity.</p> <p><b>The <i>problem</i>:</b></p> <p>Fish released from a hatchery interact with wild fish in the stream, however the impact of these interactions on wild fish populations is not known. Modifying hatchery rearing and release practices may reduce the impacts that hatchery fish have on wild, listed populations while still providing fish for harvest in Tribal and sport fisheries.</p> <p><b>The <i>objective</i>:</b></p> <p>This project will monitor and evaluate the behavior, distribution, and survival of hatchery fish in both the hatchery and stream environment. Potential impacts to wild fish populations will be monitored and alternative hatchery rearing and release practices will be investigated.</p> <p><b>The <i>method</i>:</b></p> <p>A variety of methods, including mark-recapture, growth monitoring, genetic parentage analyses, and underwater observations (snorkeling and video-monitoring) was used to</p>
<b>Expended</b>	\$246155	
<b>Objective</b>	Develop and share applied aquatic scientific and technologic tools with partners.	
<b>Primary Benefited Species</b>	Chinook salmon or king salmon ( <a href="#"><i>Oncorhynchus tshawytscha</i></a> )	
<b>Primary Benefited Population</b>	Not specified	
<b>Plans</b>	<p>Warm Springs Hatchery and Genetic Management Plan (draft)</p> <p>Comprehensive Hatchery Management Plan- Warm Springs NFH</p> <p>1999 NMFS Biological Opinion on Artificial Propagation in the Columbia River Basin.</p> <p>2000 NMFS FCRPS Biological Opinion - December 21, 2000</p>	
<b>Keyword</b>	Monitoring and Assessment	
<b>Need Number</b>	N-002	
<b>Partners</b>	<p>Abernathy Fish Technology Center</p> <p>Confederated Tribes of The Warm Springs</p> <p>Lower Columbia River Fish Health Center</p> <p>National Oceanic and Atmospheric Administration, Fisheries</p>	

Oregon Department of  
Fish and Wildlife  
U.S. Geological Survey  
Warm Springs National  
Fish Hatchery

## Accomplishments

Number of population assessments completed	4
Number of other Recovery Plan tasks implemented for T&E populations	8
Number of applied science and technology tasks implemented as prescribed by Recovery Plans. (PART)	1
Number of applied science and technology tasks implemented as prescribed by Fishery Management Plans. (PART)	1

monitor interactions between hatchery and wild fish populations.

### Further description:

We have established cooperative agreements with Confederated Tribes of the Warm Springs Reservation of Oregon (CTWSRO) and U.S. Geological Survey (USGS) and worked closely with our Fish Health Center, Abernathy FTC, Warm Springs National Fish Hatchery (WSNFH), and Oregon Department of Fish and Wildlife in developing and implementing plans to investigate ecological interactions between hatchery spring Chinook salmon from WSNFH and native fishes in the Deschutes and Columbia rivers. The CRFPO obtained permission to work on CTWSRO streams and worked closely with tribal personnel in developing snorkeling and underwater video-monitoring techniques to estimate behavioral interaction between juvenile salmon and listed steelhead and bull trout. Genetic samples were collected from hatchery and wild fish in order to compare the distribution, behavior, and reproductive success of wild and outplanted hatchery fish. We have developed plans to use PIT-tag technology to monitor releases of juvenile salmon. Information gathered from these projects will be used in management decisions at National Fish Hatcheries to minimize the risk to wild and listed fish.

13310-A-156 - [US-Canada, Pacific Salmon Treaty, Technical Assistance](#)

<b>Facility</b>	Columbia River Fisheries Program Office
<b>Expended</b>	\$44855
<b>Objective</b>	Support, facilitate, and/or lead collaborative approaches to manage interjurisdictional fisheries.
<b>Primary Benefited Species</b>	Chinook salmon or king salmon ( <a href="#"><i>Oncorhynchus tshawytscha</i></a> )
<b>Primary Benefited Population</b>	Not specified
<b>Plans</b>	<p>Pacific Salmon Treaty of 1999</p> <p>1999 NMFS Biological Opinion on Artificial Propagation in the Columbia River Basin.</p> <p>Conservation of Columbia Basin Fish, Final Basinwide Salmon Recovery Strategy, 12/2000 (All H Paper)</p> <p>Columbia River Basin Fish and Wildlife Program (NPPC 2000)</p>
<b>Keyword</b>	Monitoring and Assessment
<b>Need Number</b>	N-002
<b>Partners</b>	

### Accomplishments

Number of population assessments completed	30
Number of other Recovery Plan tasks	3

### Accomplishment Summary

Assisted in the technical analysis of fishery exploitation rates on indicator stocks and estimation of current year salmon stock abundance for the Pacific Salmon Commission.

### Description

**The *importance* to the Resource:**

The Pacific Salmon Commission is responsible for salmon harvest sharing between the US and Canada in the development of fishery regimes that provide opportunity for important coastal fisheries while providing an appropriate level of protection for ESA listed and other stocks of concern..

**The *problem*:**

The Commission relies on a collaborative effort of the relevant state, federal and tribal fishery management entities to provide technical assistance, management expertise and policy direction within the Commission process.

**The *objective*:**

The Chinook Technical Committee (CTC) conducts the annual fishery exploitation rate analysis on indicator stocks to track harvest impacts on stocks of concern relative to US-Canada harvest sharing agreements and calculates the Treaty allowed "Aggregate Abundance Based Management" catch given information on the current abundance of key stocks.

**The *method*:**

CRFPO Staff conducted the 2005 exploitation rate analysis based on code wire tag

implemented for T&E populations		7	<p>recoveries for Lyon's Ferry/Snake River, Spring Creek Hatchery, Hanford Wild, Upriver Brights, Bonneville Hatchery, Cowlitz Falls, Stayton Pond, Lewis River Wild, and Wells Summer Stock groups. CRFPO staff also calibrated the Chinook model for the same stocks.</p> <p><b>Further description:</b></p> <p>The CTC fishery impact analysis is critical to protection and recovery of depressed and listed west coast stocks.</p>
Number of other Fishery Management Plan tasks implemented for populations of management concern.			

13310-A-157 - [Magnuson-Stevens Sustainable Fisheries Management Act, Technical Assistance](#)

<b>Facility</b>	Columbia River Fisheries Program Office
<b>Expended</b>	\$20000
<b>Objective</b>	Support, facilitate, and/or lead collaborative approaches to manage interjurisdictional fisheries.
<b>Primary Benefited Species</b>	Chinook salmon or king salmon ( <a href="#"><i>Oncorhynchus tshawytscha</i></a> )
<b>Primary Benefited Population</b>	Not specified
<b>Plans</b>	<p>Pacific Salmon Plan (1999), and various amendments</p> <p>1999 NMFS Biological Opinion on Artificial Propagation in the Columbia River Basin.</p> <p>Conservation of Columbia Basin Fish, Final Basinwide Salmon Recovery Strategy, 12/2000 (All H Paper)</p> <p>Columbia River Basin Fish and Wildlife Program (NPPC 2000)</p>
<b>Keyword</b>	Monitoring and Assessment
<b>Need Number</b>	N-002
<b>Partners</b>	

### Accomplishments

Number of population assessments completed	16
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<h3>Accomplishment Summary</h3> <p>Assisted in the technical analysis of proposed salmon fishery regulatory options being considered by the Pacific Fishery Management Council and the development and compilation of west coast salmon stock abundance information that is used to make annual ocean fisheries management decisions.</p> <h3>Description</h3> <p><b>The importance to the Resource:</b></p> <p>The Pacific Fishery Management Council (PFMC) is responsible for developing and recommending salmon fishing regulations for federal waters off the coasts of Washington, Oregon, and California to the Secretary of Commerce for promulgation.</p> <p><b>The problem:</b></p> <p>The PFMC relies on a collaborative effort of a number of scientific, technical, and fishery advisory committees with representation from the relevant state, federal, tribal, and fishery users (depending on the charge of the committee) to provide technical assistance, impact analysis and management advice within the PFMC process.</p> <p><b>The objective:</b></p> <p>The Columbia River Fisheries Program Office provided staff representation at the technical level for the Salmon Technical Team and the Model Evaluation Workgroup of the Pacific Fishery Management Council.</p> <p><b>The method:</b></p> <p>The Salmon Technical Team reviewed the past year's ocean fisheries and analyzed the current</p>
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Number of other Recovery Plan tasks implemented for T&E populations	5	<p>year's proposed regulatory options using computer models. The analysis takes into account the escapement needs of critical species, the treaty rights of native Americans consistency with applicable law, especially ESA, and the needs of the fishery users.</p> <p><b>Further description:</b></p> <p>Protection and recovery of the fisheries resource continues to be the first priority of the Service in its participation in the PFMC forum at the technical level.</p>
Number of other Fishery Management Plan tasks implemented for populations of management concern.	6	

**13310-A-158 - [General Biometrics Activities](#)**

<b>Facility</b>	Columbia River Fisheries Program Office	<b>Accomplishment Summary</b>  Provided biometric support to a variety of fisheries projects and recovery efforts.  <b>Description</b>  <b>Further description:</b>  Performed quantitative analyses and provided statistical advice for a wide range of problems. Among these was helping to develop strategies for assessing and monitoring the status of listed bull trout population segments. Much of this work was done in cooperation with state and tribal partners. Provided statistical advice for experimental designs for studies that estimate survival rates and fish abundance, and for studies relating habitat attributes to abundance of aquatic animals. These include serving on the oversight committee for the regional Comparative Survival Study of salmon throughout the Columbia River basin, and participating in the Collaborative Systemwide Monitoring and Evaluation Project (CSMEP). Participated in the FCRPS Biological Opinion Remand Collaboration Passage Model Workgroup by developing hypotheses for models, attending meetings. Ongoing tasks include technical assistance and review of NOAA Fisheries and FWS policy documents and peer review of manuscripts for journal publication.
<b>Expended</b>	\$68500	
<b>Objective</b>	Utilize appropriate scientific and technologic tools in formulating and executing fishery management plans and policies.	
<b>Primary Benefited Species</b>	Chinook salmon or king salmon ( <a href="#">Oncorhynchus tshawytscha</a> )	
<b>Primary Benefited Population</b>	Not specified	
<b>Plans</b>	Conservation of Columbia Basin Fish, Final Basinwide Salmon Recovery Strategy, 12/2000 (All H Paper) 2000 NMFS FCRPS Biological Opinion - December 21, 2000 Bull Trout Recovery Plan (Draft)	
<b>Keyword</b>	Monitoring and Assessment	
<b>Need Number</b>	N-002	
<b>Partners</b>	ESSA Technologies, Ltd. Environmental Protection Agency Idaho Department of Fish and Game Montana Fish, Parks and Wildlife National Oceanic and Atmospheric Administration, Fisheries Oregon Department of	

	<p>Fish and Wildlife U. S. Forest Service U.S. Geological Survey Utah State University Washington Department of Fish and Wildlife</p>	
<h2>Accomplishments</h2>		
Number of population assessments completed	25	
Number of other Recovery Plan tasks implemented for T&E populations	8	

**13310-A-159 - [Science Team Activities](#)**

<b>Facility</b>	Columbia River Fisheries Program Office	<b>Accomplishment Summary</b>  Supported RO activities in bull trout conservation issues. Chaired Recovery Monitoring and Evaluation Group for bull trout recovery which continued to develop guidance for assessing recovery criteria. Identified and developed methods to delineate fundamental sampling units (populations) and sample for distribution. Initiated the development of methods to assess connectivity. Continued deliberations on how to assess abundance and trends in abundance.  <b>Description</b>  <b>The importance to the Resource:</b>  The Science Team (ST) is the Service's attempt to formally organize its collective efforts across the various Service offices that are involved with broad scale, scientific issues that would be best addressed utilizing a diversity of expertise.  <b>The problem:</b>  Through a comprehensive assessment, analysis and review of the best available science, the team served to provide a sound approach and defensible response to various scientific questions facing the Service.  <b>The objective:</b>  The initial focus of the ST was to assist in issues surrounding bull trout recovery. As part of that effort, the bull trout Recovery Monitoring and Evaluation Group (RMEG) was formed. In FY2006, the RMEG held two meetings, had multiple conference calls, and continued to develop a comprehensive monitoring strategy. This work is ongoing.
<b>Expended</b>	\$82723	
<b>Objective</b>	Utilize appropriate scientific and technologic tools in formulating and executing fishery management plans and policies.	
<b>Primary Benefited Species</b>	Bull trout ( <a href="#">Salvelinus confluentus</a> )	
<b>Primary Benefited Population</b>	Not specified	
<b>Plans</b>	Conservation of Columbia Basin Fish, Final Basinwide Salmon Recovery Strategy, 12/2000 (All H Paper) Bull Trout Recovery Plan (Draft) Bull Trout Recovery Plan, Ch 1 Introduction	
<b>Keyword</b>	Monitoring and Assessment	
<b>Need Number</b>	N-002	
<b>Partners</b>	ESSA Technologies, Ltd. Environmental Protection Agency Montana Fish, Parks and Wildlife U. S. Forest Service U.S. Geological Survey University of Georgia University of Montana Utah State University Washington Department of Fish and	

	Wildlife	
<b>Accomplishments</b>		
Number of population assessments completed	36	
Number of other Recovery Plan tasks implemented for T&E populations	3	
Number of applied aquatic scientific and technologic tools shared with partners.	3	
		<p><b>The <i>method</i>:</b></p> <p>CRFPO staff chair the RMEG and represent RMEG and the FWS in the Columbia System Monitoring and Evaluation Plan (CSMEP) forum. The RMEG worked on developing guidance on appropriate ways to monitor and evaluate bull trout connectivity, distribution, abundance and trends in abundance. This work is ongoing.</p> <p><b>Further description:</b></p>

**13310-A-165 - [Evaluation of the Effect of Columbia River Water Management on the Hanford Reach National Monument](#)**

<b>Facility</b>	Columbia River Fisheries Program Office	<p><b>Accomplishment Summary</b></p> <p>Conducted additional habitat modeling and developed Reach-wide spawning habitat model. Completed spawning habitat modeling of Hanford Reach. Recommended operations to reduce juvenile mortality and improve productivity of spawning habitat for fall Chinook while maintaining flexibility for hydropower production. Coordinated with Tribes, States, and assisted with FERC relicensing.</p> <p><b>Description</b></p> <p><b>The <i>importance</i> to the Resource:</b></p> <p>Hanford Reach NM was established in part to protect the last free-flowing section of the mainstem Columbia River in the US, and the internationally significant stock of fall Chinook salmon that spawn and rear there. Evaluation of the effect of water management for power production on stock productivity is required to maintain fishery benefits.</p> <p><b>The <i>problem</i>:</b></p> <p>Spawning habitat and production are degraded and millions of juvenile salmon are killed each spring as a result of hydropower operations. Realistic escapement goals cannot be determined because of compromised freshwater productivity. Habitat-based escapement goals have not yet been determined and productivity and fishery benefits are being lost.</p> <p><b>The <i>objective</i>:</b></p> <p>The objective of the project is to assess the effect of water management, including hydropower operations, on the productivity of the habitat and on juvenile salmon mortality.</p>
<b>Expended</b>	\$41945	
<b>Objective</b>	Utilize appropriate scientific and technologic tools in formulating and executing fishery management plans and policies.	
<b>Primary Benefited Species</b>	Chinook salmon or king salmon ( <a href="#">Oncorhynchus tshawytscha</a> )	
<b>Primary Benefited Population</b>	<a href="#">Col. R. below Priest Rapids Dam - Hanford Reach Fall Chinook</a>	
<b>Plans</b>	<p>Conservation of Columbia Basin Fish, Final Basinwide Salmon Recovery Strategy, 12/2000 (All H Paper)</p> <p>Pacific Salmon Treaty of 1999</p> <p>Columbia River Basin Fish and Wildlife Program (NPPC 2000)</p>	
<b>Keyword</b>	Native Species	
<b>Need Number</b>	N-002	
<b>Partners</b>	<p>Alaska Department of Fish and Game (\$1000)</p> <p>American Rivers (\$1000)</p> <p>Columbia River Inter Tribal Fish Commission (\$2000)</p> <p>Hanford Reach National Monument/Saddle Mountain National Wildlife</p>	

	Refuge (\$1000) Umatilla Tribe Upper Columbia Fish and Wildlife Office Yakama Indian Nation	Conditions evaluated range from stable, natural streamflows to current load following hydrographs that have resulted in lost productivity.
<b>Accomplishments</b>		<b>The <i>method</i>:</b>
Number of habitat assessments completed	2.0	Physical, hydrodynamic, habitat, and biological models were developed in a GIS to conduct the assessment of water management effects. These models were used to quantify spawning and rearing habitat for a range of streamflows. They were also used to quantify juvenile salmon mortality under existing conditions, and to predict how to reduce mortality.
Number of miles of in-stream habitat assessed	51.0	
Number of population assessments completed	1	
Number of other Recovery Plan tasks implemented for T&E populations	1	
Number of other Fishery Management Plan tasks implemented for populations of management concern.	7	
Number of applied aquatic scientific and technologic tools shared with partners.	1	
Number of applied science and technology tasks implemented as prescribed by Fishery Management Plans. (PART)	1	
		<b>Further description:</b>
		Hanford Reach National Monument was established in part to protect the last free-flowing section of the mainstem Columbia River in the US, and the internationally significant stock of fall Chinook salmon that spawn and rear there. Hydropower operations cause hourly fluctuations in streamflow that compromise spawning habitat and production, and result in the death of millions of juvenile salmon each spring during the rearing period. This project developed recommendations for hydro operations during the spring to minimize juvenile salmon mortality, while maintaining flexibility for power production. A spawning habitat model was also completed and used to simulate the effect of streamflows and hydropower operations on spawning habitat. A process was developed to evaluate a range of operational options to be implemented each season. Options were designed to accommodate both hydropower production and fish production. Technical assistance was provided to the FERC process for the relicensing of the upstream hydro project (Priest Rapids) to protect the Chinook salmon that use the Hanford Reach, to protect the other significant resources of the Hanford

	Reach National Monument, and maintain flexibility for power production.
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13310-A-167 - [Evaluate Habitat Use and Population Dynamics of Lampreys in Cedar Creek](#)

<b>Facility</b>	Columbia River Fisheries Program Office	<p><b>Accomplishment Summary</b></p> <p>Estimated abundance, migration timing, and biological characteristics of adult and juvenile lampreys; conducted spawning ground surveys; and conducted evaluation of electrofishing efficiency for juvenile lamprey.</p> <p><b>Description</b></p> <p><b>The <i>importance</i> to the Resource:</b></p> <p>Three lower Columbia subbasin plans as well as the Columbia River Basin Lamprey Technical Workgroup outlines lamprey status, distribution, habitat use, and migration biology as some of the major critical uncertainties facing both anadromous and resident lamprey species. This project has addressed these specific uncertainties during FY 2006.</p> <p><b>The <i>problem</i>:</b></p> <p>The USFWS was petitioned in 2003 to list four species of lamprey. Three of these species are native to the Columbia River Basin. The petition was declined based on the paucity of information about lamprey status, distribution, and population structure. Too little research is being conducted in the CRB to understand these critical uncertainties.</p> <p><b>The <i>objective</i>:</b></p> <p>Estimate abundance, migration timing, biological characteristics of adult and juvenile Pacific and Western brook lampreys; Describe spawning habitat and assess approaches to monitor spawning activity; Determine susceptibility of larval lampreys to electrofishing and assess electrofishing as a tool for determining presence and estimating abundance.</p>
<b>Expended</b>	\$0	
<b>Objective</b>	Restore declining fish and other aquatic resource populations before they require listing under the Endangered Species Act.	
<b>Primary Benefited Species</b>	Pacific lamprey ( <a href="#">Lampetra tridentata</a> )	
<b>Primary Benefited Population</b>	Not specified	
<b>Plans</b>	<p>Columbia River Basin Fish and Wildlife Program (NPPC 2000)</p> <p>Lower Columbia and Columbia Estuary Bi-State Subbasin Plan - 2004</p> <p>Critical Uncertainties for Lamprey in the Columbia River Basin: Results from a strategic planning retreat of the Columbia River Lamprey Technical Workgroup 2005</p>	
<b>Keyword</b>	Monitoring and Assessment	
<b>Need Number</b>	N-002	
<b>Partners</b>	<p>Bonneville Power Administration (\$204465)</p> <p>Fish First Washington</p> <p>Washington Department of Ecology</p> <p>Washington Department of Fish and Wildlife</p>	

## Accomplishments

Number of habitat assessments completed	1.0
Number of miles of in-stream habitat assessed	10.0
Number of population assessments completed	6
Number of other Fishery Management Plan tasks implemented for populations of management concern.	10
Number of applied aquatic scientific and technologic tools shared with partners.	1
Number of techniques and culture technology tools developed.	2
Number of applied science and technology tasks implemented as prescribed by Fishery Management Plans. (PART)	1

## The *method*:

Adult PCL captured in pot traps and fish ladder. Mark recapture used for abundance estimates. Rotary screw trap used for migration timing and abundance estimates of juvenile PCL and WBL. Foot surveys completed for assessment of spawning activity. Controlled trials were conducted to assess efficiency of electroshocker and susceptibility of larvae.

## Further description:

The goal of the project is to gain information on the distribution, abundance, and biological characteristics of lampreys in a watershed that is not directly influenced by reservoirs and passage impediments associated with dams in the Columbia River. It is funded by Bonneville Power Administration. This ongoing, multi-year study examined lamprey in Cedar Creek, Washington, a third-order tributary to the Lewis River. Adult ( $n = 151$ ), macrophthalmia ( $n = 10$ ), and ammocoete ( $n = 176$ ) stages of Pacific and Western brook lamprey were examined in 2006. Thirty-one spawning ground surveys were conducted during which 246 Pacific lamprey nests were identified. Ammocoete movement was positively correlated with high flows and appeared to be passive while macrophthalmia movement was not associated with discharge. The ability to detect presence of larval lamprey with an electroshocker was assessed relative to larval size and larval density. Higher densities increased the probability of detection. Capture efficiency was higher for smaller fish.

**13310-A-168 - [Movement of Coastal Cutthroat Trout in the Lower Columbia River: Tributary, Mainstem, and Estuary](#)**

<b>Facility</b>	Columbia River Fisheries Program Office	<p><b>Accomplishment Summary</b></p> <p>The project goal is to provide guidance for monitoring and evaluation of populations and habitat use by various life history stages of cutthroat trout relative to potential disturbances to mainstem and estuarine habitats. This year continued investigations of investigations of movements from tributaries to the lower Columbia River; monitoring movement of fish within three tributaries using PIT tag technology; and assessing population status in lower Columbia River tributaries.</p> <p><b>Description</b></p> <p><b>The <i>importance</i> to the Resource:</b></p> <p>Effective management of coastal cutthroat trout relies upon an understanding of population status, migration patterns and habitat used by this sensitive species.</p> <p><b>The <i>problem</i>:</b></p> <p>This study continues a time series data set describing movement of trout within and between tributaries, mainstem and estuary habitat. Information collected through implementation of this project is critical to assess population status for prevention of listing.</p> <p><b>The <i>objective</i>:</b></p> <p>Quantify populations and identify those most in peril. Quantify trout movement between tributary and main stem habitat in time series sufficient to provide predictive power to habitat modifications and to describe trout utilization of important estuary habitat.</p> <p><b>The <i>method</i>:</b></p>
<b>Expended</b>	\$65218	
<b>Objective</b>	Restore declining fish and other aquatic resource populations before they require listing under the Endangered Species Act.	
<b>Primary Benefited Species</b>	Cutthroat trout ( <a href="#">Oncorhynchus clarkii</a> )	
<b>Primary Benefited Population</b>	Not specified	
<b>Plans</b>	<p>Conservation of Columbia Basin Fish, Final Basinwide Salmon Recovery Strategy, 12/2000 (All H Paper)</p> <p>Coastal Cutthroat Trout Framing Document (draft)</p> <p>Columbia River Basin Fish and Wildlife Program (NPPC 2000)</p> <p>Columbia Estuary Province Sub-basin Plans</p> <p>Lower Columbia Salmon Recovery And Fish &amp; Wildlife Subbasin Plan: Volume II, Chapter A – Lower Columbia Mainstem and Estuary for Washington State - 2004</p>	
<b>Keyword</b>	Monitoring and Assessment	
<b>Need Number</b>	N-002	
<b>Partners</b>	Columbia River Estuary Study Taskforce	

	<p>Lower Columbia Fly Fishers</p> <p>Lower Columbia River Estuary Partnership</p> <p>Lower Columbia River Watershed Council</p> <p>North Coast Watershed Association</p> <p>Oregon Department of Fish and Wildlife</p> <p>Scappoose Bay Watershed Council</p> <p>Sea Resources</p> <p>U.S. Army Corps of Engineers (\$62564)</p> <p>Washington Department of Fish and Wildlife</p>	<p>A combination of PIT tag and acoustic tag technologies will be used to accomplish project objectives. PIT tag technology within tributaries will help quantify population status and describe movement between tributary and mainstem habitat. Monitoring acoustic tagged fish will describe estuary habitat utilization.</p> <p><b>Further description:</b></p>
<b>Accomplishments</b>		
Number of population assessments completed	6	

**13310-A-174 - [Bull Trout Population assessment of viability and demographic parameters for guiding recovery.](#)**

<b>Facility</b>	Columbia River Fisheries Program Office	<p><b>Accomplishment Summary</b></p> <p>Continued population assessment of bull trout focusing on quantifying key demographics, including fish density and distribution, growth, survival, movement, and population size. Also, assessment efforts expanded into the North Fork John Day basin, and bull trout genetic assessments continued.</p> <p><b>Description</b></p> <p><b>The <i>importance</i> to the Resource:</b></p> <p>Bull Trout are listed throughout the coterminous United States with populations demonstrating a wide range in population abundance, structure, demography, and vital rates. There is a need to 1) finalize a recovery plan for this wide ranging species with measurable recovery criteria, and 2) develop an associated monitoring and evaluation plan.</p> <p><b>The <i>problem</i>:</b></p> <p>Although bull trout are listed, quantitative measures of population viability criteria (e.g., distribution, abundance, and trend) are lacking, and little information exists for key demographic parameters (structure, movement, survival and growth) to identify limiting factors, set recovery benchmarks, and evaluate responses to proposed measures.</p> <p><b>The <i>objective</i>:</b></p> <p>Evaluate population viability through measurement of population distribution, abundance, and trend. Provide information for identifying recovery benchmarks and limiting factors through measurement of key vital rates and parameters including movement, growth, and survival. Evaluate strategies for M&amp;E</p>
<b>Expended</b>	\$230785	
<b>Objective</b>	Recover fish and other aquatic resource populations protected under the Endangered Species Act.	
<b>Primary Benefited Species</b>	Bull trout ( <a href="#">Salvelinus confluentus</a> )	
<b>Primary Benefited Population</b>	<a href="#">Walla Walla River core area Bull Trout</a>	
<b>Plans</b>	<p>Bull Trout Recovery Plan (Draft)</p> <p>Bull Trout Draft Recovery Plan, Chapter 9</p> <p>Bull Trout Draft Recovery Plan, Chapter 10</p> <p>Columbia River Basin Fish and Wildlife Program (NPPC 2000)</p>	
<b>Keyword</b>	Monitoring and Assessment	
<b>Need Number</b>	N-002	
<b>Partners</b>	<p>Environmental Protection Agency (\$5000)</p> <p>Oregon Department of Fish and Wildlife (\$8000)</p> <p>U.S. Geological Survey (\$28753)</p> <p>Umatilla Tribe</p> <p>Utah State University (\$24500)</p> <p>Walla Walla Basin Watershed Council</p>	

## Accomplishments

Number of habitat assessments completed	1.0
Number of miles of in-stream habitat assessed	21.0
Number of miles of riparian habitat assessed	21.0
Number of population assessments completed	3
Number of other Recovery Plan tasks implemented for T&E populations	13
Number of other Fishery Management Plan tasks implemented for populations of management concern.	1
Number of applied science and technology tasks implemented as prescribed by Fishery Management Plans. (PART)	1

based on cost, effort and information gained.

### **The method:**

Population assessment, including mark-recapture, was used for estimation of population and demographic parameters (e.g., size, trend and growth, survival). Study includes assessment of genetic structure using microsatellites as well as evaluation of habitat suitability, cues for migration, and the role of marine-derived nitrogen using isotopes.

### **Further description:**

USGS Utah Coop. Unit and CRFPO conducted research in the South Fork Walla Walla, the North Fork Umatilla River, and the North Fork John Day River. Assessments included mark-recapture studies with innovative PIT tag techniques. We made robust estimates for population distribution, size, and trend and estimates of growth, survival, movement, and habitat suitability. Techniques provided guidance to the RMEG on sample design. Patch model assessment for monitoring and evaluation was evaluated. The potential for genetic differentiation among putative groups was assessed. There appears to be gene flow among fish categorized a priori as likely resident versus migratory, as well as among all spatial groupings, and data demonstrate one panmictic population. Isotopic tissue analysis combined with bioenergetics models provided an evaluation of formerly-abundant salmon in determining the diet and growth of bull trout. This indicated that growth rates are low and summer diets contain only a small portion of fish; bioenergetics simulations suggest a diet rich in salmon (as present historically) would increase bull trout growth potential considerably. The study contributed to the goal of providing a template for recovery planning region-wide.

**13310-A-176 - [Determination of Bull Trout Instream Flow and Passage Needs in the Walla Walla River](#)**

<b>Facility</b>	Columbia River Fisheries Program Office	<h2>Accomplishment Summary</h2> <p>Monitoring of the Walla Walla bull trout spawning population continued to determine recovery. Better definition of bull trout distribution and habitat criteria helped to determine relevant areas for development of instream flow and passage needs. Additional PIT arrays were installed in the basin and some PIT arrays were improved to gather directional information and increase efficiency which should further refine distribution and movement information.</p> <h2>Description</h2> <p><b>The <i>importance</i> to the Resource:</b></p> <p>This project is designed to provide the technical data to improve conditions for ESA-listed bull trout in the Walla Walla basin to make progress towards recovery and delisting.</p> <p><b>The <i>problem</i>:</b></p> <p>Inadequate instream flows occur throughout the basin, primarily as a result of irrigation withdrawals which may limit bull trout movement and distribution.</p> <p><b>The <i>objective</i>:</b></p> <p>Our objective continues to be an assessment of habitat and passage conditions in the basin to determine seasonal distribution and movement of bull trout throughout both un-impacted and impacted areas of the South Fork and mainstem river. This will allow development of instream flow targets for relevant areas in the basin.</p> <p><b>The <i>method</i>:</b></p>
<b>Expended</b>	\$94069	
<b>Objective</b>	Recover fish and other aquatic resource populations protected under the Endangered Species Act.	
<b>Primary Benefited Species</b>	Bull trout ( <a href="#">Salvelinus confluentus</a> )	
<b>Primary Benefited Population</b>	<a href="#">Walla Walla River core area Bull Trout</a>	
<b>Plans</b>	Bull Trout Draft Recovery Plan, Chapter 10	
<b>Keyword</b>	Monitoring and Assessment	
<b>Need Number</b>	N-002	
<b>Partners</b>	Oregon Department of Fish and Wildlife Umatilla Tribe Upper Columbia Fish and Wildlife Office Walla Walla Basin Watershed Council Washington Department of Fish and Wildlife	

<h2>Accomplishments</h2>	
Number of population assessments completed	2
Number of other Recovery Plan tasks implemented for T&E populations	7

<div data-bbox="248 212 703 283">Number of applied aquatic scientific and technologic tools shared with partners.</div>	<div data-bbox="776 233 792 258">1</div> <div data-bbox="842 207 1375 424"> <p>Our work will determine the current distribution of bull trout and movement patterns to identify current passage and rearing areas. The Instream Flow Methodology can be applied to rearing and passage areas as habitat suitability curves are developed.</p> </div> <div data-bbox="842 470 1097 499"> <p><b>Further description:</b></p> </div> <div data-bbox="842 546 1375 877"> <p>PIT tag detection arrays were installed to determine passage timing and numbers for bull trout, steelhead, and spring Chinook. Fluvial bull trout passage was observed through late June, and sub-adult bull trout presence was documented at Nursery Bridge Dam during the summer. Snorkel surveys documented rearing bull trout in the mainstem downstream as far as the Washington/Oregon state line.</p> </div>
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13310-A-181 - [Technical Assistance For Selective Harvest Development](#)

<b>Facility</b>	Columbia River Fisheries Program Office	<p><b>Accomplishment Summary</b></p> <p>Provided technical assistance in the effort to upgrade the fishery assessment models used in the PSC and PFMC forums to evaluate the impact of selective fisheries on ESA listed wild stocks.</p> <p><b>Description</b></p> <p><b>The importance to the Resource:</b></p> <p>Developing methods and the fishery management and evaluation tools to selectively harvest abundant hatchery fish while providing appropriate protection for ESA listed and other stocks of concern is a common goal of many west coast fishery managers .</p> <p><b>The problem:</b></p> <p>Current management and impact analysis of west coast salmon fisheries rely on a coastwide CWT tagging and sampling program that was not designed to accommodate mark selective fisheries. As a result, the management database is being degraded by the expanding implementation of selective fisheries.</p> <p><b>The objective:</b></p> <p>CRFPO staff participate in various conservation planning arenas that review selective harvest methods and work on developing new management and fishery impact analysis models. These new tools are designed to work in concert with current management tools to minimize database degradation and maximize information for stock specific management needs.</p> <p><b>The method:</b></p>
<b>Expended</b>	\$57025	
<b>Objective</b>	Support, facilitate, and/or lead collaborative approaches to manage interjurisdictional fisheries.	
<b>Primary Benefited Species</b>	Chinook salmon or king salmon ( <a href="#">Oncorhynchus tshawytscha</a> )	
<b>Primary Benefited Population</b>	Not specified	
<b>Plans</b>	<p>Pacific Salmon Plan (1999), and various amendments</p> <p>2005-2007 Interim Management Agreement for Upriver Chinook, Sockeye, Steelhead, Coho, and White Sturgeon</p> <p>1999 NMFS Biological Opinion on Artificial Propagation in the Columbia River Basin.</p> <p>Columbia River Basin Fish and Wildlife Program (NPPC 2000)</p> <p>Conservation of Columbia Basin Fish, Final Basinwide Salmon Recovery Strategy, 12/2000 (All H Paper)</p> <p>2000 NMFS FCRPS Biological Opinion - December 21, 2000</p>	
<b>Keyword</b>	Monitoring and Assessment	
<b>Need</b>	N-002	

<b>Number</b>	
<b>Partners</b>	
<b>Accomplishments</b>	
Number of population assessments completed	17
Number of other Recovery Plan tasks implemented for T&E populations	8
Number of other Fishery Management Plan tasks implemented for populations of management concern.	8
<p>CRFPO staff have been participating in WDFW's study evaluating the use of tangle (small mesh) nets in the lower Columbia River and the computer code (FRAM) used to model selective fisheries in Puget Sound. PSC area efforts included enhancing a pilot coho selective fisheries computer model for Chinook salmon in ocean fisheries.</p> <p><b>Further description:</b></p>	

13310-A-188 - [U.S. v. Oregon Technical Assistance](#)

<b>Facility</b>	Columbia River Fisheries Program Office	<p><b>Accomplishment Summary</b></p> <p>Assisted in the technical analysis of proposed fishery regulatory options, stock status assessments, and necessary escapements being considered under the 2005-2007 Interim Management Agreement for Upriver Chinook, Sockeye, Steelhead, Coho, and White Sturgeon.</p> <p><b>Description</b></p> <p><b>The importance to the Resource:</b></p> <p>The U.S. v Oregon forum is responsible for developing harvest sharing and production management agreements between the states and the tribes under federal oversight to address ESA listed stock issues.</p> <p><b>The problem:</b></p> <p>State, tribal, and federal fishery management agencies often have differing perspectives on management approaches and even the appropriate level of restriction to protect stocks of concern. These interjurisdictional management issues must be worked out in technical and policy level forums that provide opportunity for all concerns to be addressed.</p> <p><b>The objective:</b></p> <p>CRFPO staff, in cooperation and coordination with the other state, tribal, and federal fishery management agencies, participated in U.S. v. Oregon technical fishery and production management forums, primarily the Technical Advisory Committee, to address interjurisdictional fisheries issues.</p> <p><b>The method:</b></p> <p>CRFPO staff provided technical level</p>
<b>Expended</b>	\$23000	
<b>Objective</b>	Support, facilitate, and/or lead collaborative approaches to manage interjurisdictional fisheries.	
<b>Primary Benefited Species</b>	Chinook salmon or king salmon ( <a href="#">Oncorhynchus tshawytscha</a> )	
<b>Primary Benefited Population</b>	Not specified	
<b>Plans</b>	<p>2005-2007 Interim Management Agreement for Upriver Chinook, Sockeye, Steelhead, Coho, and White Sturgeon</p> <p>1999 NMFS Biological Opinion on Artificial Propagation in the Columbia River Basin.</p> <p>Columbia River Basin Fish and Wildlife Program (NPPC 2000)</p> <p>Conservation of Columbia Basin Fish, Final Basinwide Salmon Recovery Strategy, 12/2000 (All H Paper)</p>	
<b>Keyword</b>	Monitoring and Assessment	
<b>Need Number</b>	N-002	
<b>Partners</b>	<p>Columbia River Inter Tribal Fish Commission</p> <p>Confederated Tribes of The Warm Springs</p> <p>Idaho Department of</p>	

	Fish and Game National Marine Fisheries Service Nez Perce Tribe Oregon Department of Fish and Wildlife Umatilla Tribe Washington Department of Fish and Wildlife Yakama Indian Nation	<p>representation and assistance for Columbia River management forums that develop harvest management options that meet the needs of critical salmon and steelhead species, the treaty rights of native Americans, and provide the greatest benefit to other users, consistent with applicable law.</p> <p><b>Further description:</b></p> <p>CRFPO staff provide technical assistance to U.S. v Oregon process by participating in the Technical Advisory Committee (TAC). Some of the tasks of the TAC include preparation of preseason forecast of salmon and steelhead run sizes to the Columbia River, inseason updates on run projects, review of in-river harvest models and projects, preparation of the "Fact Sheet" for the Columbia River Compact , run reconstruction for listed stocks, and preparation of Biological Assessments for listed stocks. Most of the ad-hoc tasks are data analysis requested by the U.S. v Oregon Policy Committee as they negotiate harvest sharing and hatchery production agreements between the states and the tribes. Some of the ad-hoc assignments during the last fiscal year include analysis of PIT tags of spring and summer Chinook, development of a new preseason forecast method for listed Snake River stocks, development of new methods to use PIT tag recoveries for inseason run size update, run reconstruction of fall Chinook at Lower Granite Dam and confidence intervals for those estimates.</p>
<b>Accomplishments</b>		
Number of population assessments completed	17	
Number of other Recovery Plan tasks implemented for T&E populations	5	
Number of other Fishery Management Plan tasks implemented for populations of management concern.	7	

13310-A-197 - [Ecological Interactions between Hatchery and Wild Fish in Eagle Creek, Oregon](#)

<b>Facility</b>	Columbia River Fisheries Program Office	<p><b>Accomplishment Summary</b></p> <p>Study design and work plans have been developed with Eagle Creek NFH, Abernathy FTC, and the LCR Fish Health Center. In-stream assessments on wild fish populations and hatchery studies have been initiated for hatchery reform.</p> <p><b>Description</b></p> <p><b>The importance to the Resource:</b></p> <p>Information gathered from these projects will be used in management decisions at National Fish Hatcheries to minimize the risk to wild and listed fish and lead to hatchery reform.</p> <p><b>The problem:</b></p> <p>Hatchery fish can have negative impact to wild and ESA listed fish. Hatcheries built to mitigate loss of fisheries from habitat destruction and dams are now taking on a role to help conserve populations.</p> <p><b>The objective:</b></p> <p>CRFPO staff worked closely with our Fish Health Center, Abernathy FTC, Eagle Creek National Fish Hatchery (ECNFH), NOAA Fisheries, and Oregon Department of Fish and Wildlife in developing and implementing plans to investigate ecological interactions between hatchery salmon and steelhead from ECNFH and native fishes in Eagle Creek, Oregon.</p> <p><b>The method:</b></p> <p>Developing in-stream evaluations and monitoring techniques to estimate distribution, abundance, run timing, and behavioral interaction between hatchery and wild fish. Adult salmon and steelhead were affixed with</p>
<b>Expended</b>	\$169220	
<b>Objective</b>	Develop and share applied aquatic scientific and technologic tools with partners.	
<b>Primary Benefited Species</b>	Rainbow trout ( <a href="#">Oncorhynchus mykiss</a> )	
<b>Primary Benefited Population</b>	<a href="#">Clackamas River winter run steelhead</a>	
<b>Plans</b>	<p>1999 NMFS Biological Opinion on Artificial Propagation in the Columbia River Basin.</p> <p>Eagle Creek NFH Coho Salmon Hatchery and Genetic Management Plan</p> <p>Eagle Creek NFH Winter Steelhead Hatchery and Genetic Management Plan</p> <p>2000 NMFS FCRPS Biological Opinion - December 21, 2000</p>	
<b>Keyword</b>	Fish Technology	
<b>Need Number</b>	N-002	
<b>Partners</b>	<p>Abernathy Fish Technology Center</p> <p>Bureau of Land Management</p> <p>Eagle Creek National Fish Hatchery</p> <p>Lower Columbia River Fish Health Center</p> <p>National Oceanic and Atmospheric Administration,</p>	

	<p>Fisheries Oregon Department of Fish and Wildlife Portland General Electric U. S. Forest Service</p>	<p>radio-tags and genetic samples collected in order to compare the distribution, behavior, and their reproductive success.</p>
<p><b>Accomplishments</b></p>		<p><b>Further description:</b></p>
<p>Number of population assessments completed</p>	<p>6</p>	<p>Hatchery fish have been marked and coded-wire tagged, multiple rearing densities of hatchery steelhead are being evaluated, and we have monitored releases of these juvenile salmon using radio telemetry.</p>
<p>Number of other Recovery Plan tasks implemented for T&amp;E populations</p>	<p>5</p>	
<p>Number of applied science and technology tasks implemented as prescribed by Recovery Plans. (PART)</p>	<p>2</p>	

13310-A-199 - [Deschutes River Genetics Monitoring](#)

<b>Facility</b>	Columbia River Fisheries Program Office	<p><b>Accomplishment Summary</b></p> <p>Study design and work plans have been developed with Abernathy FTC (\$23,000 allocated to run genetic samples), NOAA Fisheries, Warm Springs Tribe, and Oregon Department of Fish and Wildlife. Sampling fish to describe their genetics has begun.</p> <p><b>Description</b></p> <p><b>The importance to the Resource:</b></p> <p>The project entails chartacterizing the life history characteristics and genetic make-up of hatchery and wild ESA listed steelhead trout populations in the Deschutes River, Oregon to assist with recovery planning.</p> <p><b>The problem:</b></p> <p>Lack of genetic information on steelhead could hinder recovery.</p> <p><b>The objective:</b></p> <p>The objective of the study is to determine the population structure and genetic characteristics of hatchery and wild fish, and also determine the origin of stray hatchery steelhead based on their genetics.</p> <p><b>The method:</b></p> <p>Juvenile and adult fish were sampled at multiple locations throughout the Deschutes River, Oregon. Small tissue samples (partial fin clips) were collected and analyzed for genetic DNA markers.</p> <p><b>Further description:</b></p> <p>Study design, planning, equipment and supplies purchase occurred in FY 04. Sample</p>
<b>Expended</b>	\$56407	
<b>Objective</b>	Utilize appropriate scientific and technologic tools in formulating and executing fishery management plans and policies.	
<b>Primary Benefited Species</b>	Rainbow trout ( <a href="#">Oncorhynchus mykiss</a> )	
<b>Primary Benefited Population</b>	Not specified	
<b>Plans</b>	<p>1999 NMFS Biological Opinion on Artificial Propagation in the Columbia River Basin.</p> <p>Warm Springs Hatchery and Genetic Management Plan (draft)</p> <p>2000 NMFS FCRPS Biological Opinion - December 21, 2000</p>	
<b>Keyword</b>	Genetics	
<b>Need Number</b>	N-002	
<b>Partners</b>	<p>Abernathy Fish Technology Center</p> <p>Confederated Tribes of The Warm Springs</p> <p>National Marine Fisheries Service</p> <p>Oregon Department of Fish and Wildlife (\$3000)</p> <p>Portland General Electric (\$3000)</p>	

**Accomplishments**

Number of other Recovery Plan tasks implemented for T&E populations	2
Number of applied science and technology tasks implemented as prescribed by Recovery Plans. (PART)	1

collection began in FY 05. Abernathy Fish Technology Center began processing genetic samples in FY06. This project will lead to hatchery reform and habitat protection to better maintain the wild fish population traits in the Deschutes River. This project will assist the Technical Recovery Teams.



**13310-A-208 - [Monitoring the Use of the Mainstem Columbia River by Bull Trout from the Walla Walla River Subbasin](#)**

<b>Facility</b>	Columbia River Fisheries Program Office	<p><b>Accomplishment Summary</b></p> <p>A remote PIT tag detection array was operated in the lower Walla Walla River to monitor the passage of bull trout between the Walla Walla and Columbia Rivers. An incidental advantage of the installation is the detection of Chinook and steelhead to benefit state and tribal fisheries programs.</p> <p><b>Description</b></p> <p><b>The importance to the Resource:</b></p> <p>Bull trout historically used the mainstem Columbia and Snake rivers as part of their life cycle and they are currently listed as a threatened species.</p> <p><b>The problem:</b></p> <p>Passage in the lower Walla Walla and the presence of hydropower dams in the Columbia may be restricting bull trout movement and limiting progress towards recovery.</p> <p><b>The objective:</b></p> <p>This project is designed to help determine use of mainstem Columbia River habitat by bull trout, consistent with the USFWS 2000 FCRPS Biological Opinion.</p> <p><b>The method:</b></p> <p>A multi-agency effort by the USFWS, Forest Service, and Utah State University has tagged more than 2,000 bull trout with PIT tags in the basin. The installation of the PIT array at Oasis Road Bridge will monitor movement of PIT tagged bull trout between the Walla Walla and Columbia Rivers.</p>
<b>Expended</b>	\$0	
<b>Objective</b>	Utilize appropriate scientific and technologic tools in formulating and executing fishery management plans and policies.	
<b>Primary Benefited Species</b>	Bull trout ( <a href="#">Salvelinus confluentus</a> )	
<b>Primary Benefited Population</b>	<a href="#">Walla Walla River core area Bull Trout</a>	
<b>Plans</b>	2000 FWS Biological Opinion - Effects to Listed Species from Operations of the Federal Columbia River Power System Bull Trout Draft Recovery Plan, Chapter 10	
<b>Keyword</b>	Monitoring and Assessment	
<b>Need Number</b>	N-002	
<b>Partners</b>	U.S. Army Corps of Engineers (\$86031) Umatilla Tribe Walla Walla Basin Watershed Council Washington Department of Fish and Wildlife	
<b>Accomplishments</b>		

<div> <div>Number of other Recovery Plan tasks implemented for T&amp;E populations</div> <div>4</div> </div>	<p><b>Further description:</b></p> <p>This detection site will also continue to provide data on Chinook and steelhead that are important to state and tribal fisheries management programs.</p>
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**13310-A-209 - Develop Geographic Information System Program for staff & provide analytical support and training.**

<b>Facility</b>	Columbia River Fisheries Program Office
<b>Expended</b>	\$110000
<b>Objective</b>	Utilize appropriate scientific and technologic tools in formulating and executing fishery management plans and policies.
<b>Primary Benefited Species</b>	Chinook salmon or king salmon ( <a href="#"><i>Oncorhynchus tshawytscha</i></a> )
<b>Primary Benefited Population</b>	Not specified
<b>Plans</b>	Columbia River Basin Fish and Wildlife Program (NPPC 2000) Bull Trout Draft Recovery Plan, Chapter 10 Bull Trout Recovery Plan (Draft)
<b>Keyword</b>	Monitoring and Assessment
<b>Need Number</b>	N-002
<b>Partners</b>	

### Accomplishments

Number of habitat assessments completed	2.0
Number of miles of in-stream habitat assessed	59.0
Number of other Recovery Plan tasks implemented for T&E populations	5
Number of other Fishery Management	2

### Accomplishment Summary

Acquired GIS analyst who planned, developed, and is implementing our GIS program and capabilities to assess aquatic habitat for resident and anadromous fish in the Columbia River basin. Training was provided to staff on using software for analysis and display. GIS layers were developed for hydrologic modeling and a fall Chinook spawning habitat assessment in the Hanford Reach of the Columbia R. GIS layers were developed for a bull trout spawning habitat assessment and multi-basin patch analysis.

### Description

#### **The importance to the Resource:**

GIS analysis has become critical for resource assessments due to the ability to perform complex spatial and statistical analyses. Spatial problem solving produces more realistic, understandable solutions since most problems are spatially oriented. Adequate GIS capabilities are critical for recovery planning and developing conservation strategies.

#### **The problem:**

Complex spatial and statistical analyses and queries are not possible without a fully functioning GIS program. Analytical products are difficult to understand in numeric and text formats. Easy to understand maps that depict results of analyses are not available. Recovery planning is more difficult and less intuitive without GIS capabilities.

#### **The objective:**

The objective of the project is to obtain a GIS analyst (FTE) and the necessary hardware,

Plan tasks implemented for populations of management concern.		1	<p>software, and field equipment to work towards implementation of an enterprise GIS program along with the ability to conduct spatially oriented field work that will be compatible with, and benefit from analytical and display capabilities of the program.</p> <p><b>The <i>method</i>:</b></p> <p>A GIS analyst with the necessary skills will develop and implement the program and provide analytical assistance and training. Hardware (e.g. servers, plotters) and software (e.g. ARCGis) will be acquired that will enable GIS assessments and analyses. Field equipment (e.g. GPS) will be acquired that will enable spatially oriented data collection.</p> <p><b>Further description:</b></p> <p>Advanced GIS analysis has become a requirement for many CRFPO resource assessment activities due to the ability to perform complex spatial and statistical analyses that were not previously feasible. Spatial problem solving produces more realistic on-the-ground solutions since most problems are spatially distributed. Our GIS capabilities will be better able to adequately provide technical support for recovery plans and multi-state conservation strategies such as those for bull trout, cutthroat trout, and Pacific lamprey. Hardware, software, and field equipment need to be acquired to complete development of our comprehensive, integrated GIS program. Because of the diverse nature of the CRFPO and the strong spatial orientation of its work, a functional GIS with appropriate equipment will provide essential information for many products currently required by the agency. Developed GIS layers for building a hydrologic model in the Hanford Reach of the Columbia River. Developed GIS layers for assessing spawning habitat suitability of fall chinook salmon in the Hanford Reach. Developed GIS</p>
Number of applied science and technology tasks implemented as prescribed by Fishery Management Plans. (PART)			

	layers for assessing spawning habitat suitability of bull trout in the South Fork of the Walla Walla River, Oregon
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13310-A-213 - [Lamprey Population Structure](#)

<b>Facility</b>	Columbia River Fisheries Program Office	<p><b>Accomplishment Summary</b></p> <p>Collected western brook lamprey and contracted with GIS to isolate 20 microsatellite DNA markers</p> <p><b>Description</b></p> <p><b>The <i>importance</i> to the Resource:</b></p> <p>The USFWS was recently petitioned to list four species of lamprey. One of the biggest uncertainties regarding lamprey, and a significant reason the petition was denied, revolved around a poor understanding of lamprey population structure.</p> <p><b>The <i>problem</i>:</b></p> <p>Pacific lamprey (PCL) and western brook lamprey (WBL) are the two focal species of lamprey in the Pacific Northwest. These species exhibit very different life histories, PCL are anadromous whereas WBL are freshwater residents. Almost no research has been conducted on WBL and their population structure but it is essential to prevent listing.</p> <p><b>The <i>objective</i>:</b></p> <p>Given that WBL are resident species and presumed to migrate very little, the hypothesis is that WBL populations are finely structured and will show very little mixing. If this is the case, management scenarios may need to be very different for these two species. This project is designed to increase our knowledge of lamprey population structure.</p> <p><b>The <i>method</i>:</b></p> <p>Fin clips were collected from WBL adults and sent to Genetic Identification Services for the development of microsatellite markers and</p>
<b>Expended</b>	\$10500	
<b>Objective</b>	Develop and share applied aquatic scientific and technologic tools with partners.	
<b>Primary Benefited Species</b>	Western brook lamprey ( <a href="#">Lampetra richardsoni</a> )	
<b>Primary Benefited Population</b>	Not specified	
<b>Plans</b>	<p>Lower Columbia Salmon Recovery and Fish &amp; Wildlife Subbasin Plan: Volume II, Chapter G – Lewis Subbasin - 2004</p> <p>Columbia River Basin Fish and Wildlife Program (NPPC 2000)</p> <p>Critical Uncertainties for Lamprey in the Columbia River Basin: Results from a strategic planning retreat of the Columbia River Lamprey Technical Workgroup 2005</p>	
<b>Keyword</b>	Genetics	
<b>Need Number</b>	N-002	
<b>Partners</b>	<p>Great Lakes Institute for Environmental Research</p> <p>Margaret Docker</p> <p>University of Manitoba</p>	
<b>Accomplishments</b>		

Number of population assessments completed	10	<p>custom primers. These tools are still being fine tuned and will be used for analyzing population structure of WBL.</p> <p><b>Further description:</b></p> <p>Although little research has been done on any native lamprey in the Northwest, what has been done has focused on PCL. This research includes work on the population structure of PCL, as inferred from genetic and behavioral analyses, and suggests that PCL populations are coarsely (if at all) structured and exhibit a large amount of mixing. Population structure for both species, Pacific and Western brook, are outlined as critical uncertainties by the Columbia River Basin Lamprey Technical Workgroup.</p>
Number of other Fishery Management Plan tasks implemented for populations of management concern.	3	
Number of applied aquatic scientific and technologic tools shared with partners.	1	
Number of techniques and culture technology tools developed.	1	

**13310-A-215 - Simulated Natural Rearing (NATURES) Environments compared to standard hatchery ponds.**

<b>Facility</b>	Columbia River Fisheries Program Office
<b>Expended</b>	\$10913
<b>Objective</b>	Develop and share applied aquatic scientific and technologic tools with partners.
<b>Primary Benefited Species</b>	Chinook salmon or king salmon ( <a href="#">Oncorhynchus tshawytscha</a> )
<b>Primary Benefited Population</b>	<a href="#">Warm Springs hatchery spring chinook</a>
<b>Plans</b>	Warm Springs Hatchery and Genetic Management Plan (draft) 1999 NMFS Biological Opinion on Artificial Propagation in the Columbia River Basin.
<b>Keyword</b>	Fish Technology
<b>Need Number</b>	N-002
<b>Partners</b>	Abernathy Fish Technology Center Confederated Tribes of The Warm Springs Lower Columbia River Fish Health Center Warm Springs National Fish Hatchery

### Accomplishments

Recovery Plan production tasks implemented (PART)	1
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### Accomplishment Summary

Hatchery reform to increase health and survival rates of hatchery fish by mimicking conditions in the natural environment.

### Description

**The *importance* to the Resource:**

Warm Springs National Fish Hatchery, Oregon will serve as the pilot facility for this evaluation. This hatchery produces and releases fish native to its watershed and strives to maintain characteristics of the native stocks in both the hatchery and stream environment.

**The *problem*:**

Survival of hatchery fish is lower than wild fish, once the hatchery fish are released into the stream, from the smolt to adult phase.

**The *objective*:**

NATURES rearing seeks to improve survival of hatchery stocks and minimize impacts on imperiled wild stocks.

**The *method*:**

This project will investigate the performance of fish reared in simulated natural rearing (NATURES) environments compared to standard hatchery ponds. This project will develop features at the hatchery to simulate natural habitat found in streams, including shade, cover, instream structure, color, flow, and rearing density.

**Further description:**

The Columbia River Fisheries Program Office



Number of applied science and technology tasks implemented as prescribed by Recovery Plans. (PART)	1	will monitor juvenile fish in each treatment/control group and in streams to assess and compare performance; and develop techniques to measure performance including growth, survival, cryptic coloration, predator avoidance, foraging behavior, habitat utilization, and fish health.
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13310-A-222 - [Age Discrimination in Bull Trout](#)

<b>Facility</b>	Columbia River Fisheries Program Office
<b>Expended</b>	\$1
<b>Objective</b>	Develop and share applied aquatic scientific and technologic tools with partners.
<b>Primary Benefited Species</b>	Bull trout ( <a href="#">Salvelinus confluentus</a> )
<b>Primary Benefited Population</b>	Not specified
<b>Plans</b>	Bull Trout Recovery Plan (Draft) Bull Trout Draft Recovery Plan, Chapter 12
<b>Keyword</b>	Native Species
<b>Need Number</b>	N-002
<b>Partners</b>	Portland State University U.S. Geological Survey Utah State University

### Accomplishments

Number of population assessments completed	1
Number of other Recovery Plan tasks implemented for T&E populations	16

### Accomplishment Summary

Determine non-lethal methods to accurately measure the age of bull trout. This information will be used to better understand the population dynamics of bull trout. It is critical to assist recovery planning, implementation and monitoring, and will be used by local biologists to better manage bull trout populations. End of year FY05 funds were used to subcontract hard part age analysis. Results were received in FY06. A report will be produced in FY07.

### Description

**The *importance* to the Resource:**

Bull trout are listed as threatened in the coterminous United States. A Recovery Plan is being developed. Recovery of bull trout will depend, in large part, on assessing the status of bull trout populations. To assess adequately the status of bull trout it is necessary to determine the age structure of populations or metapopulations.

**The *problem*:**

Bull trout status assessments and recovery planning rely on the age structure of populations. It is important to know, for example, how old fish must be to reproduce. Bull trout scales are very difficult to read and age is primarily inferred from the size of fish. Errors in age are significant and impact our ability to assess populations.

**The *objective*:**

CRFPO is conducting a study with bull trout to compare the accuracy of various aging techniques and to determine whether fin rays may be collected non-lethally.

	<p><b>The <i>method</i>:</b></p> <p>See additional information below.</p> <p><b>Further description:</b></p> <p>The age of most salmonids has been determined using a variety of methods. Scales may be collected non-lethally, analyzed relatively inexpensively, and for many salmonids provide sufficiently accurate age information. However, bull trout are a member of the charr family (<i>Salvelinus</i> spp.). Scale analysis of charr often provide relatively inaccurate age information. Fin rays may be used to determine the age of bull trout, may possibly be collected non-lethally, and are only moderately expensive to analyze. Otolith analysis provides very accurate age information but otoliths are collected through lethal sampling and analysis is relatively expensive.</p>
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**13280-A-016 - [Stream Nutrient Enrichment Program](#)**

<b>Facility</b>	Eagle Creek National Fish Hatchery
<b>Expended</b>	\$10693
<b>Objective</b>	Develop and share applied aquatic scientific and technologic tools with partners.
<b>Primary Benefited Species</b>	Chinook salmon or king salmon ( <a href="#">Oncorhynchus tshawytscha</a> )
<b>Primary Benefited Population</b>	<a href="#">Clackamas River Spring Chinook</a>
<b>Plans</b>	Eagle Creek NFH Coho Salmon Hatchery and Genetic Management Plan
<b>Keyword</b>	Habitat
<b>Need Number</b>	N-002
<b>Partners</b>	Bureau of Land Management Oregon Department of Fish & Wildlife U. S. Forest Service

### Accomplishments

Number of applied aquatic scientific and technologic tools shared with partners.	1
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### Accomplishment Summary

Coho salmon carcasses were provided for stream nutrient supplementation.

### Description

**Further description:**

In cooperation with the U. S. Forest Service, Oregon Department of Fish and Wildlife and the US Bureau of Land Management, 6,096 coho salmon carcasses were supplied for stream nutrient supplementation in the upper Clackamas River and other streams. The salmon, from spawning operations and surplus to hatchery needs, were killed and put into refrigerated vans for the U.S. Forest Service or frozen for later use. Some carcasses were frozen and utilized by Oregon Department of Fish & Wildlife and Bureau of Reclamation. The cooperating agencies assisted by Salmon Corps staff picked up the frozen carcasses and distributed them in streams in the Willamette River and Sandy River basins. These carcasses will provide a needed nutrient base to natural spawning Chinook, coho, steelhead and cutthroat trout populations in addition to many other species of animals which are part of the ecosystem. The carcasses received by the U.S. Forest Service were distributed via helicopter drop to inaccessible areas of the Clackamas River.

**14226-A-121 - [Visitor Out reach](#)**

<b>Facility</b>	Idaho Fish Health Center	<b>Accomplishment Summary</b>  Provide opportunity for volunteers to get field experience and learn something about fish health  <b>Description</b>  <b>Further description:</b>  We have volunteers work during the summer, primarily, to assist with field work and laboratory work. These volunteers are often students but also have been members of the community who want a different experience.
<b>Expended</b>	\$2000	
<b>Objective</b>	Provide support to States, Tribes, and other partners to identify and meet shared or complementary recreational fishing and aquatic education and outreach objectives.	
<b>Primary Benefited Species</b>	Rainbow trout ( <a href="#">Oncorhynchus mykiss</a> )	
<b>Primary Benefited Population</b>	<a href="#">North Fork Clearwater River</a>	
<b>Plans</b>	National Wild Fish Health Survey U. S. vs OR Columbia River Fishery Management Plan (under renegotiation) U.S. Fish and Wildlife Service National Aquatic Animal Health Policy	
<b>Keyword</b>	Fish Health	
<b>Need Number</b>	N-002	
<b>Partners</b>		

14330-A-002 - [Salmon Supplementation Studies in Idaho Rivers \(ISS\)](#)

<b>Facility</b>	Idaho Fisheries Resource Office
<b>Expended</b>	\$97000
<b>Objective</b>	Develop and share applied aquatic scientific and technologic tools with partners.
<b>Primary Benefited Species</b>	Chinook salmon or king salmon ( <a href="#">Oncorhynchus tshawytscha</a> )
<b>Primary Benefited Population</b>	<a href="#">South Fork Clearwater River</a>
<b>Plans</b>	Supplementation Studies in Idaho Rivers (ISS) (Bowles and Leitzinger 1991)
<b>Keyword</b>	Monitoring and Assessment
<b>Need Number</b>	N-002
<b>Partners</b>	Bonneville Power Administration Idaho Department of Fish and Game Nez Perce Tribe Shoshone-Bannock Tribe

## Accomplishments

Number of population assessments completed	1
Number of other Fishery Management Plan tasks implemented for populations of management concern.	2
Number of consultations conducted to support Tribal fish & wildlife conservation.	1

## Accomplishment Summary

We continued to collect and PIT-tag naturally produced smolts in Clear Creek. We snorkel surveyed Clear and Pete King creeks, and estimated parr abundance. Escapement and natural spawning were documented on Clear and Pete King creeks. Adult Chinook salmon continued to be passed above the KNFH weir to meet natural production recruitment goals for Clear Creek. With help from our cooperators, the BY03 Cooperative Report was completed.

## Description

### The *importance* to the Resource:

This project develops recommendations on how to restore or rebuild naturally spawning populations of spring/summer Chinook in Idaho.

### The *problem*:

Spring/summer Chinook populations in Idaho have been in decline due to mortality associated with the lower Snake River and Columbia River dams and reservoirs.

### The *objective*:

The objective of this project is to assess the use of hatchery Chinook to restore or augment naturally spawning spring/summer Chinook populations in Idaho. Also, this project will evaluate the effects of supplementation on the survival and fitness of existing natural populations.

### The *method*:

Streams will be supplemented with hatchery origin spring/summer Chinook for 1 to 2

Number of applied aquatic scientific and technologic tools shared with partners.	1	<p>generations. Experimental treatments will include supplementation with a particular life stage and/or a particular brood source.</p> <p>Population responses (i.e. parr abundance, emigration, survival, and adult escapement) will be measured.</p>
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14330-A-004 - [Monitoring the spawning population of Snake River fall chinook salmon](#)

<b>Facility</b>	Idaho Fisheries Resource Office
<b>Expended</b>	\$41440
<b>Objective</b>	Recover fish and other aquatic resource populations protected under the Endangered Species Act.
<b>Primary Benefited Species</b>	Chinook salmon or king salmon ( <a href="#">Oncorhynchus tshawytscha</a> )
<b>Primary Benefited Population</b>	<a href="#">Snake River Fall Chinook Salmon</a>
<b>Plans</b>	2000 FWS Biological Opinion - Effects to Listed Species from Operations of the Federal Columbia River Power System
<b>Keyword</b>	Fish Technology
<b>Need Number</b>	N-002
<b>Partners</b>	Idaho Power Company Nez Perce Tribe

## Accomplishments

Number of other Recovery Plan tasks implemented for T&E populations	5
Number of consultations conducted to support Tribal fish & wildlife conservation.	1

## Accomplishment Summary

We monitored spawning in the Snake River by conducting nine aerial surveys and searching 18 deepwater spawning areas using submersible cameras. A total of 2,127 redds were counted, and the data were distributed to cooperators.

## Description

### The *importance* to the Resource:

This project provides spawning distribution data used to determine if recovery thresholds are reached, if spawners are in peril (e.g., redd de-watering), and if the goals of management actions are realized (e.g., supplementing in river reaches).

### The *problem*:

Sneke River fall Chinook salmon are listed as a Threatened Species. Spawning surveys are needed to assess their status.

### The *objective*:

The objective of this project is to document the spawning distribution of fall Chinook salmon in a 100 mile reach of the Snake River in Hells Canyon. While working with our partners, all redd-count data collected in the Snake River basin are compiled and disseminated in a summary report prepared by staff at the Idaho Fishery Resource Office.

### The *method*:

The study reach is surveyed from a helicopter weekly, between mid-October and mid-December. In November and December, submersible cameras are used to locate redds in waters that are too deep to be effectively



	searched from the air. Effort to search deep-water areas is shared with our partners due to the large numbers of potential spawning sites.
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14330-A-006 - [Comparative survival study of hatchery PIT tagged Chinook](#)

Facility	Idaho Fisheries Resource Office
Expended	\$5758
Objective	Support, facilitate, and/or lead collaborative approaches to manage interjurisdictional fisheries.
Primary Benefited Species	Chinook salmon or king salmon ( <a href="#">Oncorhynchus tshawytscha</a> )
Primary Benefited Population	<a href="#">Clearwater River Lower Mainstem Tributaries</a>
Plans	2000 NMFS FCRPS Biological Opinion - December 21, 2000 Columbia River Basin Fish and Wildlife Program (NPPC 2000)
Keyword	Fish Passage
Need Number	N-002
Partners	Bonneville Power Administration Fish Passage Center Idaho Department of Fish and Game

Accomplishments

Number of other Recovery Plan tasks implemented for T&E populations	1
Number of applied science and technology tasks implemented as prescribed by Fishery Management Plans. (PART)	2

Accomplishment Summary

We released 52,895 PIT-tagged spring Chinook salmon on March 27 and 29, 2006 into the North Fork Clearwater River. The average juvenile detection at Lower Granite Dam was 16.1%. The average migration time was 32.3 days. We collected 30 PIT-tagged adult spring Chinook salmon in the Dworshak NFH ladder. The ocean age class composition of the returning adults was 1 I-salt, 24 II-ocean and 5 III-ocean.

Description

The importance to the Resource:

Large numbers of wild and hatchery fish are transported from Snake and Columbia river dams annually. The impacts of the transportation program are not fully known or evaluated. There is both direct and delayed mortality associated with transportation and a full evaluation of these impacts are critical to salmon recovery throughout the basin.

The problem:

The problem is obtaining definitive data that completely evaluates fish transportation from Snake and Columbia river dams. A large scale study that encompasses many hatcheries in the basin is difficult to fund and conduct in order to develop the long-term data set needed to truly answer the question.

The objective:

The objectives are to develop a long-term index of transport and in-river survival rates for Snake River wild and hatchery spring Chinook salmon, to develop a long-term index of survival rates from release to return, and to compare overall survival rates for upriver and

	<p>downriver spring/summer Chinook hatchery and wild populations.</p> <p><b>The <i>method</i>:</b></p> <p>Thee CSS program PIT tags large numbers of spring and summer Chinook at most major hatcheries in the basin and estimates survival rates over different life stages and transported versus non-transported fish in this multi-year study.</p>
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**14330-A-012 - [Technical Review of Fishery Documents](#)**

<b>Facility</b>	Idaho Fisheries Resource Office
<b>Expended</b>	\$30000
<b>Objective</b>	Utilize appropriate scientific and technologic tools in formulating and executing fishery management plans and policies.
<b>Primary Benefited Species</b>	(0) Can Not Assign
<b>Primary Benefited Population</b>	Not specified
<b>Plans</b>	Columbia River Basin Fish and Wildlife Program (NPPC 2000)
<b>Keyword</b>	Fish Technology
<b>Need Number</b>	N-002
<b>Partners</b>	

**Accomplishments**

Number of other Fishery Management Plan tasks implemented for populations of management concern.

2

**Accomplishment Summary**

IFRO staff improved the technical accuracy and ensured sound science was applied in technical papers pertaining to fisheries management by completing peer reviews on approximately 30 fishery documents in FY2006.

**Description****The *importance* to the Resource:**

This project provides current, accurate, and correct data, information, and analysis to support decisions made by Fishery managers in the Snake and Columbia river basins.

**The *problem*:**

Reports and plans that are not reviewed for accuracy, complete analysis, and supported conclusions may lead to incorrect decisions and potential mis-management of fishery resources.

**The *objective*:**

The objective is to provide unbiased reviews and ensure that documents are technically accurate and based on sound scientific principles.

**The *method*:**

We will provide technical reviews and comments on documents produced by this office or from outside requests on documents such as; Biological Assessments, Biological Opinions, Technical Reports, Management Plans, Conservation Plans, Research Proposals, manuscripts submitted for publication to scientific journals, etc...

14330-A-036 - [Updated Review on Bull Trout Assessments and Radio-telemetry Studies](#)

<b>Facility</b>	Idaho Fisheries Resource Office
<b>Expended</b>	\$50000
<b>Objective</b>	Recover fish and other aquatic resource populations protected under the Endangered Species Act.
<b>Primary Benefited Species</b>	Bull trout ( <a href="#">Salvelinus confluentus</a> )
<b>Primary Benefited Population</b>	Not specified
<b>Plans</b>	Bull Trout Recovery Plan, Ch 18 Southwest Idaho RU Bull Trout Recovery Plan, Ch 16 Clearwater RU
<b>Keyword</b>	Recovery
<b>Need Number</b>	N-002
<b>Partners</b>	Boise State University (\$15000) U.S. Bureau of Reclamation (\$32000)

## Accomplishments

Number of habitat assessments completed	1.0
Number of other Recovery Plan tasks implemented for T&E populations	1
Number of applied aquatic scientific and technologic tools shared with partners.	1
Number of applied science and technology tasks implemented as prescribed by Recovery Plans. (PART)	1

## Accomplishment Summary

Data from three different studies was synthesized and analyzed. The November 2006 final report will include a discussion of the case studies, data collection and analysis, as well as the types of questions we have asked in the past, how these data have been used, and what types of questions we can ask given the data we have collected. The report will culminate in some guidelines for conducting future studies grounded in the question of interest. All monies have been expended.

## Description

### The *problem*:

Much data on bull trout has been collected since previous reviews were done. In particular, many studies involving radio telemetry that help characterize life history, movements and habitat preferences have been conducted. Analysis and review beyond individual studies or watersheds has not been done.

### The *objective*:

Assimilate and synthesize the existing data regarding bull trout habitat use and movement into a database and several peer-reviewed articles, which will fill a void in the literature associated with broad-scale questions of bull trout biology and ecology.

### The *method*:

Survey biologists conducting bull trout radio telemetry studies over the range of the species, update what is known about bull trout and make it readily available for managers and recovery planning.

**13231-A-007 - [National Wild Fish Health Survey](#)**

<b>Facility</b>	Lower Columbia River Fish Health Center	<b>Accomplishment Summary</b>  <p>Surveyed over 1500 wild fish from 21 watersheds in WA, OR, ID and the Columbia River to evaluate disease and to prevent spread of aquatic pathogens for improved aquatic ecosystem management.</p> <b>Description</b>  <p><b>The <i>importance</i> to the Resource:</b></p> <p>Initiated by Congress in 1997 because wild fish populations were being decimated by disease, the National Wild Fish Survey gathers health information for wild fish to ascertain the extent of disease problems and ways to manage disease in the wild.</p> <p><b>The <i>problem</i>:</b></p> <p>Disease disables and kills wild fish. A limited knowledge of disease sources and their environmental inducers inhibits better management of habitat problems for wild fish.</p> <p><b>The <i>objective</i>:</b></p> <p>The 9 National Fish Health Ctrs undertook this project to survey the health of wild fish and to make this information available to federal, state, and tribal fishery managers. Information is used to improve fisheries management and monitor specific populations. The national database (<a href="http://wildfishsurvey@fws.gov">http://wildfishsurvey@fws.gov</a>) is available for public use.</p> <p><b>The <i>method</i>:</b></p> <p>In FY06, the Lower Columbia River FHC examined over 1500 wild fish from 21 watersheds in WA, OR, ID and the Columbia River. We tested for 13 pathogens (virus, bacteria, parasites) using state-of-the-art</p>
<b>Expended</b>	\$64977	
<b>Objective</b>	Facilitate management of aquatic habitats on national and regional scales.	
<b>Primary Benefited Species</b>	Rainbow trout ( <a href="#">Oncorhynchus mykiss</a> )	
<b>Primary Benefited Population</b>	<a href="#">Wind River summer run steelhead</a>	
<b>Plans</b>	<p>National Wild Fish Health Survey</p> <p>U.S. Fish and Wildlife Service National Aquatic Animal Health Policy</p> <p>Conservation of Columbia Basin Fish, Final Basinwide Salmon Recovery Strategy, 12/2000 (All H Paper)</p> <p>1999 NMFS Biological Opinion on Artificial Propagation in the Columbia River Basin.</p> <p>2000 NMFS FCRPS Biological Opinion - December 21, 2000</p> <p>Yakima Subbasin Plan</p>	
<b>Keyword</b>	Fish Health	
<b>Need Number</b>	N-002	
<b>Partners</b>	<p>Confederated Tribes of The Warm Springs</p> <p>Oregon Department of Fish and Wildlife</p> <p>U.S. Geological Survey</p>	

	(\$5000) Washington Department of Fish and Wildlife Yakama Indian Nation (\$900)	<p>technology to confirm presence/absence of disease in freshwater and seagoing fish.</p> <p><b>Further description:</b></p> <p>The National Wild Fish Health Survey was initiated by Congress in 1997 because wild fish populations were being decimated by disease and there was little information available on the extent of the problem and ways to manage disease in the wild. The 9 National Fish Health Ctrs undertook this project to survey the health of wild fish and to make this information available to federal, state, and tribal fishery managers. This year, the Lower Columbia River Fish Health Ctr, in cooperation with the Yakama Nation, extensively sampled over 10 fish species in Drano Lake, a popular fishing lake that also serves as nursery habitat for Chinook salmon, a resting area for salmonid adults migrating up the Columbia River and the inlet/outlet for the Little White Salmon Hatchery fish. In anticipation of Condit Dam removal, fish in the White Salmon River were sampled for future health comparisons. Information from the wild fish health surveys are used by state/federal agencies for Ecosystem Diagnosis models for improving aquatic resource management and by the various cooperators for monitoring specific populations of fish. The national database, a repository of all survey information, is available for managerial and public use.</p>
<b>Accomplishments</b>		
Number of population assessments completed	21	
Number of post-stocking survival tasks met, as prescribed by Recovery plans for hatchery propagated listed species. (PART)	1	
Number of other Recovery Plan tasks implemented for T&E populations	1	
Number of post stocking survival tasks met as prescribed by Fishery Management Plans, for hatchery propagated depleted species (PART)	1	
Number of other Fishery Management Plan tasks implemented for populations of management concern.	1	
Number of technical assistance requests fulfilled to support Tribal fish and wildlife conservation	3	
Number of applied aquatic scientific and technologic tools shared with partners.	1	
Number of techniques and culture technology tools developed.	1	
Number of applied science and technology tasks implemented as prescribed by Recovery Plans. (PART)	1	
Number of applied science and technology tasks implemented as prescribed by Fishery Management Plans. (PART)	2	

**13231-A-012 - [Ecological Interactions of Wild and Hatchery Fish in the Warm Springs and Deschutes River System](#)**

<b>Facility</b>	Lower Columbia River Fish Health Center	<p><b>Accomplishment Summary</b></p> <p>Measured health of wild Chinook salmon and other native fish from the Warm Springs River and Shitike Creek. Fish health testing shows that wild and hatchery salmon carry the same pathogens, an indication of their identical genetic origins, similar ocean destinations and food sources. Additional field sampling and testing of other native species is ongoing. DNA technology is used for disease detection and to prevent the spread of microbial aquatic nuisance species that cause disease.</p> <p><b>Description</b></p> <p><b>The <i>importance</i> to the Resource:</b></p> <p>The Warm Springs National Hatchery annually releases 750,000 fish into the Deschutes River system which contains wild Chinook salmon, steelhead and endangered bull trout. It is important to ensure that both the wild and hatchery fish cohabit without adverse consequences, a goal of the Confederated Tribes of the Warm Springs.</p> <p><b>The <i>problem</i>:</b></p> <p>Interactions of wild and hatchery fish can result in disease transmission.</p> <p><b>The <i>objective</i>:</b></p> <p>To increase fish survival and to prevent disease transmission between hatchery and wild fish. While the common myth states that hatchery fish transmit disease to wild fish, the converse can be true and pathogens of native fish may be transmitted through the river water to the captive hatchery fish. This study examines both hatchery and wild fish</p>
<b>Expended</b>	\$9731	
<b>Objective</b>	Facilitate management of aquatic habitats on national and regional scales.	
<b>Primary Benefited Species</b>	Bull trout ( <a href="#">Salvelinus confluentus</a> )	
<b>Primary Benefited Population</b>	<a href="#">Lower Deschutes River core area Bull Trout</a>	
<b>Plans</b>	<p>U.S. Fish and Wildlife Service National Aquatic Animal Health Policy</p> <p>National Wild Fish Health Survey</p> <p>Warm Springs Hatchery and Genetic Management Plan (draft)</p> <p>1999 NMFS Biological Opinion on Artificial Propagation in the Columbia River Basin.</p> <p>2000 NMFS FCRPS Biological Opinion - December 21, 2000</p> <p>Conservation of Columbia Basin Fish, Final Basinwide Salmon Recovery Strategy, 12/2000 (All H Paper)</p>	
<b>Keyword</b>	Fish Health	
<b>Need Number</b>	N-002	
<b>Partners</b>	Confederated Tribes of The Warm Springs	



U.S. Geological  
Survey, Columbia River  
Research Lab

## Accomplishments

Number of population assessments completed	2
Number of post-stocking survival tasks met, as prescribed by Recovery plans for hatchery propagated listed species. (PART)	1
Number of other Recovery Plan tasks implemented for T&E populations	3
Number of post stocking survival tasks met as prescribed by Fishery Management Plans, for hatchery propagated depleted species (PART)	1
Number of other Fishery Management Plan tasks implemented for populations of management concern.	1
Number of technical assistance requests fulfilled to support Tribal fish and wildlife conservation	2
Number of consultations conducted to support Tribal fish & wildlife conservation.	1
Number of techniques and culture technology tools developed.	1
Number of applied science and technology tasks implemented as prescribed by Recovery Plans. (PART)	1
Number of applied science and technology tasks implemented as prescribed by Fishery Management Plans. (PART)	3

### The *method*:

Since the inception of the hatchery, its fish have been subjected to intensive health exams and management by the Lower Columbia River Fish Health Ctr. To address issues of disease transmission between hatchery and wild fish in FY06, wild fish were examined for disease pathogens using DNA technology and standard methodology.

### Further description:

Interactions of wild and hatchery fish can result in disease transmission. The Warm Springs National Hatchery annually releases 750,000 fish into the Deschutes River system which contains wild Chinook salmon, steelhead and endangered bull trout. Since the inception of the hatchery, its fish have been subjected to intensive health exams and management by the Lower Columbia River Fish Health Ctr. This is to increase fish survival and to prevent disease transmission to the wild fish. Conversely, the pathogens of native fish can be transmitted through the river water to the captive hatchery fish. To address issues of disease transmission between hatchery and wild fish in FY06, wild fish were examined for disease pathogens. Clinical testing shows that wild and hatchery salmon carry the same pathogens, an indication of their identical genetic origins, similar ocean destinations and food sources. Additional field sampling and testing of other native species is ongoing. DNA technology is used for disease detection and to prevent the spread of microbial aquatic nuisance species that cause disease. This technology is also being tested to determine whether non-lethal sampling methods can be used to detect infections. FONS# 2000-003.

13231-A-013 - [Outreach for the Lower Columbia River Fish Health Center and Gorge Hatcheries](#)

<b>Facility</b>	Lower Columbia River Fish Health Center	<p><b>Accomplishment Summary</b></p> <p>Educated students, interagency personnel and the public on fish health issues through classes, tours, website and services of Information/Education officer.</p> <p><b>Description</b></p> <p><b>The importance to the Resource:</b></p> <p>The Lower Columbia River Fish Health Center (FHC) helps educate the public, students and agency folks about fish issues and the environment through classes, tours of the lab, public talks and a website.</p> <p><b>The problem:</b></p> <p>Public awareness and knowledge of the nation's aquatic resources remains a challenge to the USFWS and other agencies.</p> <p><b>The objective:</b></p> <p>The USFWS takes great care to ensure that the fish reared at their hatcheries are healthy and the Fish Health Center is responsible for overseeing this issue, and helps promote this to the public.</p> <p><b>The method:</b></p> <p>The FHC, along with the Gorge Hatchery's Information and Education Officer, work with students and public. Students are instructed in the techniques of necropsy, bacteriology, virology, parasitology and DNA technology. Center personnel also demonstrate fish health techniques and fish biology to high school students here and at the hatcheries.</p> <p><b>Further description:</b></p>
<b>Expended</b>	\$13450	
<b>Objective</b>	Recognize and promote the value and importance of recreational fishery objectives in implementation of other Service responsibilities.	
<b>Primary Benefited Species</b>	Chinook salmon or king salmon ( <a href="#">Oncorhynchus tshawytscha</a> )	
<b>Primary Benefited Population</b>	<a href="#">White Salmon River fall run (tule) Chinook</a>	
<b>Plans</b>	Pacific Region Fisheries Outreach Action Plan	
<b>Keyword</b>	Outreach	
<b>Need Number</b>	N-002	
<b>Partners</b>	<p>Confederated Tribes of The Warm Springs</p> <p>Mt. Hood Community College</p> <p>Oregon Department of Fish and Wildlife</p> <p>U. S. Forest Service</p> <p>U.S. Geological Survey, Columbia River Research Lab</p> <p>Washington Department of Fish and Wildlife</p> <p>Yakama Indian Nation</p>	
<b>Accomplishments</b>		

Number of other Fishery Management Plan tasks implemented for populations of management concern.	5	<p>The Lower Columbia River Fish Health Center helps educate the public, students and agency folks about fish issues and the environment through classes, tours of the lab, public talks and a website. The USFWS takes great care to ensure that the fish reared at their hatcheries are healthy and the Fish Health Center is responsible for overseeing this issue, and helps promote this to the public. Yearly, students from the Fishery Internship at Mt. Hood Community College are instructed in the techniques of necropsy, bacteriology, virology, parasitology and DNA technology. Center personnel also demonstrate fish health techniques and fish biology to high school students here and at the hatcheries. Personnel help at Carson NFH Kid's Fishing Day to promote recreational fishing and stewardship of the environment. Outreach is achieved by the Center's personnel and through an Information and Education Officer who is shared with Spring Creek and Carson National Fish Hatcheries. And in FY05, a formal dedication and tour was held to celebrate the newly constructed facility designed for fish health technology. The public, USFWS personnel and retirees, the Assistant Director of Fish &amp; Habitat Conservation and others were in attendance.</p>
Number of visitors to service facilities.	200	
Number of aquatic outreach and education activities.	10	

13231-A-016 - [DNA Technology to Improve Hatchery Practices and Reduce Disease](#)

<b>Facility</b>	Lower Columbia River Fish Health Center
<b>Expended</b>	\$30471
<b>Objective</b>	Utilize appropriate scientific and technologic tools in formulating and executing fishery management plans and policies.
<b>Primary Benefited Species</b>	Chinook salmon or king salmon ( <a href="#">Oncorhynchus tshawytscha</a> )
<b>Primary Benefited Population</b>	<a href="#">Wild Warm Springs River Spring Chinook</a>
<b>Plans</b>	U.S. Fish and Wildlife Service National Aquatic Animal Health Policy Warm Springs Hatchery and Genetic Management Plan (draft) National Wild Fish Health Survey Conservation of Columbia Basin Fish, Final Basinwide Salmon Recovery Strategy, 12/2000 (All H Paper)
<b>Keyword</b>	Fish Technology
<b>Need Number</b>	N-002
<b>Partners</b>	Confederated Tribes of The Warm Springs

<b>Accomplishments</b>	
Number of other Recovery Plan tasks	4

<b>Accomplishment Summary</b>
New instrumentation allows rapid disease detection through analysis of DNA. This helps determine how to improve hatchery practices to reduce disease and save 1000's of fish.
<b>Description</b>
<b>The importance to the Resource:</b>
A new DNA technology called quantitative polymerase chain reaction (QPCR) can detect very low levels of disease in eggs, water and young fish. The QPCR instrumentation is used by the Lower Columbia River Fish Health Ctr. to help detect routes of disease, allowing hatcheries to improve or modify practices.
<b>The problem:</b>
Bacterial kidney disease kills thousands of salmon every year, resulting in expensive efforts to reduce this disease. The drug erythromycin is used to prevent this disease and improve survival but this has its risks and deducing where disease starts might reduce of this antibiotic.
<b>The objective:</b>
Track points of disease dissemination at the hatchery to ascertain how to best control disease so that antibiotic use can be reduced or eliminated.
<b>The method:</b>
The QPCR allows studies to determine routes of disease transmission. For instance, the Warms Springs NFH maintains the genetics and environmental integrity of the native wild salmon by identifying their fish with a tiny snout tag which may inadvertently cause localized

implemented for T&E populations		
Number of techniques and culture technology tools developed.	1	
Number of applied science and technology tasks implemented as prescribed by Recovery Plans. (PART)	1	
Number of applied science and technology tasks implemented as prescribed by Fishery Management Plans. (PART)	3	
		<p>infections.</p> <p><b>Further description:</b></p> <p>Bacterial kidney disease kills thousands of salmon every year, resulting in expensive efforts to reduce this disease. A new DNA technology called quantitative polymerase chain reaction (QPCR) can detect very low levels of disease in eggs, water and young fish, something not possible by the standard methodologies. The QPCR instrumentation is used by the Lower Columbia River Fish Health Ctr. to help detect routes of disease, allowing hatcheries to improve or modify practices. For instance, the Warms Springs NFH maintains the genetics and environmental integrity of the native wild salmon by identifying their fish with a tiny snout tag which may inadvertently cause localized infections. The QPCR will allow studies to determine whether this is a route of disease transmission. This is important as it could mean a reduction in use of erythromycin, a drug currently being used to prevent BKD which is a concern to the Confederated Tribes of the Warm Springs Reservation who help manage the hatchery. This is FONS project 13231-2002-008 funded by the Columbia Basin Salmon Initiative.</p>

13231-A-026 - [Habitat enhancement and fish carcasses: disease concerns](#)

<b>Facility</b>	Lower Columbia River Fish Health Center	<p><b>Accomplishment Summary</b></p> <p>Enriched aquatic habitats and prevented spread of disease to wild fish by developing simple treatments to kill ""germs"" in fish carcasses used for nutrient enhancement in streams. Results were immediately useable in the field to help in interagency efforts to revitalize aquatic habitats in a manner consistent with the Endangered Species Act and NMFS Biological Opinions</p> <p><b>Description</b></p> <p><b>The importance to the Resource:</b></p> <p>In the past, the nutrients supplied by salmon returning to their natal streams were a key component in the web of insects, mammals and plants that all played an intertwining role in fish survival. The lack of returning salmon has created streams barren of nutrients needed to provide habitat for wild fish survival.</p> <p><b>The problem:</b></p> <p>The lack of returning salmon has created streams barren of nutrients needed to provide habitat for wild fish survival. To combat these losses, tribal, state and federal entities are using hatchery salmon carcasses to resupply vital nutrients to streams. However, they may also be transmitting pathogenic "germs" that might infect native fish.</p> <p><b>The objective:</b></p> <p>Simple methods, easily adaptable for field use, were tested to ascertain their effectiveness in killing fish germs. Goal is to allow the use of fish carcasses to help replenish nutrients to streams without the risk of disease dissemination.</p>
<b>Expended</b>	\$11400	
<b>Objective</b>	Expand the use of Fisheries Program expertise to avoid, minimize, or mitigate impacts of habitat alteration on fish and other aquatic species.	
<b>Primary Benefited Species</b>	Chinook salmon or king salmon ( <a href="#">Oncorhynchus tshawytscha</a> )	
<b>Primary Benefited Population</b>	<a href="#">Yakima River Summer/Fall-Run Chinook Salmon</a>	
<b>Plans</b>	<p>U.S. Fish and Wildlife Service National Aquatic Animal Health Policy</p> <p>1999 NMFS Biological Opinion on Artificial Propagation in the Columbia River Basin.</p> <p>Conservation of Columbia Basin Fish, Final Basinwide Salmon Recovery Strategy, 12/2000 (All H Paper)</p> <p>National Fish Habitat Action Plan</p> <p>Yakima Subbasin Plan</p>	
<b>Keyword</b>	Habitat	
<b>Need Number</b>	N-002	
<b>Partners</b>	<p>Washington Department of Fish and Wildlife</p> <p>Yakama Indian Nation</p>	

## Accomplishments

Number of other Recovery Plan tasks implemented for T&E populations	3
Number of other Fishery Management Plan tasks implemented for populations of management concern.	1
Number of applied science and technology tasks implemented as prescribed by Fishery Management Plans. (PART)	1

## The *method*:

The ""germ load"" of fish carcasses, before and after heating treatments, was measured using standard fish health protocols. Using these results, simple methodologies were developed for use by states, federal and tribal entities.

## Further description:

In the past, the nutrients supplied by salmon returning to their natal streams were a key component in the web of insects, mammals and plants that all played an intertwining role in fish survival. The lack of returning salmon has created streams barren of nutrients needed to provide habitat for wild fish survival. To combat these losses, tribal, state and federal entities are using hatchery salmon carcasses to resupply vital nutrients to streams. This strategy results in a dilemma: if diseased carcasses are used, there can be inadvertant transmittal of pathogenic germs to the native fish, many of which are endangered. Simple methods, easily adaptable for field use, will be tested to ascertain their effectiveness in killing fish germs. The ""germ load"" of fish carcasses, before and after freezing/heating treatments, were measured using standard fish health protocols. This information will prevent the spread of disease and follows the policies of the US Fish & Wildlife Service and the Pacific NW Fish Health Protection Committee. Results were immediately useable in the field to help in interagency efforts to revitalize aquatic habitats in a manner consistent with the Endangered Species Act and NMFS Biological Opinions.

13295-A-007 - [Investigational New Animal Drug \(INAD\) coordination and monitoring](#)

<b>Facility</b>	Olympia Fish Health Center	<p><b>Accomplishment Summary</b></p> <p>New investigational drug (INAD) permits and reporting requirements are coordinated and completed for Region 1 hatcheries.</p> <p><b>Description</b></p> <p><b>The <i>importance</i> to the Resource:</b></p> <p>All hatchery production may be threatened by diseases that do not have effective control measures. New drugs that are effective, must be used by permits that have legal requirements for reporting to the Food and Drug Administration (FDA).</p> <p><b>The <i>problem</i>:</b></p> <p>Effective drugs are not legally approved for certain diseases in fish that are essential to meet Service goals.</p> <p><b>The <i>objective</i>:</b></p> <p>For Region 1, this project coordinates information and permitting with the Aquatic Animal Drug Approval Program (AADAP) and the FDA as required by law.</p> <p><b>The <i>method</i>:</b></p> <p>This project provides guidance to hatcheries and other fish health professionals on types and amounts of drugs to be used, testing of effectiveness and requirements for reporting and documentation.</p> <p><b>Further description:</b></p> <p>New drugs that are effective, must be used by permits that have legal requirements for reporting to the Food and Drug Administration (FDA). This process will support efforts in new</p>
<b>Expended</b>	\$22000	
<b>Objective</b>	Develop and share applied aquatic scientific and technologic tools with partners.	
<b>Primary Benefited Species</b>	Chinook salmon or king salmon ( <a href="#">Oncorhynchus tshawytscha</a> )	
<b>Primary Benefited Population</b>	Not specified	
<b>Plans</b>		
<b>Keyword</b>	INAD	
<b>Need Number</b>	N-002	
<b>Partners</b>	University of Idaho	



	approvals of drugs that will prevent disease losses and increase survival of hatchery production for Service fisheries goals. 18 INADs were monitored/ coordinated and reports were submitted to the Aquatic Animal Drug Approval Program office.
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13295-A-008 - [Wild Fish Health Survey](#)

<b>Facility</b>	Olympia Fish Health Center	<p><b>Accomplishment Summary</b></p> <p>1598 Wild fish scientifically tested to determine the presence, range and importance of fish diseases in the wild.</p> <p><b>Description</b></p> <p><b>The <i>importance</i> to the Resource:</b></p> <p>Wild fish and the habitats they inhabit are important to the Service and the public. Diseases that may be transmitted by wild fish can cause reductions of populations and may be limiting factors in wild and hatchery populations.</p> <p><b>The <i>problem</i>:</b></p> <p>Determining the presence of pathogens in wild populations. Information gaps exist because of the magnitude in numbers of populations and geographic areas to be surveyed.</p> <p><b>The <i>objective</i>:</b></p> <p>Sample and test wild populations as opportunities arise with partnerships.</p> <p><b>The <i>method</i>:</b></p> <p>Scientifically sound testing provides information for sound management decisions. 1598 juvenile fish from 5 cooperating partners were sampled and tested for diseases at 20 locations representing 9 watersheds</p> <p><b>Further description:</b></p> <p>The information gathered was transmitted to the National Wild Fish Health database for access by the public through the Internet.</p>
<b>Expended</b>	\$95950	
<b>Objective</b>	Utilize appropriate scientific and technologic tools in formulating and executing fishery management plans and policies.	
<b>Primary Benefited Species</b>	(0) Can Not Assign	
<b>Primary Benefited Population</b>	Not specified	
<b>Plans</b>	U.S. Fish and Wildlife Service National Aquatic Animal Health Policy	
<b>Keyword</b>	Fish Health	
<b>Need Number</b>	N-002	
<b>Partners</b>	<p>Hood Canal Salmon Enhancement Group</p> <p>Northwest Indian Fisheries Commission</p> <p>Olympic National Park Washington</p> <p>Department of Fish and Wildlife</p> <p>Yakama Indian Nation</p>	

13245-A-014 - [New technologies, Improve fish handling procedures](#)

<b>Facility</b>	Quilcene National Fish Hatchery	<p><b>Accomplishment Summary</b></p> <p>Purchase large net and fabricate fencing/ hand railing to safely move adult fish out of the holding pond. This is used for mark sampling and for surplussing adult salmon to tribes and food bank programs. A fish pescalator was acquired and additional modifications needed to use the new fish handling equipment.</p> <p><b>Description</b></p> <p><b>The importance to the Resource:</b></p> <p>Improving the survival of fish reared on station increases the number of fish that would survive for harvest in tribal, recreational, and commercial fisheries.</p> <p><b>The problem:</b></p> <p>The method of removing adult fish from the holding pond has been improved using a "fish pescalator". This new adult fish handling procedures required additional equipment (net, fencing, hand railing)</p> <p><b>The objective:</b></p> <p>A new net, fencing and hand railing for holding adult salmon in conjunction with the a "fish pescalator" will ease handling of adult salmon for surplussing to the tribes or food bank programs. This new method is also a dramatic safety improvement for employees.</p> <p><b>The method:</b></p> <p>A new fish net was purchased and fencing and hand railings constructed for use in adult salmon handling for distribution of surplus salmon carcasses and movement of fish for fish rearing.</p>
<b>Expended</b>	\$3000	
<b>Objective</b>	Develop and share applied aquatic scientific and technologic tools with partners.	
<b>Primary Benefited Species</b>	Coho salmon or silver salmon ( <a href="#">Oncorhynchus kisutch</a> )	
<b>Primary Benefited Population</b>	<a href="#">Puget Sound/Strait of Georgia ESU</a>	
<b>Plans</b>	<p>Puget Sound and Coastal Washington Hatchery Reform Project</p> <p>Hood Canal Salmon Management Plan (Quilcene NFH)</p> <p>Puget Sound Salmon Management Plan</p> <p>Pacific Region Fisheries Outreach Action Plan</p>	
<b>Keyword</b>	Fish Technology	
<b>Need Number</b>	N-002	
<b>Partners</b>	<p>Jamestown S'Klallam tribe</p> <p>Lower Elwha S'Klallam tribe</p> <p>Port Gamble S'Klallam tribe</p> <p>Skokomish Tribe</p> <p>Suquamish tribe</p>	
<b>Accomplishments</b>		

Number of Fishery Management Plan production tasks implemented (PART)	6	
number of marking and tagging targets met, as prescribed by Fishery management plans. (PART)	2	
Number of other Fishery Management Plan tasks implemented for populations of management concern.	7	

13320-A-019 - [Cedar River Chinook Habitat Use: The Influence of Flow](#)

<b>Facility</b>	Western Washington Fisheries Resource Office	<p><b>Accomplishment Summary</b></p> <p>We evaluated the influence of flow on habitat selection by juvenile Chinook salmon in the Cedar River at several spatial and temporal scales. Two chapters for the draft report were completed and submitted to cooperators for review.</p> <p><b>Description</b></p> <p><b>The importance to the Resource:</b></p> <p>The Chinook salmon population in the Cedar River has declined to critically low number, and is part of the listed Puget Sound Chinook salmon ESU.</p> <p><b>The problem:</b></p> <p>This heavily managed system is a primary water source for the City of Seattle and surrounding areas and is also used to produce electrical power. A Habitat Conservation Plan was established with the City of Seattle for water management in this system.</p> <p><b>The objective:</b></p> <p>The plan listed several information needs, one of which was determining how flow influences habitat use and availability for juvenile Chinook salmon. The information collected will be incorporated into the Habitat Conservation Plan to improve flow management in this system for Chinook salmon restoration.</p> <p><b>The method:</b></p> <p>We collected habitat use data at several spatial scales in 2002-2004, which is being used to model habitat use by juvenile Chinook salmon. Data analysis occurred in FY 2004, FY 2005 and continued in FY 2006. Two chapters for</p>
<b>Expended</b>	\$125000	
<b>Objective</b>	Recover fish and other aquatic resource populations protected under the Endangered Species Act.	
<b>Primary Benefited Species</b>	Chinook salmon or king salmon ( <a href="#">Oncorhynchus tshawytscha</a> )	
<b>Primary Benefited Population</b>	<a href="#">Puget Sound ESU/Cedar River Independent Population</a>	
<b>Plans</b>	Shared Strategy for Puget Sound and Recovery Plan, Draft Cedar River Watershed Habitat Conservation Plan	
<b>Keyword</b>	Monitoring and Assessment	
<b>Need Number</b>	N-002	
<b>Partners</b>	City of Seattle Muckleshoot Indian Tribe National Oceanic and Atmospheric Administration, Fisheries U.S. Army Corps of Engineers, Seattle District Washington Department of Ecology Washington Department of Fish and Wildlife	

**Accomplishments**

Number of habitat assessments completed	3.0
Number of miles of in-stream habitat assessed	2.5
Number of miles of riparian habitat assessed	2.5
Number of population assessments completed	1
Number of other Recovery Plan tasks implemented for T&E populations	1
Number of other Fishery Management Plan tasks implemented for populations of management concern.	1

the draft report were completed in FY 2006. Final reporting will be completed in FY 2007.

**Further description:**

This work was initially funded in total by City of Seattle.

13320-A-020 - [Monitoring of Engineered Logjams in Western Washington](#)

<b>Facility</b>	Western Washington Fisheries Resource Office
<b>Expended</b>	\$50000
<b>Objective</b>	Recover fish and other aquatic resource populations protected under the Endangered Species Act.
<b>Primary Benefited Species</b>	Chinook salmon or king salmon ( <a href="#">Oncorhynchus tshawytscha</a> )
<b>Primary Benefited Population</b>	<a href="#">Puget Sound ESU/Skokomish River Independent Population</a>
<b>Plans</b>	Shared Strategy for Puget Sound and Recovery Plan, Draft
<b>Keyword</b>	Restoration
<b>Need Number</b>	N-002
<b>Partners</b>	Lower Elwha Klallam Tribe National Oceanic and Atmospheric Administration, Fisheries Stillaguamish Tribe Washington State Fisheries Restoration Funding Board Washington Trout

### Accomplishments

Number of habitat assessments completed	4.0
Number of miles of in-stream habitat assessed	6.0

### Accomplishment Summary

We monitored fish densities and distribution near engineered logjams in the North Fork Stillaguamish and Elwha Rivers, and fish distribution around natural logjams in the Quinault and North Fork Stillaguamish Rivers.

#### Description

**The *importance* to the Resource:**

Habitat restoration is seen as a means of restoring salmon populations and often includes adding woody debris to stream or river channels. Current knowledge of factors influencing fish densities in larger river channels is lacking, but limited data suggests that fish densities are greater at large woody debris structures that provide complex cover.

**The *problem*:**

Salmon populations throughout the Pacific Northwest have declined during the past two decades due to habitat degradation.

**The *objective*:**

The data collected will be used to determine if engineered logjams are an effective tool for restoring salmon in the Pacific Northwest.

**The *method*:**

We participated in a multi-agency team evaluating the influence of engineered logjams on river morphology and ecology. Data collection continued through FY 2006. Seasonal snorkel surveys were conducted to assess abundance at sites in the North Fork Stillaguamish River and Elwha River. A draft report was submitted to NOAA-Fisheries in FY 2006.

Number of other Recovery Plan tasks implemented for T&E populations	1	<p><b>Further description:</b></p> <p>We assisted NOAA-Fisheries and Lower Elwha Tribal personnel in determining the influence of ELJ's on fish densities and distribution. We also evaluated the distribution of fish near ELJ's in the North Fork Stillaguamish River and around natural logjams in the Quinault River.</p>
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