

Cedar River Habitat Conservation Plan

**Annual Accomplishments Report
Year 2**

**Seattle Public Utilities & Seattle City Light
May 2003**

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EXECUTIVE SUMMARY

This report marks the completion of the second full year of implementation of the Cedar River Habitat Conservation Plan (HCP). In April 2000 the City of Seattle, along with state and federal agencies, signed the agreements to the HCP, launching a comprehensive 50-year effort to protect and improve habitat for 83 species of fish and wildlife in the Cedar River Watershed. Seattle Public Utilities and Seattle City Light focussed their Year 1 implementation efforts on creating and chartering the implementation team and oversight committees, developing management tools for ongoing program implementation, and planning and designing the program elements. In addition, construction work started on several capital projects and new instream flow and forest management prescriptions were begun. Creating business systems and project planning during the first year of HCP Implementation provided a solid foundation for additional on-the-ground projects and research and monitoring to proceed in Year 2.

The program element summaries that follow this Executive Summary collectively describe a year of intensive effort implementing the HCP's goals and commitments for ecological protection and restoration.

This report follows the organization of the HCP, which is divided into three general categories: Watershed Management, Landsburg Mitigation, and Instream Flows. Within each of these categories there are a number of projects, and research and monitoring efforts, each considered a separate HCP "program element." Most of this report is comprised of summaries of each of the "program elements" which discuss the goals and objectives, work accomplished in 2002 (including any issues or challenges that may have arisen), work planned for 2003, and a financial summary. This report also includes an overview of the Anadromous Fish Committee's Year 2 accomplishments and work, the 2002 Instream Flow Annual Compliance Report, and a Year 2 Financial Monitoring Report for the HCP Program as a whole.

HCP Program Management

The main challenge for program managers in 2002 was to coordinate the HCP team's efforts in meeting cost commitments within City departments facing the effects of the national and regional economic downturn. During 2002, SPU reduced both its capital and operations/maintenance budget to better match a reduced water fund revenue picture. Also, development of the 2003-2004 biennial budget occurred during 2002, and HCP staff were expected to identify areas in our program where operations/maintenance expenditures could be reduced in 2003 and 2004. SPU's HCP team members worked to carefully craft their HCP program budgets to ensure that *performance* commitments, as well as cost commitments, would be met in 2002, 2003 and 2004. To achieve SPU's overall budget goals, the HCP team used creative approaches such as planning simpler, more accessible road decommissioning and stream restoration projects in 2003 and 2004 and identifying acceptable elements of long-term environmental studies that could be delayed in 2002 without affecting our ability to achieve HCP goals.

Watershed Management

HCP activities in the watershed continued on the two parallel tracks initiated in Year 1: planning and implementing projects on the ground in the near term, and developing long-term, landscape-level plans. Interdisciplinary teams were formed to develop long-term strategic plans for characterizing the watershed to support restoration planning, monitoring projects and habitats, prioritizing areas for restoration, and developing an information management system to support these activities. For watershed characterization, we acquired, and began analyzing geo-rectified, remotely sensed data (called MASTER). MASTER has 5-meter resolution and 50 spectral bands.

We made substantial progress on many restoration projects, and had the able assistance of many volunteers in getting projects done. Volunteers contributed a total to 2,458 hours removing

invasive plants; planting conifers, deciduous trees and shrubs; collecting plants for biological diversity studies; and helping with trail mapping.

We decommissioned 8.5 miles of road in 2002, bringing the total for the first two years to 23 miles, above the 10 miles per year average expected under the HCP. Work in 2002 included the decommissioning of the 16 Road, a sensitive section of road constructed through wetland and riparian areas of Rock Creek, areas that are expected to provide exceptional rearing and spawning habitat once anadromous salmon pass Landsburg beginning in the fall of 2003. An interdisciplinary team planned the project, which involved removing road fill from riparian and wetland habitats; restoring hydrologic functions to streams and wetlands; removing Japanese knotweed, an invasive plant; and replanting the roadbed with native plants, using volunteers. To reduce sediment loading from watershed roads to water bodies, crews also did resurfacing work on nine road segments and installed cross drains on six segments as part of the road improvements program. In the planning arena, we began developing a new road inventory and classification system that will support planning of all road capital projects and annual maintenance, as well as prioritizing road projects to meet HCP ecological objectives.

In 2002, we designed and implemented the HCP's first two large woody debris projects under the HCP to restore habitat complexity, both on tributaries to Chester Morse Lake Reservoir. At Shotgun Creek, crews felled some trees into the creek; at Lost Creek crews brought logs in from off-site using an excavator. We also designed and implemented the first restoration thinning projects in riparian areas, thinning 5 acres along a stream in the lower watershed and 24 acres along a number of streams in the upper watershed. Using watershed staff and volunteers, we planted 9 acres of riparian habitat with 4,180 native conifers and hardwood shrubs at four locations in the watershed.

We completed work on the two fish passage projects that were mostly constructed in 2001 (at Webster and Shotgun creeks). We did design work on four more crossings to be constructed in 2003-04 to restore access to habitat for either anadromous fish or bull trout. We also upgraded 13 stream crossings on six road segments to accommodate peak flows and reduce sediment delivery to streams.

In December 2002, the City Council passed an ordinance authorizing the first ecological thinning project, the 45 Road Forest Restoration Unit. This project is designed to accelerate the development of forest structure and habitat typical of old-growth forest by implementing a combination of variable density thinning and planting. About 157 acres of the 321-acre site will be thinned, and 67 acres will be planted. Restoration thinning was done in the upper watershed for approximately 1,350 acres of young forest, well in excess of the 800-acre target for HCP Year 2.

Despite near-record low flows in watershed tributaries and extremely low reservoir levels during the fall of 2002, spawning surveys revealed the highest totals yet for bull trout in the upper watershed and kokanee (landlocked sockeye salmon) in Webster Creek, a tributary to Walsh Lake in the lower watershed. A total of 504 bull trout redds (nests) were found, far exceeding the former high count of 236 redds found each year in 2000 and 2001. These numbers are well within the range expected for a viable, adfluvial bull trout population of this size, and the 2002 results indicate that spawning bull trout can gain access to tributaries even at relatively low reservoir levels. In Webster Creek the highest daily count of kokanee was 586 adults and over 370 redds were found. Both results are orders of magnitudes higher than numbers from previous years.

Landsburg Mitigation

The Landsburg Fish Passage Project was celebrated at the groundbreaking ceremony held in June, after which construction proceeded on schedule. Fish passage was completed at the aqueduct

crossing in August, resulting in a series of naturally-appearing stepped pools. Sockeye, chinook and coho salmon successfully passed through these pools during the fall of 2002 to spawn above the aqueduct for the first time in 70 years. Throughout the summer instream work was completed without any citations or water quality violation notices from regulatory agencies. The downstream fish passage gate was completed in November, and Landsburg Park improvements and riparian restoration along the entrance road were completed in December. Construction on a new fish intake screen began in December.

Program development and design of the Cedar River Sockeye Hatchery Project progressed during 2002. The hatchery design team, TetraTech/KCM, working closely with SPU fish biologists, to develop the hatchery program documents. These documents include preliminary design, operating protocols, capacity analysis and an adaptive management plan. The environmental review process continued in 2002, with the Draft Environmental Impact (EIS) Statement released in September, and a Final EIS issued in March 2003. The EIS evaluated design and siting alternatives under SEPA guidelines. Construction is currently schedule to begin in 2004, subject to the outcome of a recently filed appeal to the Hatchery project's FEIS.

In the research and monitoring arena, research continued on sockeye fry. This work attempts to better understand performance of the interim sockeye hatchery at Landsburg and includes trapping, otolith marking, and counting. Juvenile sockeye research in Lake Washington is anticipated to contribute to timely assessments of abundance and distribution of juvenile sockeye and interacting species.

Instream Flows

The City manages the Cedar River water supply for multiple objectives: (1) to provide its customers in the region with a high quality, reliable, and adequate supply of drinking water; (2) to protect fisheries resources in the Cedar River and Lake Washington; and (3) to provide a measure of flood protection compatible with the City's primary water supply mission. The instream flow management strategy commits the City to a binding instream flow regime designed to improve habitat conditions for chinook, coho, sockeye, and steelhead in the regulated portion of the Cedar River.

Flow management decisions are based on many years of study and analysis of the needs of all life stages for each of the four anadromous species. Flows provide habitat for spawning, incubation, rearing of young fish, and holding for adult fish. The flow regime includes not only minimum instream flow requirements but also adaptive provisions for the allocation of supplemental flows above minimums in years when available, through operation of a multi-agency commission.

The Cedar River produced relatively large numbers of juvenile chinook and sockeye in the spring of 2002, indicating good conditions for salmon spawning, incubation and emigration. Although the return of spawning adult steelhead in the spring was disappointing, all steelhead redds were protected from dewatering with the application of supplemental stream flows. At the request of the IFC, stream flows were held well above guaranteed levels in August and early September to provide additional benefits to instream resources. Generally, instream flow management was complicated by runoff from a near record snowpack, construction of fish passage facilities at the Landsburg diversion dam, construction of fish and flow protection facilities at the Cedar Falls powerhouse, and construction of new water treatment facilities at Lake Youngs.

In addition to these challenges, severe drought conditions began to develop in July of 2002 and persisted through December. Recorded precipitation for this period in the Cedar River watershed was the second lowest in more than 70 years of record keeping. Dry fall conditions are especially challenging for instream flow operations on the Cedar River. Owing in part to a robust reservoir storage situation at the start of the drought, high normal flows were provided for two weeks during the period of peak chinook spawning and flows were held at or above low-normal

flow levels throughout the fall. Despite these challenging hydrologic conditions in the fall and early winter, managed stream flows were held at or above normal levels at all times. During the spring of 2003, the river has been producing relatively large numbers of young chinook and sockeye salmon, suggesting that these managed flows supported favorable spawning and incubation conditions during the past fall and winter. Normal weather patterns returned in January 2003, and it appears Chester Morse Reservoir will be full or near-full prior to the start of the summer drawdown season.

The interagency Cedar River Instream Flow Commission (IFC) met at least monthly throughout the year to help guide real-time instream flow management. The IFC was closely involved in the management of reservoir refill during the spring and stream flow management during the summer/fall drought. The IFC also directed the implementation of a number of aspects of the Supplemental Biological Studies Program including chinook spawning and rearing studies and the development of flow data sets for comparing regulated to unregulated flows in the Cedar mainstem.

Seattle City Light has spent 2002 modifying the Cedar Falls Powerhouse and the Masonry dam to provide fish protection and improve habitat for when this reach of river will be accessible to anadromous fish. Two tailrace barriers were constructed at the Cedar Falls Powerhouse. New mechanical devices, sensors, and electronic controls were installed in the powerhouse to maintain and regulate flow in the event of a load rejection or load reduction. Testing and fine-tuning of the automatic coordination of the new equipment will continue through 2003. In 2002, work also began at the Masonry Dam in preparation for the installation of a new valve that will provide minimum flows in the Canyon Reach above the powerhouse.

HCP PROGRAM ELEMENT SUMMARIES

HCP Background

The HCP, approved in April 2000, is a comprehensive, ecosystem based plan for the Cedar River Municipal Watershed and areas downstream affected by river flows. The HCP incorporates more than 10 years of scientific research and monitoring, and commits more than \$90 million over the next 50 years to improve conditions for fish and wildlife. The plan will substantially contribute to ensuring that our region has an ample supply of high-quality drinking water well into the 21st century by meeting the requirements of the Endangered Species Act with regard to 83 species of fish and wildlife addressed in the HCP. It addresses many long-standing issues between the City of Seattle and the State of Washington regarding the blockage to anadromous fish posed by the Landsburg Diversion Dam. It also represents the completion of a long-running effort with state and federal agencies to develop technically sound instream flows in the Cedar River to protect salmon.

Because the Cedar River Municipal Watershed contains the headwaters of the major river that discharges into Lake Washington, management of the watershed and the Cedar River's instream flows represent a very important regional opportunity to protect and restore both salmon and other species that are dependent upon late-successional and old-growth forests. The watershed is important not only as the region's primary water supply but also as the major source of downstream river flows necessary to maintain habitat for anadromous salmonids. In addition, the municipal watershed offers one of the few significant opportunities to reestablish a block of mature, late-successional, and old-growth forest below 3,000 ft in a manner that could effectively link this forest block to existing old-growth in other areas of the Cascade Mountains.

As part of the HCP, the City of Seattle has made a 50-year commitment to a wide variety of programs providing significant benefits to fish and wildlife found throughout the entire Cedar River system. These commitments are in three primary categories: **Watershed Management**, **Landsburg Mitigation**, and **Instream Flows**. The HCP includes conservation measures and research and monitoring efforts in all three categories. In developing the Cedar River Watershed HCP, the City understood that undertaking a comprehensive, 50-year habitat protection and restoration program could be successful only with significant commitments to fund and implement monitoring and research activities. This includes: (1) compliance monitoring to determine whether HCP programs and elements are implemented; (2) effectiveness monitoring to determine whether HCP programs and selected elements result in the anticipated changes in habitat or other conditions for the species of concern; and (3) cooperative research to obtain more information on species of concern, test critical assumptions in the plan, and gain understanding needed to refine management decisions to meet plan objectives.

The sections that follow provide a finer level of detail for each program element's first year accomplishments (Program Element Summaries). The Program Element Summaries are organized into the three HCP Categories (Watershed Management, Landsburg Mitigation and Instream Flows) and each section is preceded by an explanation of the HCP Program Category.

Watershed Management Background

The Cedar River Municipal Watershed supports a variety of species that are at risk in the region, largely as a result of habitat degradation and loss. Within the watershed the northern spotted owl, marbled murrelet, bald eagle, and bull trout are found, as well as other terrestrial and aquatic species that are at risk regionally. When the fish ladders are constructed at the Landsburg Diversion Dam, native anadromous salmonids, such as chinook salmon and steelhead trout, will also have access to the watershed. The HCP's watershed management mitigation and conservation strategies are designed to protect and contribute to the restoration of the habitats of at-risk species, and to contribute to the restoration of ecological and physical processes and functions that create and maintain key habitats.

The proposed mitigation represents a landscape approach to watershed management that includes both a commitment not to harvest timber for commercial purposes within the municipal watershed, effectively creating an ecological reserve that includes all forest outside limited developed areas, and a significant commitment to habitat restoration. These measures were developed collectively to mitigate for impacts of past land management activities, and they were developed in an integrated fashion to foster natural biological diversity and to help restore much of the watershed to more natural conditions.

Following is a listing of the specific components of the City's commitments under Watershed Management:

- Eliminate timber harvest for commercial purposes, effectively creating a watershed ecological reserve that includes all forest outside the few developed areas and that will provide long-term, comprehensive protection of the watershed ecosystem
- Develop and implement a comprehensive program to restore fish and wildlife habitats in the watershed that have been degraded by past activities, such as logging and road construction
- Commit to removing approximately 38% of the forest roads within the watershed by the end of HCP year 20; use restoration thinning, planting, and similar approaches to restore the natural ecological functions and processes in watershed forests that create and maintain habitats for at-risk species
- Design and conduct projects to restore habitat in streams and streamside areas and to improve water quality over the long term
- Design and conduct comprehensive research and monitoring studies that will provide the information needed to improve our ability to achieve the conservation objectives of the HCP over the long term

The following pages provide summaries of the individual HCP PROGRAM ELEMENTS under the Watershed Management program category.

HCP Program Element: Cedar River Watershed Biodiversity Initiative (to support restoration and monitoring in aquatic, riparian, and upland habitats)

HCP Program Category: Watershed Management

Contact: David Chapin, Biologist and Clay Antieau, Senior Watershed Planner, Watershed Management Division, Cedar River Watershed, Cedar Falls

Objectives & Goals

Protecting, restoring, and monitoring natural biodiversity are stated goals of the HCP. Thus, it is important to have a framework for acquiring, documenting, organizing, and housing biodiversity data during the course of the HCP and beyond. The Cedar River Watershed Biodiversity Initiative (CRWBI) is intended to provide this framework by: (1) defining biodiversity in the context of the HCP; (2) developing a biodiversity database for the Watershed; (3) conducting targeted field surveys and biodiversity research and monitoring; (4) interpreting biodiversity data within the Watershed's biogeographical context; (5) facilitating biodiversity research in the region, (4) evaluating losses of biodiversity within the Watershed, and (6) developing and implementing approaches to restoring biodiversity in the Watershed. This project is part of the Watershed Characterization project (see separate summary).

Status of Work (2002)

- ***Document information from past ecological and taxonomic studies in the watershed***

Based on work in 2001, the considerable amount of research that has been conducted in the Watershed over many decades continues to be compiled into an organized bibliography. Staff continues to build on a bibliography of over 300 references, from which we are extracting pertinent biodiversity data.

- ***Collaborate with UW Botany Department on collecting and cataloging vascular plants***

Four day-long collecting forays were conducted in the Watershed in coordination with the UW Botany Department. Volunteers collected more than 250 plant specimens from a wide variety of habitats throughout the Watershed. Data for these and future specimens will be incorporated into the Watershed's biodiversity database. Previous inventory work in 2001 identified two new State-listed rare plants [many-flowered sedge (*Carex pluriflora*); russet sedge (*Carex saxatilis*)], and two new State-listed noxious weeds [diffuse knapweed (*Centaurea diffusa*); yellow hawkweed (*Hieracium caespitosum*)].

- ***Continue studies on presence and distribution of invertebrates***

Dr. Rick Sugg continued with his survey of terrestrial invertebrates in the Watershed. This work is initially focused on ground-dwelling invertebrates across the Watershed.

Looking Ahead (Planned 2003 Accomplishments)

The HCP Biological Diversity Initiative will continue in 2003 with major tasks focused on continuing biological inventory, defining Cedar River Watershed restoration efforts in the context of biodiversity, and identifying research and monitoring priorities that will support Watershed restoration efforts. In addition, we expect to seek funding to continue the invertebrate diversity studies described. We also expect to seek grant funding for conducting workshops on the topics of techniques for assessing losses of biodiversity, tools and approaches for restoring biodiversity, and efficient and effective methods for monitoring changes in biodiversity over time.

Financial Summary

This is not an explicit HCP Cost Commitment. Thus, there is no financial summary for this activity.

HCP Program Element: HCP Volunteer Involvement Program
HCP Program Category: Watershed Management

Contact: Clay Antieau, Senior Watershed Planner, Watershed Management Division, Cedar River Watershed, Cedar Falls

Objectives & Goals

Watershed staff support two volunteer programs: a docent program associated with the Watershed Education Center, its collections/displays, and its visitors; and a "Habitat Conservation Plan (HCP) Implementation" program focusing on projects in the Watershed. The Cedar River Watershed's HCP Volunteer Program uses volunteers and "conservation corps" to assist Division staff in implementing HCP elements in the Watershed. As with most citizen-involvement initiatives, Cedar River Watershed managers use this Volunteer Program to renew citizens' commitment to their own communities and resources while benefiting from that volunteer assistance. Thus, essentially all events in which volunteers participate are designed and managed to provide distinct educational, training, or development opportunities to those volunteers.

Status of Work (2002)

- ◆ The HCP Volunteer Program involved more than 395 different volunteers in the mission, management, and ecology of the Cedar River Watershed, and generated approximately 2,458 hours (307 person-days) of volunteer effort.
- ◆ The HCP Volunteer Program partnered with 13 partners: Friends of the Cedar River Watershed, Biodiversity Northwest, University of Washington, Student Conservation Association, Girl Scouts Totem Council, Seattle County Day School, Earth Ministries, Washington Toxics Coalition, Bank of America, EarthCorps, Mountains-to-Sound, YMCA Earth Service Corps, and the King County Department of Natural Resources.
- ◆ Scot's broom (*Cytisus scoparius*), an invasive plant species, was removed from portions of the Rattlesnake Lake Recreation Area (RLRA) (within an area of approximately 2 acres).
- ◆ Japanese knotweed (*Polygonum cuspidatum*), an invasive plant species, was managed on portions of the RLRA, near the Education Center, and along the 16 Road in the Lower Watershed.
- ◆ Tansy ragwort (*Senecio jacobaea*), an invasive plant species, was managed along the 9 Road in the Lower Watershed.
- ◆ Hundreds of conifers, deciduous trees, and shrubs (estimated to be approximately 1,500 plants) were planted in the RLRA and inside the Watershed at the 16 Road, along Rock Creek in the vicinity of the 16 Road, and in the Lost Creek Coarse Woody Debris Project Area.
- ◆ More than 250 herbarium collections were made of the plant diversity found in the Watershed; these collections were deposited into the permanent collections at the University of Washington Herbarium.
- ◆ Portions of the Watershed Management Division's GIS data layers and On-line Map Utility were developed.
- ◆ Portions of existing trail system in the Lower Watershed were GPS-located.

Looking Ahead (Planned 2003 Accomplishments)

The HCP Volunteer Program will continue in 2003 with major tasks focused on biological inventory, invasive plant species management, and revegetation.

Financial Summary

This is not an HCP Cost Commitment, thus there is no financial summary for this activity.

HCP Program Element: Watershed Road Decommissioning (C100026)
HCP Program Category: Watershed Road Decommissioning & Improvements

Contact: Chris Anderson, Acting Watershed Operations Manager, Watershed Management Division

Objectives and goals

To reduce the road network to a long-term core road system of approximately 384 miles, the City will remove approximately 236 miles of roads (about 38 percent of the current total), and expects to average about 10 miles of roads per year for the first 20 years of the HCP. The primary purpose of road decommissioning is to minimize sediment delivery to streams and to improve drainage patterns. Decommissioning also will reestablish fish passage between significant amounts of habitat. The basic principles of road deconstruction are to restore the site to approximate pre-road functioning and stability, which involves restoring drainage, placing material in stable locations, and controlling surface erosion. Mineral soils and organic debris are removed from "perched" or otherwise unstable locations and placed either in the roadbed against the cutbank, or hauled to a suitable waste site where they will not be likely to fail and deliver sediment to streams. Culverts are removed. Stream crossings are restored, and stabilized with grade control to avoid eroding into the hillslope. Constructing frequent waterbars across the road surface is done to restore cross-slope drainage. All disturbed soils are treated with an approved seed mix and protected with an application of straw or brush to reduce surface erosion. We have had a lot of success with self-seeding of trees, and have occasionally planted seedling trees on deconstructed roads. Some of the roads slated for deconstruction may pass inspection for long-term stability of material and drainage, and may not require any work before declaring them "decommissioned."

Status of work (2002)

In 2002, we abandoned 8.5 miles of road network. Due to the budget restraints, we did not achieve the targeted 10 miles /per year target. Fortunately, in HCP Year 1 we surpassed the 10 miles of targeted work by 4.5 miles and exceeded our projected accomplishment of 7 miles. In 2002 overall, the following road sections were abandoned: 111, 16, 150 (spurs), 320 (spurs), 540 (spurs), and 560 (spurs). Work in 2002 included the decommissioning of a very high-profile and sensitive section of road (16 Road) that we believe now serve as a model for road decommissioning using a multidisciplinary team approach. This was a road section through Rock Creek and an associated wetland complex, areas that are expected to provide exceptional rearing and spawning habitat once anadromous salmon are able to pass Landsburg beginning in the fall of 2003. Road decommissioning for this segment involved removing road fill from riparian and wetland habitats; restoring hydrologic functions to streams and wetlands; removing Japanese knotweed, an invasive plant; and replanting the roadbed with native plants, using volunteers.

Looking ahead (Planned 2003 Accomplishments)

In 2003, we plan on abandoning the 60 (spurs), 70 (spurs) and the upper 200 (spurs) for a total of 10.6 miles of Road Abandonment. This effort may also include design of a monitoring program to determine if we are achieving the HCP objectives related to sediment delivery to streams. A road inventory system and long-term road plan will also be developed in 2003, as described under the summary for HCP Road Improvements.

Financial summary

The HCP Cost Commitment for Year 2002 was \$290,000 and a total of \$292,622 of cost-commitment funds was expended for labor, equipment, materials, and related expenses.

HCP Program Element: Watershed Road Improvements (C100023)
HCP Program Category: Watershed Road Decommissioning & Improvements

Contact: Chris Anderson, Acting Watershed Operations Manager, Watershed Management Division

Objectives and goals

The purpose of road improvements is to reduce sediment loading to streams and other water bodies over time. To minimize sediment delivery to streams and to improve drainage patterns, priority stream crossing will be upgraded, and ditches will be sized to control hillslope surface and groundwater flows and to protect the road from surface erosion. Cross-drains will be installed at frequent intervals to move hillslope surface and groundwater across the road in a pattern that approximates the drainage pattern upslope of the road, and unstable sidecast and fill material will be moved. A road may be stabilized by constructing a supported keyed fill or by reconstructing the cutslope. Road improvements include activities such as applying rock for stability, increasing frequency of cross-drains, stabilizing fills, removing unstable sidecast material and dismantling perched landings.

Status of work (2002)

This is an on-going project, funded for 50 years of the HCP. In 2002, we applied rock to the 100, 500, 540, 600, 650, 700, and 50, 60, and 10 roads, which improves road structure, increases stability, and reduces surface run-off. We installed cross-drain culverts on the 540, 650, 700, 60, 300, and the 9 roads to improve cross-road drainage and reduce sediment delivery to streams. Work was also done to develop a new road inventory system to support short-term, logistical planning to accomplish work in a cost-effective manner, and long-term prioritization and planning of road improvement, decommissioning, and maintenance work to meet HCP ecological objectives.

Looking ahead (Planned 2003 Accomplishment)

In 2003, we plan to make improvements to the 100, 60, 70, 55, 64, 815, and the 200 systems, depending on the limits of funding. We will continue with cross-drain improvements on the 21, 60, 64, 70, 76, 72, and into the 200 system. We also plan to develop a design for improvements of the 200 Road adjacent to Chester Morse Lake. This is a complex project and will also require extra permitting, so construction is planned for 2004. In addition, we plan to complete the road inventory described above, which will include a basis and method for prioritizing and sequencing road improvements and decommissioning with regard to HCP ecological objectives. The inventory will be used, with other information, to develop a long-term strategic plan for road management to meet HCP and other objectives.

Financial summary

The HCP funding committed in 2002 was \$406,000. A total of \$347,137 was expended for cost commitments in 2002. Part of the cost-commitment funds (\$50,000) was used for developing the road inventory.

HCP Program Element: Watershed Road Maintenance (N541701)
HCP Program Category: Watershed Road Decommissioning & Improvements

Contact: Chris Anderson, Acting Watershed Operations Manager, Watershed Management Division

Objectives and Goals

The primary objectives of road maintenance under the HCP are to minimize sediment delivery to streams, to improve drainage patterns that have been altered by roads, and to provide fish passage, following standards included in the HCP. These standards are designed to maintain a stable, functional road system that minimizes adverse impacts on stream and riparian habitat. The focus is on road segments that are near streams or have the potential to deliver sediment to streams. Other areas are now maintained with more precautions and added cost to protect draws and water crossings.

Status of Work (2002)

In 2002 we accomplished maintenance on particular roads that have potential to impact aquatic habitat. Significant amounts of applied maintenance were increased in 2002 due to comprehensive ditch cleaning efforts, re-establishing runoff diversion. Also, in identified HCP areas, increased care and time was spent on grading and compacting existing surfaces that were near streams. One of our goals in 2002, in addition to maintaining HCP roads, was to distinguish HCP maintenance objectives from normal road maintenance. This has been an ongoing procedure that has been identified through planning and mapping exercises. During 2002, we were able to identify these areas of immediate maintenance concern and, although Road Improvements will be necessary in the future for some of these areas, we mitigated potential impacts before those improvements are completed.

Looking Ahead (Planned 2003 Accomplishments)

We will continue road maintenance activities to protect and benefit habitat. In 2003, we plan on continuing maintenance on HCP Roads that are not immediately scheduled for Road Improvements, with emphasis on data collected from the Road Inventory we will be developing in 2003. In 2003, the process will be finalized for accurately identifying road segments for which HCP objectives apply regarding maintenance, and more specific identification and accurate tracking will be implemented.

Financial Summary

The HCP cost commitment during 2002 totaled \$108,580. In 2002, \$94,019 of cost commitment funding was spent for HCP Road Maintenance. Records indicate that we did not meet the Year 1 commitment, with a balance of \$27,282 not expended. In HCP Year 1, a significant amount of maintenance that would meet the criteria for cost commitments under the HCP was applied to non-HCP O&M expenditures related to road maintenance, because the two areas were not clearly categorized and separated for the Operations crew. Improved information tracking in 2003 should produce an accurate record of HCP-related maintenance, in part because we will have the use of an improved road inventory. We expect to find that the full amount of Year 1 cost commitment was expended, and plan to report corrections to the cost commitment expenditure for HCP Year 1 in the accomplishment report for 2003.

HCP Program Element: Large Woody Debris Replacement (C100019)
HCP Program Category: Stream and Riparian Restoration

Contact: Dave Beedle, Senior Watershed Hydrologist, Watershed Management Division

Goals and Objectives

The objective of this element is to temporarily enhance stream habitat by placing large woody debris (LWD) in selected streams that lack wood as a result of past land management activities. The goal is to help restore ecological functions by enhancing in-channel structural characteristics. This will temporarily improve fish habitat until the adjacent riparian area begins to supply woody debris of appropriate size and quantity. A specific plan was developed for the Cedar River between Cedar Falls and Landsburg. This plan was developed to incorporate specific water supply infrastructure, water quality, and personnel safety concerns.

Status of Work (2002)

Two LWD Replacement projects were completed in 2002. The projects were intended to increase the habitat complexity of two creeks, Shotgun Creek and Lost Creek, that have been impacted from past road management activities. Both creeks are tributaries to Chester Morse Lake.

This LWD placement was intended to assist in moving the stream channels toward naturally controlled routing of water and sediment and toward naturally controlled geomorphic unit dynamics (pools, riffles, cover, etc.) The sources of the LWD for the Shotgun Creek project were trees growing in the creek's core zone. Using experienced fallers with chainsaws, 29 trees were directionally felled into designated locations in a 450-foot segment of Shotgun Creek. The source of the LWD for the Lost Creek project was from a remote stockpile location. Four logjams of 4 logs each were mechanically installed in designated locations along a 275-foot segment using an experienced operator and an excavator. Logs with attached root wads were used to provide additional stability and fish habitat.

Year 2002 was also devoted to creating a strategic plan with consultants to develop a system (rationale) for identifying and prioritizing locations for aquatic restoration, and to develop a field inventory system that will allow prioritization over the landscape. An Interdisciplinary Team continued to select short-term project locations by areas with a high probability of success and low negative ecological consequences.

Looking Ahead (Planned 2003 Accomplishments)

The planned LWD project for 2003 is Rock Creek. The proposed project will introduce LWD into Rock Creek via a helicopter adjacent to the BPA powerline. In addition, work on the identification and prioritization system and stream inventory methodologies will continue.

Financial Summary

The HCP commits funding of \$116,000 (in 2002 dollars) for HCP years 1- 8. Approximately \$10,000 was spent in 2002 completing two projects.

Large Woody Debris Replacement			
HCP work Commitment	HCP Cost Commitment	HCP work Commitment, completed in 2002	HCP Cost Commitment, spent in 2002
1.6 projects per year	\$14,500 per year	2 projects for a total	\$9,595

(average)	(average)	of 725 stream feet	
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HCP Program Category: Streambank Stabilization (C100017)

HCP Program Element: Stream and Riparian Restoration

Contact: Dave Beedle, Senior Watershed Hydrologist, Watershed Management Division

Goals and Objectives

The objective of this element is to minimize excessive rate of streambank erosion caused by forest roads and land management activities. The goal is to improve storm water quality and reduced magnitude and frequency of disturbance to fish habitat from sediment inputs and bedload movement.

Status of Work (2002)

Streambanks with high impacts to the aquatic system were stabilized in 2002. The projects removed poorly designed or failed stream drainage structures and redesigned the channel to provide long-term stability at several road abandonment projects.

Year 2002 was also devoted to creating a strategic plan with consultants to develop a system (rationale) for identifying and prioritizing locations for aquatic restoration, and to develop a field inventory system that will allow prioritization over the landscape. An Interdisciplinary Team continued to select short-term project locations by areas with a high probability of success and low negative ecological consequences.

Looking Ahead (Planned 2003 Accomplishments)

The exact sections of streams to be stabilized will depend on the projected cost of the work and will be determined in the field as the information becomes available. The proposed work will include Rack Creek design and possible construction of eroding streambanks downstream of the 200 road and/or channel stabilization through drainage structure removal during road abandonment. The exact sections of streams to be stabilized will depend on the projected cost of the work and will be determined by the final design of the projects.

Financial Summary

The HCP commits funding of \$183,280 (in 2002 dollars) for HCP years 1-8. Approximately \$11,800 was spent in 2002 completing about 200 feet of stabilization.

Streambank Stabilization			
HCP work Commitment	HCP Cost Commitment	HCP work Commitment, completed in 2002	HCP Cost Commitment, spent in 2002
197 feet per year (average)	\$22,910 per year (average)	200 feet	\$11,800

HCP Program Element: Streambank Revegetation (C100022)

HCP Program Category: Stream and Riparian Restoration

Contact: Dave Beedle, Senior Watershed Hydrologist, Watershed Management Division

Goals and Objectives

The objective of this element is to revegetate streambanks where past upstream or upslope activities have altered the riparian vegetation to the point where excessive streambank erosion is occurring and channel stability has been reduced. The goal is to help restore ecological functions by recovery of vegetation characteristics. This will improve storm water quality and reduced magnitude and frequency of disturbance to fish habitat from sediment inputs and bedload movement.

Status of Work (2002)

Year 2002 was devoted to creating a strategic plan with consultants to develop a system to identify and prioritize locations for aquatic restoration, and to develop a field inventory system that will allow prioritization over the landscape. An Interdisciplinary Team continued to select short-term project locations by areas with a high probability of success and low negative ecological consequences.

Looking Ahead (Planned 2003 Accomplishments)

Streambanks with high impacts to the aquatic system will be stabilized in 2003. The projects will provide vegetative stability to redesigned channels to provide long-term stability at several road abandonment locations. The exact sections of streams to be stabilized will depend on the projected cost of the work and will be determined by the final design of the projects.

Financial Summary

The HCP commits funding of \$61,520 for HCP years 1-8 (in 2002 dollars). \$4,316 was spent in 2002 for a consultant to develop an ecologically based site selection and prioritization system. Projects will be implemented in 2003.

Streambank Revegetation			
HCP work Commitment	HCP Cost Commitment	HCP work Commitment, completed in 2002	HCP Cost Commitment, spent in 2002
331 feet per year (average)	\$7,690 per year (average)	Development of ecologically based site selection and prioritization system	\$4,316

HCP Program Element: Riparian Conifer Underplanting (C100018)
HCP Program Category: Stream and Riparian Restoration

Contact: Amy LaBarge, Senior Forest Ecologist, Watershed Management Division

Objectives & Goals

The objective of this element is to plant and reestablish conifers near streams and in forested areas around wetlands, ponds, and other non-forested aquatic habitats that were converted to hardwoods as a result of past land management activities. This conifer establishment will help accelerate the restoration of diverse and structurally complex riparian stands within the watershed and promote biodiversity in areas that were disturbed by early timber harvest activities.

Status of Work (2002)

In 2002, approximately nine acres of riparian habitat were planted with 4,180 native conifers and hardwood shrubs in four locations in the Cedar River Municipal Watershed. In the first quarter, four acres along Rock Creek were planted with 1,600 tree seedlings by watershed staff and volunteers. In the fourth quarter, following road decommissioning, two acres of the 16 Road adjacent to Rock Creek were planted with 1,684 tree seedlings and shrubs by staff and volunteers. Also in the fourth quarter, three acres of riparian areas adjacent to Shotgun Creek and Lost Creek were planted with approximately 900 tree seedlings (450 in each area) by staff and volunteers to complement large woody debris aquatic restoration projects. Riparian vegetation monitoring, including follow-up monitoring at Webster Creek, was also accomplished to track the success of these and past riparian conifer planting projects.

Looking Ahead (Planned 2003 Accomplishments)

Projects in 2003 will focus on riparian underplanting along Boulder and Rock Creeks. Longer-term site selection and prioritization of areas to be planted will also occur during 2003 through the interdisciplinary team process. Monitoring data will continue to be collected and analyzed that will allow us to assess planting methods, seedling survival, and variety of techniques used in riparian underplanting projects to inform future work.

Financial Summary

The HCP commits funding of \$58,000 for HCP years 1-8 (in 2002 dollars), with an average of \$7,250 per year, all of which was expended for plant materials, tools, and staff time during planting projects. In addition, effort was devoted to monitoring projects installed in 2001 and 2002.

HCP Program Element: Riparian Restoration Thinning (C100020)
HCP Program Category: Stream and Riparian Restoration

Contacts: Amy LaBarge, Senior Forest Ecologist, Watershed Management Division

Objectives & Goals

The objective of this element is to conduct restoration thinning (in forests under 30 years old) and ecological thinning (in forests over 30 years old) within previously disturbed riparian zones of streams, open water bodies, and wetlands. Riparian thinning will accelerate the growth and structural development of trees, provide greater protection for streams and eventually develop forest structure, composition, and diversity characteristics similar to the natural mature riparian conifer forest originally on the site. Thinning is focused on stands with high tree density and involves cutting trees to a desired spacing to promote more rapid tree growth, improve current habitat, and accelerate the development of older forest characteristics. Thinning in riparian areas also focuses on retaining high tree species diversity, including conifer and hardwood trees and shrubs. In the long-term, riparian thinning will benefit adjacent aquatic ecosystems by contributing shade, large woody debris, stream bank stability, and nutrients.

Status of Work (2002)

In 2002, the Selleck riparian restoration thinning project was commenced and approximately five acres were thinned along an unnamed creek in the lower watershed to improve remaining tree growth and riparian plant species diversity. Staff time was committed to implement this project. Additionally, approximately 24 acres of young forests were thinned to within 10 feet of the channel edge of various small streams in the upper watershed. This thinning was implemented by restoration thinning contractors who were working on upland restoration thinning areas concurrently. In 2002, interdisciplinary planning efforts continued to develop a project site selection and prioritization strategy for riparian thinning projects through year 2016.

Looking Ahead (Planned 2003 Accomplishments)

In 2003, the Selleck riparian thinning project will continue, and we will complete the remaining 11 acres identified. Riparian thinning will also occur in conjunction with the upland restoration thinning contract work. Planning will commence for a riparian restoration thinning project along the mainstem of Seattle Creek, which is a unique site with special thinning needs. Additionally, strategic planning will continue to select and prioritize sites for both riparian restoration thinning and riparian ecological thinning in the watershed through 2016.

Financial Summary

The HCP commits funding of \$52,240 for HCP years 1-8 (in 2002 dollars), with an average of \$6,530 per year. A total of \$8,360 was expended for staff time implementing the Selleck thinning project, while contracted riparian restoration thinning in the upper watershed expended \$3,673. The total cost commitment for riparian restoration thinning in 2002 was \$12,033. These expenditures above the cost-commitment level made up for little progress in Year 1.

HCP Program Element: Stream Crossings for Peak Flows (C100016)

HCP Program Category: Watershed Management, Stream and Riparian Restoration

Contact: Marti Spencer, Watershed Engineering Supervisor, Watershed Management Division

Objectives and Goals

Stream crossing projects in this category are designed to improve drainage patterns that have been altered by roads, to minimize sediment delivery to streams and to achieve channel stability at that particular site. There are approximately 1,300 stream crossing structures on non-fish-bearing streams in the Cedar River Municipal Watershed. Many of these crossing structures need to be upgraded in size or an alignment correction made, except where the road is deconstructed, which includes culvert removal. A few crossings, depending on other site-specific conditions, will need more expensive repairs or modifications.

Status of Work (2002)

In 2002, work on stream crossings to improve conditions for passage of peak flow was completed in the following areas: 540 Road (2 crossings), 549.1a Road (1 crossing), 600 Road (3 crossings), 650 Road (2 crossings), 700 Road (3 stream crossings) and 9 Road (2 crossings). These 13 stream crossings were upgraded to accommodate peak flow conditions and reduce sediment delivery to streams.

During culvert inventory surveys, several locations were identified for future improvement projects. A consultant has been hired to design some of these improvement projects.

Looking Ahead (Planned 2003 Accomplishments)

As part of the 2003 Road Improvement Program, we are planning to improve stream crossings during road improvement projects, taking advantage of having workers and equipment in the same area. Several stream crossings will be improved on the 55, 60, 64, 70, 76, 100, 200 and 815 road systems.

Financial Summary

The cost commitment for 2002 was \$18,130. A total of \$17,500 was spent in peak flow work during 2002. We anticipate catching up with cost commitments in 2003.

HCP Program Element: Stream Crossings for Fish Passage (C100021)**HCP Program Category: Watershed Management, Stream and Riparian Restoration**

Contact: Marti Spencer, Watershed Engineering Supervisor, Watershed Management Division

Objectives and Goals

Stream crossing improvements in this category are designed, when both economically and technically feasible, to reestablish fish passage at locations where forest road crossings interrupt connectivity of significant habitat reaches for either anadromous or resident fish. One of the most cost-effective strategies for increasing and/or improving fish habitat can be to restore access to potential habitat by upgrading, replacing or removing blocking culverts on fish-bearing streams. Removal of artificial migration barriers can restore biological connections between upstream and downstream populations and/or make unoccupied habitat available for recolonization. Fish populations can potentially increase when access to spawning and rearing habitat is restored.

Status of Work (2002)

Work was completed on the two fish passage improvement structures that were constructed in 2002. These were large projects that involved the removal of perched culverts and the installation of small pre-fabricated bridges at 2 locations, at Webster Creek and at Shotgun Creek. Most of the construction was completed in 2001, with final approaches and paving being completed in 2002.

In addition to finishing the above construction projects, field design was initiated for four fish passage restoration projects in the watershed. Prioritization of potential project locations has been focused on restoring fish passage in locations that 1) are presently accessible, or will soon be accessible to anadromous fish after successful completion of the fish passage project at Landsburg in fall of 2003 and 2) those that affect federally listed, threatened resident species (e.g., bull trout). Three sites potentially restricting passage of anadromous fish, either currently or in the future, are located on the 13 Road at Williams Creek, on the 20 Road at Webster Creek, and on the 19 Road at a small tributary to Carey Creek, which is secondary tributary to Issaquah Creek. When installation of these three projects is complete, we will have removed all potential barriers to passage of anadromous fish at roads in the lower Cedar River Municipal Watershed. No other stream crossings located within the potential anadromous fish access zone within the watershed are known to present passage barriers to anadromous fish. The fourth site, a small tributary to Bear Creek located in the upper watershed on the 600 Road, represents a potential passage barrier for bull trout (a threatened species) in the upper Cedar River drainage system above the reservoir. This site is one of the few potential passage barriers to bull trout remaining in the upper watershed. All of the remaining sites potentially restricting movement of bull trout are outside of the documented range of the species within the municipal watershed and are of lower priority for restoration at this time. Other resident salmonids are present at all of the sites described above and will also benefit from restoration of passage.

Looking Ahead (Planned 2003 Accomplishments)

Two of the stream-crossing barriers described above are in the final design phase and scheduled for construction in 2003. The crossing (a perched, corrugated culvert) on the small tributary to Carey Creek that flows into Issaquah Creek, a stream with established spawning runs (and known rearing) of anadromous fish, will be replaced by an arch-type structure designed to pass fish and anticipated stream flows and large woody debris. At the tributary site on Williams Creek, a stream that flows into the mainstem Cedar River and that should provide high quality habitat for anadromous fish, the perched, iron/tile pipe currently blocking passage will be removed. This structure will not be completely replaced, only footings will be installed to leave the site ready to

accept installation of a temporary bridge that will allow future access for equipment needed to implement aquatic restoration project(s) in the mainstem of Williams Creek beyond this location and most efficiently accessed by this route.

Financial Summary

The cost commitment for 2002 was \$139,200, and a total of \$71,419 in cost commitment funds was spent in this account in 2002. The total cost commitment expenditures for this project over HCP years 1 and 2 together are above commitments, due to high expenditures in 2001. (The 2001 cost commitment was \$132,000 (in 2001 dollars) and expenditures were \$400,007.) The crossing improvements completed in 2001 were unusually high-cost, individual projects that must be completed in one construction season, and, in general, expenditures in any given year will depend on the type and complexity of the crossing upgrade. As we did in 2002, we will focus largely on design in those years following the installation of high-cost structures.

HCP Program Element: Upland Restoration Thinning (C100024)**HCP Program Category: Upland Forest Restoration**

Contacts: Amy LaBarge, Senior Forest Ecologist, and Stan Pasin, Watershed Resource Specialist, Watershed Management Division

Objectives & Goals

The objective of this element is to use thinning in young upland forests (generally less than 30 years old) to accelerate development of late-successional and old-growth forest conditions, to develop habitat that supports diverse native wildlife, and to reduce the chance of catastrophic damage to the forest through wildfire, insect outbreak or disease. These young forests have developed as a direct result of commercial timber harvest that occurred within the watershed during the past several decades. They often have a very high density of trees that results in intense competition for light, water, and nutrients. Restoration thinning involves cutting trees to a desired spacing to promote more rapid tree growth, improve current habitat, and accelerate the development of older forest characteristics. Because the relative value of restoration thinning diminishes as a stand ages, efforts in HCP years 1-16 will focus on thinning large areas of very high tree density.

Status of Work (2002)

In 2002, approximately 1,350 acres were restoration thinned, well in excess of the 800-acre target for HCP year 2. The target was exceeded because the cost per acre was less than anticipated, and more restoration thinning areas have been identified than can be accomplished at the estimated annual acreage level in 16 years. In 2002, restoration thinning was focused in the upper watershed, which is dominated by the Pacific silver fir forest type. These forests grow more slowly than Douglas-fir forests in the lower watershed, so the age at which restoration thinning is appropriate may be older than 30 years. Many stands needing thinning had already been identified and mapped prior to implementation of the HCP, but in 2002 additional forest stands were identified as appropriate for restoration thinning. Staff designed restoration thinning unit locations and boundaries through a landscape analysis approach, and units included young forest of different ages and species compositions. The restoration thinning prescriptions were developed by an interdisciplinary team and were designed to leave existing large trees, retain diverse species (preferring western red cedar and hardwoods), and create snags (dead trees) through girdling. Monitoring occurred in two restoration thinning areas to provide baseline data for future monitoring and adaptive management efforts. Planning occurred for 2003 restoration thinning sites, including the preparation of a site-specific restoration thinning management plan. Surveying was performed to identify and mark City ownership boundaries for 2002 and 2003 restoration thinning work.

Looking Ahead (Planned 2003 Accomplishments)

Approximately 1,010 acres will be thinned in 2003. Three types of prescriptions will be implemented on young forests in the upper watershed. Monitoring activities will document forest stand characteristics before and after thinning to establish baseline information for future effectiveness monitoring and adaptive management. Planning for 2004 restoration thinning areas will continue, with a small amount of surveying at watershed boundaries to ensure that activities will be on City land. The program manager and the interdisciplinary team will continue consulting with experts on forest restoration to develop the most effective approaches to young forest thinning to accomplish HCP objectives. Computer growth models will also be used to investigate different approaches and their outcomes. Additionally, strategic planning will continue to select and prioritize sites for restoration thinning in the watershed.

Financial Summary

The HCP commits funding of \$1,872,240 for HCP years 1-8 (in 2002 dollars), with an average of \$234,030 per year. A total of \$210,002 was expended in 2002, including restoration thinning contractors and surveyors.

HCP Program Element: Upland Ecological Thinning (C100027)

HCP Program Category: Upland Forest Restoration

Contact: Amy LaBarge, Senior Forest Ecologist, Watershed Management Division

Objectives & Goals

The objectives of this element are to use ecological thinning in forests greater than 30 years old to accelerate the development of characteristics associated with older forests, increase biological diversity, facilitate ecosystem function, and reduce the risk of catastrophic events, such as wildfire, insect outbreak or disease. Ecological thinning may use a variety of silvicultural techniques, including variable density thinning and gap and snag creation, and it is focused on stands with relatively high tree density and little structural complexity. Thinning will remove trees to create variable spacing in the remaining forest, retain and develop large trees and trees of varied height and diameter, increase species diversity, and encourage structural complexity. The HCP provides that trees can be removed from an ecological thinning site after the ecological objectives have been met. These surplus trees may be sold under ordinance authority.

Status of Work (2002)

Intensive planning for the 45 Road Forest Restoration Project (formerly called the Demo Thin) was completed in 2002 and a site specific management plan was developed. The Seattle City Council approved the ecological thinning ordinance (ordinance #121039) in December 2002, giving authority to cut and sell surplus trees from this project site. Trees to be cut and removed were painted by a consultant, and an appraisal was performed. A cultural resource survey was performed, and information technology consultants provided mapping expertise. This ecological thinning project will accelerate the development of forest structure and habitat typical of old-growth stands by implementing variable density thinning prescription, leaving the largest conifer trees, all hardwood trees and less prevalent conifer trees, all snags given safety considerations, and creating some down logs by cutting trees. The trees remaining after thinning will have more growing space and will therefore maintain or accelerate growth. This project will be planted under the Upland Restoration Planting program (see separate summary), which will further increase the species diversity and structural complexity of the site.

Planning also commenced on the 700 Road Ecological Thinning project. A contractor performed a cruise, and a cultural resource survey design was prepared. An interdisciplinary project team was assembled to plan the project, develop ecological objectives, and formulate silvicultural prescriptions for the site. This project is planned for implementation in 2004.

Looking Ahead (Planned 2003 Accomplishments)

Baseline monitoring for the 45 Road Forest Restoration project, which includes control and treatment areas, will be performed before and after the silvicultural treatment implementation. The contract will be finalized and advertised to implement the project, and implementation will occur during summer 2003. Planning and field layout will continue for the 700 Road Ecological Thinning project, including marking boundaries, flagging special treatment areas, determining engineering options and needs, and painting trees to be cut and removed, in addition to cultural resource surveys. Additionally, field assessment of other potential ecological thinning areas will commence, including delineation of area boundaries and cruising. Strategic planning will continue to select and prioritize sites for ecological thinning in the watershed.

Financial Summary

The HCP commits funding of \$290,000 for HCP years 1-8 (in 2002 dollars), with an average of \$36,250 per year. A total of \$35,084 was expended in 2002 for forestry, archeological and mapping consultation for the 45 Road Forest Restoration project and the 700 Road Ecological Thinning project.

HCP Program Element: Upland Restoration Planting (C100025)
HCP Program Category: Upland Forest Restoration

Contact: Amy LaBarge, Senior Forest Ecologist, Watershed Management Division

Objectives & Goals

The objective of this element is to restore the species diversity and ecological complexity through restoration planting in upland forest ecosystems. Restoration planting will benefit forest biological diversity by increasing plant community diversity to a level similar found in naturally regenerated forests on comparable sites. For example, enhancing the hardwood component in forests currently dominated by conifer trees will increase stand structural complexity and support more diverse wildlife and epiphytic plant species. Planting may include trees, shrubs, and forbs, as well as flora such as lichens and mosses. Projects will be monitored, data analyzed and techniques changed to increase understanding of how desired effects can be achieved.

Status of Work (2002)

Upland restoration planting prescriptions were prepared as part of the 45 Road Forest Restoration project, and that planting will be implemented in late fall 2003 after the ecological thinning is completed. A survey of young, poorly stocked forest areas in the watershed was commenced to identify potential sites for upland restoration planting; the survey report is due in second quarter of 2003. An assessment of techniques for planting non-traditional flora, such as cryptogams, orchids, mistletoe, and heart rot fungi was commenced, and the report and initial project designs are due in fourth quarter 2003.

Looking Ahead (Planned 2003 Accomplishments)

Sixty-four acres will be planted with conifer and hardwood trees in the 45 Road Forest Restoration project. The stocking survey report will be completed and planting prescriptions will be prepared for identified areas. A portion of those areas will be planted with conifer trees in late fall 2003. Plans for planting trees, shrubs, and non-traditional flora will be developed in conjunction with the 700 Road Ecological Thinning project. Volunteer groups will be used to a small extent for upland restoration planting projects and data collection. Upland restoration planting projects will often be integrated with other HCP projects, such as ecological thinning. Strategic planning will continue to select and prioritize sites for restoration planting in the watershed.

Financial Summary

The HCP commits funding of \$87,040 for HCP years 1-8 (in 2002 dollars), with an average of \$10,880 per year. No cost-commitment dollars were expended in this program in 2002.

HCP Program Element: Common Loon Monitoring (N541811)
HCP Program Category: Watershed Aquatic Monitoring and Research

Contact: Dwayne Paige, Senior Watershed Ecologist, Watershed Management Division

Objectives and Goals

Document the reproductive success of common loons nesting within the Cedar River Watershed, especially those utilizing habitat in the Chester Morse Lake/Masonry Pool complex, and provide alternative nest sites through the deployment of artificial nest platforms at appropriate selected location(s) and under appropriate environmental circumstances.

Status of Work (2002)

Although common loons use many lakes in Washington as foraging and resting habitat, often tolerating high levels of human activity, only 10-12 of these lakes are currently known to have supported active nesting in any given year or on a regular basis at any time during the last decade. Nesting habitat and structures are potentially available in willow-dominated zones of the Cedar and Rex River deltas and in specific small areas of Masonry Pool. This nesting habitat, however, is currently subject to springtime water level fluctuations over the course of the nesting season (April through mid-June) of up to 10 ft or more under the present reservoir operating regime.

Relatively little is known about the historic presence or reproductive success of common loons within the Cedar River Watershed prior to the last 20-25 years. Despite the lack of information before that period, a general knowledge does exist of (1) the historic uses of the watershed, (2) the major habitat changes through time, and (3) the degree of protection that has been afforded Chester Morse Lake over the last 100 years. We can reasonably assume that loons have nested on the shores of the Chester Morse Lake reservoir for many decades, and probably on the original natural lake (Cedar Lake) for hundreds of years. In the period of the mid-1970s to late-1980s, loons were frequently sighted on Chester Morse Lake, and young chicks were observed by City staff on the Masonry Pool at least once in each of the years 1979, 1982, and 1988.

In order to reduce adverse effects of reservoir fluctuations on nesting loons, since 1990 the City has been conducting an experimental nest platform program in which artificial floating platforms with native vegetation are deployed at the beginning of the loon nesting season, or when reservoir water levels allow, to provide more stable nest sites. Although the platforms are not sufficient to counteract the effects of reservoir fluctuations of more than about 5-8 ft, such as occur during a prolonged, early season drought, this program has demonstrated some success. Platforms have been used by nesting loons in at least one, and typically two, of the three nesting territories on the reservoir complex in each of the 13 project years during the period 1990-2002; a platform has been used in 12 consecutive years in one territory; and a platform has been used in 9 of 13 years in a second territory. Of 30 nests on the reservoir during the period 1990-2002, 22 (73 percent) have been on platforms. Of the 31 chicks produced during this period, 7 chicks hatched on natural nests and 25 chicks (81 percent) hatched on the platform nests.

Monitoring during three common loon nesting seasons (2000, 2001, and 2002) since implementation of the HCP has extended the long-term data record of loon reproduction on the Chester Morse Lake/Masonry Pool complex with somewhat atypical results. In 2000, two of the three pairs in the system nested on experimental platforms, the third pair did not nest. One platform nest produced two chicks. The other platform nest was lost early to a predator or scavenger, but the re-nesting effort of this pair on a natural nest site produced a single chick. Although disappointing, observations during 2001 documented the first year within the last decade in which no loon chicks were produced in the watershed. This result was significant in that, although nesting conditions in the watershed (e.g., lake levels) were apparently normal, none

of the three pairs nested successfully. The only nesting attempt was on a platform nest that was lost to a predator or scavenger early in the nesting period as in the previous year; however, no re-nest was established in this case.

Observations of loon nesting activity during 2002 regrettably documented the second year within the last decade, and the second year in succession, in which no loon chicks were produced in the watershed. Although one loon pair attempted to nest on an artificial platform, the level of harassment by bald eagles at the platform site was apparently pervasive enough to cause nest abandonment, and no evidence of re-nesting was observed. Although present within their traditional 'territories' on Chester Morse Lake and the Masonry Pool and initially exhibiting behavior indicative of searching for nest sites, there was no definitive indication that the other two loon pairs established nests. As in 2001, the lack of chick production was significant in that, although nesting conditions in the watershed (e.g., lake levels) were apparently normal, none of the three pairs nested successfully. The lack of common loon reproductive success documented in the Cedar River Municipal Watershed in both 2001 and 2002 was not inconsistent with overall results throughout western Washington, which may suggest a regional, rather than local environmental influence on nesting success during these years. Harassment of nesting loons at and in close proximity to nest sites, however, has been observed more frequently during the last several years on the Chester Morse Lake/Masonry Pool complex, as well as at other nest sites in Washington, and may become more of a threat to the nesting success of common loons in the future than has apparently been the case during the previous decade of research and monitoring.

The importance of the Cedar River Watershed as habitat for common loons takes on added significance when considered in a regional or statewide context, as the three pairs of common loons that typically nest in the municipal watershed have constituted more than one-quarter of the loons nesting in Washington State in many recent years. The production of fledglings from the watershed has, in many years, constituted an even larger fraction of the fledged loons produced in the state, likely as a result of the degree of security within the watershed compared to the high levels of human disturbance to nesting loons on lakes open to the public. As population growth and development pressure from the Seattle/Tacoma metropolitan area continue to diminish the quantity of loon habitat (through housing development around lake and reservoir shorelines) and the quality of habitat (through increasing recreational boat use of lakes and reservoirs, and through sediment input), the availability of undisturbed habitat in the municipal watershed will play an increasingly critical role in maintaining the viability of populations of common loons that nest in the Puget Trough and the western Washington Cascades.

Looking Ahead (Planned 2003 Accomplishments)

Staff will continue to monitor common loon reproductive activity and will deploy experimental nest platforms (as long as monitoring continues to document the efficacy of the program) during 2003 on the Chester Morse Lake/Masonry Pool complex.

Financial Summary

The HCP commits funding of \$29,000 for HCP years 1-10 (in 2002 dollars), with an average of \$2,900 per year. A total of \$2,900 was expended for cost commitments in years 2002.

HCP Program Elements: Bull Trout Spawning Surveys (N541805)
Bull Trout Fry/Juvenile Surveys (N541806)
Bull Trout Stream Distribution Surveys (N541809)
Bull Trout Surveys (adult/weir) (N541804)
Bull Trout Redd Inundation Study (N541810)
Bull Trout Steam Telemetry Studies (N541807)

HCP Program Category: Watershed Aquatic Monitoring and Research

Contact: Dwayne Paige, Senior Watershed Ecologist, Watershed Management Division

Objectives and Goals

Document the overall distribution of bull trout spawning habitat within the CRW (CRW) and monitor long-term trends in the annual level of spawning activity in “core” spawning habitat as an index of the status of the adfluvial bull trout population in the Chester Morse Lake drainage basin.

Document the basic behavior patterns of bull trout fry (e.g., emergence/outmigration timing), evaluate spring “fry counts” as a potential index of the adfluvial bull trout population and habitat use, and determine the distribution of juvenile rearing habitat within the CRW.

Document the overall extent and distribution of major stream and tributary habitat used by bull trout (all life history stages/forms) within the CRW in order to facilitate development of the most effective management prescriptions for protection and/or enhancement of bull trout habitat under conservation and mitigation strategies of the HCP.

Status of Work (2002)

Numbers of bull trout redds located during recent years have varied widely as a result of natural bull trout behavior, stream flow conditions (i.e., high flows), and staff time available to conduct surveys. During the 2000 season, however, relatively low river flow conditions were ideal for conducting spawning surveys, and additional HCP staff was available to conduct more intensive surveys. A conservative total of 236 redds were observed within the Chester Morse Lake drainage basin, which was more than double the previous high count of 111 redds. In the 2001 season, staff again observed a conservative total of 236 redds within the Chester Morse Lake drainage basin. Based on information from other studies, the number of bull trout redds observed in two consecutive seasons appear to fall well within the range of numbers of redds that would be predicted for a viable, adfluvial bull trout population of this size. Spawning activity was also observed in some side-channel reaches where spawning activity had not previously been documented. Also, the spawning season in 2001 extended into mid-January, approximately four weeks longer than previously documented, and a similar pattern was observed in 2002.

Data collected by Fish and Wildlife Unit staff indicate that the adfluvial bull trout population present in Chester Morse Lake spawned in record numbers in ‘core’ spawning reaches of major lake tributaries during fall/early winter (September – January) of 2002-03. Despite experiencing near record low flow levels in the Cedar River and other major spawning streams in the watershed, as well as unusually low reservoir levels (i.e., ‘drought’ conditions) in Chester Morse Lake, bull trout were able to pass potential barriers at the confluence with the lake and find adequate gravel and flow conditions in traditional spawning reaches. The highest previous bull trout redd counts in ‘core’ spawning reaches prior to this season’s survey were 236 redds in both 2000 and 2001. This number was more than doubled in 2002-03 with a count of 504 redds. Information of this type, collected over the long-term and under a variety of environmental conditions, is necessary to understand habitat requirements of this ‘threatened’ species and to make informed management decisions in order to protect this ‘unique’ population of bull trout

and its habitat in the municipal watershed. Again for the third year in succession, the number of bull trout redds observed in 2002-03 falls well within the range of numbers of redds that would be predicted for a viable, adfluvial bull trout population of this size.

Two experimental techniques have been used to investigate the seasonal timing of bull trout fry behavior and production in the Chester Morse Lake drainage basin. In the early 1990s, fyke nets were deployed at selected locations on the mainstem Cedar and Rex rivers to determine seasonal timing of fry movement and outmigration in mainstem reaches, indicating peak movement levels from mid- to late April. During 2000, 2001, and 2002, periodic surveys (direct observation) of bull trout fry have also been conducted in selected mainstem and side-channel reaches of the Cedar and Rex rivers, as well as in selected tributary streams (e.g., Boulder, Cabin, Eagle Ridge, and Morse creeks) to document habitat use and general fry behavior, and to identify general trends in the relative number of bull trout fry present in the tributaries of Chester Morse Lake from year to year. This technique is experimental at present and will be evaluated for possible use as an index to monitor annual bull trout fry production under the HCP. The presence of fry was also observed in some side-channel reaches where rearing activity had not previously been documented. Observations of fry in some reaches also indicated earlier dates of emergence and movement in streams than previously documented in this system.

The Chester Morse Lake bull trout population was conservatively estimated to be approximately 3,100 fish, and general distribution within the lake was documented in 1995 (R2 Resource Consultants, 2001). The full extent of the distribution of bull trout in tributary streams is currently incomplete. The presence of bull trout has, however, been documented in the mainstem of the Cedar River upstream from Chester Morse Lake, 0.7 mile into the North Fork to a natural barrier (falls) and also 0.7 mile into the South Fork to a partial seasonal barrier. The presence of bull trout has also been documented in Eagle Ridge Creek (a rearing area) and in several floodplain channels in the Cedar drainage. In contrast to the rainbow trout distribution within the lake basin, bull trout (or redds) have only been observed in three of the smaller tributaries to the reservoir complex (i.e., Rack Creek, Shotgun Creek, and Damburat Creek (single observation)). Bull trout have not yet been found in certain major tributaries of the Cedar River including Bear Creek, which is accessible and rainbow trout are present. Within the Rex River system, bull trout have been observed upstream in the mainstem as far as the confluence of Lindsay Creek, in Boulder Creek and Cabin Creek (spawning/rearing), and in Morse Creek and Lindsay Creek (rearing only). Observations during 2000-02 (see above) increased the known distribution of spawning and rearing habitat, but limited surveys in a few selected reaches did not extend the overall known range of bull trout within the watershed.

Surveys in several streams during 2002 extended both the known range of bull trout presence and life stage habitat use within the basin. The known presence and distribution of both bull trout spawning and rearing habitat was extended in Rack Creek, a small tributary to Chester Morse Lake. The overall distribution range and specific use of additional rearing habitat was also confirmed in upper Boulder Creek and in a small side-channel of the mainstem Rex River. Surveys in selected reaches of two other major tributary streams (South Fork Cedar and Bear Creek), thought to have substantial habitat suitable for bull trout and previously surveyed, again failed to detect the presence of bull trout.

Fish passage to reaches upstream of the lake perimeter forest road (200 road) was restored at the Shotgun Creek crossing during late summer 2001 by removal of perched culverts and replacement with a pre-cast cement bridge. Installation of this structure provided potential access for both bull trout and rainbow trout from Chester Morse Lake to upstream reaches that had been previously inaccessible for decades. Initial monitoring to detect the presence of fish in newly accessible reaches was conducted during summer/fall of 2002, but no re-colonization of upstream reaches was detected. A major factor affecting the rate of re-colonization of upstream reaches is the fact that the entire stream reach from the confluence with Chester Morse Lake to the bridge

typically exhibits subsurface flow conditions on an annual basis. Upstream reaches, however, typically remain wetted with moderate flow. The especially low flow and/or dry condition during 2002 may have severely constrained the ability of either species to reach the newly accessible habitat. This constraint may delay the re-colonization of upstream reaches for an undetermined period of time. Also, until fish re-establish residency in upstream 'refuge' habitat not affected by annual subsurface flow conditions, the presence and/or absence of fish in downstream reaches will presumably continue to vary widely.

Several aspects of the Chester Morse Lake adfluvial bull trout population are ecologically 'unique', especially its isolation from anadromous influence over a substantial expanse of recent geologic time. As a result, the upper Cedar River Municipal Watershed (CRMW), encompassing critical habitat for this population, has been designated as the 'Chester Morse Lake Core Area' in the first draft of the Puget Sound chapter of the federal Recovery Plan for bull trout, soon to be submitted to the USFWS Regional Office in Portland, OR, for review. Because of the degree and extent of physical isolation of this population, the genetics of the population as a whole is of potential regional and evolutionary significance. In addition, the potential for local populations to have differentiated within the Cedar system also has implications from the perspectives of both reservoir (i.e., water supply) and land management within the watershed.

As one component of 'stream distribution', in order to address the issue of genetic structure and relationship of the Cedar population on both a local and regional basis, Fish and Wildlife Unit staff collected tissue samples from juvenile bull trout in tributaries of Chester Morse Lake (e.g., Rack Creek) and in the Cedar and Rex rivers and their tributaries (e.g., floodplain channels, Boulder Creek, Cabin Creek) during summer 2002. These samples will be analyzed during 2003 in order to develop a clear picture of bull trout genetics within the Cedar system and their potential relationship to other bull trout populations on both regional and evolutionary scales.

A fish weir project was initially proposed as one potential method to obtain physical and behavioral data on the adfluvial bull trout spawning population accessing habitat in the major tributaries of Chester Morse Lake (Cedar and Rex rivers), as well as to efficiently support (e.g., fish capture) other HCP monitoring and research projects, such as lake and stream telemetry and redd inundation studies. At least two factors have recently come to light, that in combination, make it advisable to at least temporarily delay and reevaluate the ecological risks (and logistics) associated with this project. First, observations in some bull trout populations (and other salmonids) have indicated that weirs and/or the capture process may adversely affect aspects of natural bull trout spawning behavior (e.g., upstream and/or downstream position of spawning). The potential of interference from a weir may be of particular concern in a system, such as this one, where the actual effect of spring inundation (a result of reservoir fill regimes) of bull trout redds remains a question, and relative location of redds within the accessible reaches may be of potential significance to annual reproductive success. Secondly, bull trout redd counts in these systems over the last decade have been highly variable, as influenced by diverse environmental survey conditions (e.g., peak stream flow events) and differing levels of survey effort, as well as the natural variability of bull trout spawning behavior in these dynamic systems. The data collected in the last three years, however, indicate spawning levels consistent with expectations for a population of this size, providing a sufficient basis for making a decision regarding whether or not the weir would be the best approach to use for developing an index for use in monitoring relative change in population size over time.

Looking Ahead (Planned 2003 Accomplishments)

Staff will continue to conduct surveys under each of these three bull trout monitoring projects during 2003-04 with the intent of extending documentation of the overall range of bull trout in the watershed, increasing knowledge relative to timing of bull trout life history stages and behavior, and adding to current information on bull trout habitat use. In addition, monitoring of the

potential re-colonization of upstream reaches of Shotgun Creek will continue and results of the initial genetic analyses will be completed. As mentioned above, the City will try to reach agreement with the USFWS regarding the best approach to developing an index for monitoring bull trout relative population change over time, as was one intent of the weir proposal described above, and initiate the project in 2003. The City plans to scope and design the bull trout redd inundation study in 2003 and to implement initial steps during fall/winter 2003/4. The City will also conduct topographical surveys in core spawning reaches of the Cedar and Rex rivers to better evaluate the potential risk of inundation during spring reservoir refill.

Financial Summary

	Year 2 Cost Commitment (2002 dollars)	Year 2 Cost Commitment Expenditures (2002 dollars)	Work accomplished
Bull Trout Spawning Surveys (N541805)	\$40,600	\$17,311	Surveys completed
Bull Trout Fry/Juvenile Surveys (N541806)	\$40,600	\$17,286	Surveys completed, continuing evaluation of fry enumeration methods and techniques. Expanded range of known juvenile habitat. Cost includes data management support and collection of DNA samples from juveniles.
Bull Trout Stream Distribution Surveys (N541809) ¹	\$0	\$7,093	Completed surveys of selected stream reaches in 2002, expanding know range of bull trout.
Bull Trout Redd Inundation Study (N541810)	\$63,800	\$9,112	Deferred to 2003-2004
Bull Trout Steam Telemetry Studies (N541807)	\$69,600	\$0	Deferred to 2005
Bull Trout Surveys (adult, weir) (N541804)	\$58,000	\$11,223	Continued discussion with USFWS and evaluation regarding appropriate methods and timing. Plan to initiate in 2003.

HCP Program Element: HCP Program Element: Watershed Characterization--Includes Assessment of Expanded Forest Stand Attributes (N541501), Assessment of Expanded Forest Attributes (N541502), Augmentation of Forest Habitat Inventory (N541503), Long-term Forest Habitat Inventory, Old-growth Classification, Field Verification (N541504, N541505), Forest Habitat Modeling (N541516), and Species-Habitat Modeling (N541517)
HCP Program Category: Terrestrial Research and Monitoring

Contact: Duncan Munro, Remote Sensing Specialist, Amy LaBarge, Senior Forest Ecologist, and Dwayne Paige, Senior Planning and Development Specialist, Watershed Management Division

Objectives & Goals

The purpose of the watershed characterization project is to provide information to support the following three major uses of that information under the HCP regarding management of the Cedar River Municipal Watershed (CRW): (1) plan and prioritize habitat restoration projects to meet HCP goals and objectives, (2) track changes in habitats over time, and (3) evaluate alternative approaches for different kinds of restoration projects. This project encompasses the specific HCP commitments listed in the title above, as well as the more general commitments to plan and prioritize restoration activities on a landscape scale. Because the inventory data and remote sensing data used to develop the HCP are out of date, the funding for the above-listed activities is being combined for a comprehensive approach to providing up-to-date, useful information for planning and monitoring. The project is being closely integrated with a project to develop an Information Framework and a project to develop an overall approach to monitoring and research.

Status of Work (2002)

- Established a Watershed Characterization Interdisciplinary Team (IDT): This IDT has begun and will continue to plan and implement the watershed characterization project.
- Completed a proposal for the establishment of potential permanent sample plots (PSPs): This proposal offers an integrated data acquisition and analysis strategy. It encompasses an evaluation of the advantages and limitations of PSPs, their contribution within the overall suite of data acquisition and analysis activities, and an implementation plan.
- Documented a comprehensive suite of data variables: These variables will address a series of key questions that will support management decisions to be taken during design and implementation of restoration activities.
- Continued to integrate field inventory with remote sensing data: Image analysis data included information from aerial photos, satellites, and other sensors on fixed-wing aircraft to provide the most useful, cost-effective characterization of watershed habitats.
- Documented the completeness and quality of existing data that characterize the Cedar River Watershed: The watershed Characterization IDT summarized the development, documentation, and quality of existing data to assess the usefulness of those data in meeting the uses stated above and to substantiate new data acquisitions.
- Continued acquisition, and analysis of remote sensing data sets: geo-rectified and analyzed MASTER (multispectral) data, and reached an agreement with King County to acquire LiDAR in 2003 (potential products include canopy surface and ground surface models).
- Purchased updated set of color aerial photos and completed photo typing of forest stands.

Looking Ahead (Planned 2003 Accomplishments)

In 2003, we will continue to work on developing the most cost-effective and useful approach to developing a logical basis for watershed characterization; using existing information and information expected to be acquired in 2003; integrating inventories of aquatic, riparian, and upland habitats; and integrating field sampling information with remote sensing data for greatest usefulness and the most cost-effective use of the funding available. We will continue to pursue collaborative efforts and external grant funding to “leverage” the funding in the HCP.

Primary activities in 2003 will include:

- Complete the “interim landscape plan” for restoration projects in the 2-5 year time frame, and continue working on the long-term, landscape-level plan for restoration activities
- Integrate on-hand field data with MASTER data
- Complete a road inventory to support prioritization of road decommissioning and improvement work
- Acquire LiDAR data from King County
- Continue to evaluate appropriate forest growth models and species/habitat relationship models (see summary on Species/Habitat Modeling)
- Continue to evaluate existing field data to combine with new image analysis data for comprehensive characterization of forest habitats in the CRW
- Continue developing habitat classifications for aquatic, riparian, and upland habitats, and continue related field inventories
- Evaluate usefulness of permanent sampling plots for long-term monitoring, and, if pursued, develop funding strategies.

Financial Summary

	Year 2 Cost Commitment	Year 2 Expenditures	Work accomplished
Assessment of expanded forest stand attributes ¹	\$11,600	\$8,333	Design for field inventory system for forest stands; Development of image analysis (MASTER) data
Assessment of expanded forest attributes ¹	\$11,600	\$8,588	Design for field inventory system of forest attributes; Development of image analysis (MASTER) data
Augmentation of Forest Habitat Inventory ¹	\$17,400	\$8,334	Design for augmented forest habitat inventory
Long-term Forest Habitat Inventory ²	\$4,350	\$1,787	Purchase of aerial photos; Photo typing of forest stands
Old-growth Classification	\$0	\$0	Starts in HCP Year 3
Field verification of habitat classification ¹	\$13,043	\$7,000	Development of image analysis (MASTER) data with which to compare field data
Forest Habitat Modeling ³	\$10,880	\$7,000	Assessment of forest habitat and growth models (including FPS, FVS)
Species/Habitat Modeling ¹	\$23,200	\$17,867	See separate summary

1 The HCP commitments are funded to be accomplished within HCP years 1-5

2 Design within HCP years 1-5

3 The HCP commitments are funded to be accomplished within HCP years 1-8

HCP Program Element: Species/Habitat Relationship Modeling (contributes to Upland Forest Ecological Thinning, Restoration Thinning, and Restoration Planting,) (N541517)
HCP Program Category: Terrestrial Research and Monitoring

Contact: Bill Richards, Terrestrial Ecologist; Dwayne Paige, Senior Watershed Ecologist, Watershed Management Division

Primary Objective (initial project element)

Utilize Habitat/Dispersal Simulation Modeling as a tool to identify and aid prioritization of specific areas within the landscape of the Cedar River Municipal Watershed (CRMW) where forest restoration projects will be most effective in promoting mid- to late-seral forest connectivity as guided by the conservation strategies of the HCP.

Status of Work (2002)

This project is part of the Watershed Characterization project (see separate summary). In order to provide potential habitat benefits for populations of 28 wildlife species dependent on late-seral forest conditions, one of the goals of the HCP is to facilitate the restoration of late-seral forest characteristics by thinning relatively young and dense second-growth forest. The HCP commits to planning forest restoration on a landscape scale, prioritizing projects for the most potential benefit. This modeling application attempts to identify where ecological and restoration thinning projects will most likely contribute to the connectivity of mid- to late-seral forest habitat.

This project element is being conducted in two phases: 1) habitat modeling, and 2) dispersal simulations. The habitat-modeling phase combines the best available landscape data to define current forest habitat conditions using forest growth models (e.g., FVS, FPS) to predict forest conditions at the end of the 50-year HCP. Ecological and restoration thinning will be simulated in potential stands under current habitat conditions and 'grown' 50 years to produce alternative landscape conditions. The dispersal simulation phase utilizes a spatially explicit model (PATCH) designed to simulate populations of territorial, terrestrial vertebrate species. Comparing dispersal success and dispersal patterns for a range of late-seral dependent wildlife species between alternative landscape conditions will identify forest areas, that when thinned, will contribute most to future forested habitat connectivity. During 2001, we conducted preliminary evaluations of some available models, and preliminary evaluations of data needed for these models.

In 2002, we completed both phases of the modeling process as described above. Completion of this project element has provided the first planning 'tool' that we have developed under the HCP to address landscape-scale prioritization of forest sites in which to plan and implement restoration and ecological thinning to facilitate development of late-seral habitat conditions (e.g., connectivity).

Looking Ahead (Planned 2003 Accomplishments)

Staff will continue to investigate the availability and effectiveness of current technology pertinent to development and/or utilization of species/habitat modeling capability to support landscape level decisions for habitat protection and management under the Conservation and Mitigation Strategies in the HCP during 2003. As our capability to more accurately classify habitat within the watershed improves concurrently with advances in remote sensing technology (e.g., MASTER data, LIDAR), this analysis can be regenerated to refine results, provide a basis for comparison of alternatives, and improve predictive accuracy. Use of more advanced forest growth models that may have become available will also be investigated as a means of improving the accuracy of habitat condition simulations.

Financial Summary

The HCP commits funding of \$116,000 for HCP years 1-5 (in 2002 dollars), with an average of \$23,200 per year. A total of \$17,867 was expended in 2002, for staff time on modeling and remote sensing data to be used for forest characterization. (Also described in the summary on Watershed Characterization.)

HCP Program Element: HCP Information Resource Management (includes GIS Data Compatibility) (N541515)
HCP Program Category: Watershed Management

Contact: Tom Van Buren, IT Professional, Watershed Management Division

Objectives & Goals

Developing and maintaining a well-organized and efficient system of accurate databases, integrated and compatible with the GIS, is essential to support many HCP commitments within the Cedar River Municipal Watershed (CRW). In addition, as indicated in this section, most of the program elements are interdependent and rely on data and analyses from several tasks in order to be fully functional and effective as management tools. Therefore, it is critical that all databases are designed, maintained, and updated by a procedure that will ensure accuracy and integration of information, including the acquisition and incorporation of pertinent information from outside sources.

The objective of this program is to provide a systematic and efficient means by which data collection formats, incorporation of data into databases, database management, and integration with modeling efforts can be designed and maintained to maximize the system's ability to support HCP-related management activities. In addition, databases should be updated with the most current and best available information whenever possible from both departmental and appropriate external sources. Data management systems are being developed for various kinds of users, from technical specialists to the public.

Status of Work (2002)

- Watershed Catalog built - metadata tool and resource repository for photographs and documents (note: metadata are data about data, such as the origin and date of collection)
- Inventory of on hand spatial data completed and metadata tool built
- Geodatabase built, core GIS holdings converted to ArcGIS database
- Arc Internet Map Services built (to provide user access to GIS maps and data via a web browser)
- New database server installed
 - Development of a GIS grid of locations for potential permanent and additional inventory sample plots for upper and lower CRW.
- Acquired and georectified hyperspectral remotely sensed imagery (i.e., with many frequency bands) in collaboration with NASA and UW.
- Developed data dictionaries
- Developed metadata standards
- Developed logical data models

Looking Ahead (Planned 2003 Accomplishments)

- Build data capture and analysis tools for scientists using ArcGIS and the web:
 - + Road Inventory
 - + Stream Inventory
 - + Forest Inventory
- Develop Content Management System
 - + Share document components
 - + Adopt web services standards
 - + Build report templates and composite documents
- Develop Project Taxonomy and Project Information Management System

Financial Summary

The HCP commits specific funding of \$58,000 for HCP years 1-8 (in 2002 dollars), with an average of \$7,250 per year. The full \$7,250 was expended in Year 2. In addition, the HCP includes a variety of commitments that have no explicit HCP Cost Commitments but that create a need for linking information management to planning and documenting restoration, monitoring, and research activities.

Landsburg Mitigation Background

The anadromous fish conservation strategies are designed to mitigate for the blockage to fish passage created by the Landsburg Diversion Dam. These strategies are designed to complement other regional efforts to protect and restore declining stocks in the Lake Washington Basin. The intent is to implement biologically sound solutions that (1) contribute to the recovery and persistence of healthy, harvestable runs of anadromous fish in the Cedar River and Lake Washington Basin; (2) have a high likelihood of success; and (3) maintain a safe, high quality drinking water supply.

Anadromous salmonids have not entered the protected watershed in nearly a century. The HCP will provide passage for all native anadromous salmonids into the protected watershed, significant regionally as refuge habitat in that it is highly protected and in relatively good condition. Included among these native salmonids are chinook and coho salmon, and steelhead trout. The sockeye salmon stock in the Cedar River was introduced from the North Cascades. Because of risks to public health, the City cannot allow passage above the raw water intake of the mass-spawning sockeye salmon. In lieu of passage, the City commits to artificial propagation for sockeye, with extensive monitoring and appropriate adaptive management provisions to reduce or eliminate risks to wild fish. In addition, the City commits to funding habitat protection and/or restoration for anadromous fish in the Cedar River Basin downstream of Landsburg.

Specifically, the City has committed to the following activities:

- Provide funding to protect and restore habitats and populations of anadromous fish currently blocked from entry into the municipal watershed by the Landsburg Diversion Dam
- Construct fish ladders, protective screens on the water intake, and other improvements for the safe passage of chinook, coho, steelhead, and other native fish species over the Landsburg Diversion Dam, providing access to some of the most protected “refuge” habitat in the region
- Prior to construction of fish passage facilities, commit to interim mitigation for chinook, coho and steelhead, which could involve conducting key studies or emergency supplementation, if justified.
- Construct a new sockeye hatchery capable of producing up to 34 million fry, replacing the existing interim hatchery facility at Landsburg
- Continue to operate the interim sockeye hatchery at Landsburg as mitigation until the replacement hatchery is built
- Provide funding for habitat protection and restoration downstream of the Landsburg Diversion Dam for all anadromous fish species
- Develop and implement a comprehensive program of research, monitoring, and adaptive management for salmon and steelhead
- Create the Cedar River Anadromous Fish Committee, comprised of agencies signatory to the Landsburg Mitigation Agreement and other stakeholders, which will advise the City regarding implementation of anadromous fish mitigation

The following pages provide summaries of the individual HCP PROGRAM ELEMENTS under the Landsburg Mitigation program category.

HCP Program Element: Interim mitigation for Coho, Chinook and Steelhead (N663201)
HCP Program Category: Chinook, Coho, Steelhead Mitigation

Contact: Bruce Bachen, Senior Fish Biologist and Paul Faulds, Fish Biologist, Water Management Section

Objectives and Goals

This program has two main objectives, gathering biological information that is critical in designing and managing effective, biologically sound short-term and long-term conservation measures, and if appropriate, designing and implementing supplementation programs to help preserve one or more of the populations.

Status of Work (2002)

The AFC recommended that collection of steelhead at the locks be undertaken in 2002 to provide potential broodstock for planting the Cedar River to try to restore returns. This recommendation was approved by the Parties, but was not implemented due to various concerns, including the need for additional understanding concerning the causes of decline.

The Anadromous Fish Committee voted to recommend funding a Washington Department of Fish and Wildlife (WDFW) proposal: Genetic relationships among anadromous and nonanadromous *Oncorhynchus mykiss* in Cedar River and Lake Washington: implications for steelhead recovery planning. The proposed two-year project will conduct a comprehensive genetic evaluation based on non-lethal sampling and the use of microsatellite DNA markers and maternally inherited mitochondrial DNA. The primary goal of the project is to understand genetic population structure of Cedar River/Lake Washington *O. mykiss* so that managers can design and implement strategies that effectively conserve and recover native steelhead and rainbow trout resources. The Parties to the Landsburg Mitigation Agreement (LMA) approved partial funding for the project, supporting the collection of genetic samples in 2003.

Late in 2002, the AFC recommended a submittal and evaluation process for proposals to help identify opportunities and to make timely recommendations. These recommendations were adopted by the Parties and went into effect prior to 2003.

Looking Ahead (Planned 2003 Accomplishments)

Steelhead genetics

WDFW will be collecting genetic samples for the project: Genetic relationships among anadromous and nonanadromous *Oncorhynchus mykiss* in Cedar River and Lake Washington: implications for steelhead recovery planning.

Colonization above Landsburg Dam

The Anadromous Fish Committee voted to recommend funding the proposal: Investigations and Monitoring of Recolonization by Pacific Salmon of the Cedar River Upstream of the Landsburg Diversion Dam. The project is looking at a multi-year monitoring program to evaluate chinook, coho and steelhead as they migrate upstream of the Landsburg Dam with the completion of fish passage in the fall of 2003. The goal of the project is to provide a comprehensive evaluation of spawning adults migrating upstream of Landsburg and the production of juvenile fish from the recolonized Cedar River system. In 2003, the main objectives are to evaluate anadromous fish as they migrate upstream of Landsburg Dam, evaluate spawning distribution upstream of Landsburg Dam, and install a trap at the water intake bypass pipe to evaluate juvenile's migrating downstream in 2004. The Parties to the Landsburg Mitigation Agreement (LMA) approved this project.

Adult PIT tag detection at the Ballard Locks

The Anadromous Fish Committee also recommended funding a proposal by the US Army Corps of Engineers and Washington Department of Fish and Wildlife to install PIT Tag readers in the fish ladder at the Hiram Chittenden Locks. The primary objective of this work is to monitor for adult salmon returning to Lake Washington that were PIT tagged as juveniles in 2000 through 2004 in the Cedar River and elsewhere in the Lake Washington basin in order to evaluate questions associated with juvenile outmigration. Detection rates decline over time and it is unclear whether this is due to changes in exit pathways at the locks, in lake mortality rates or rates of residualization. The Parties to the Landsburg Mitigation Agreement (LMA) approved this project.

Financial Summary

The HCP provides \$835,200 (2002 dollars) for this program for HCP years 1-8. The HCP commitment for interim mitigation for chinook, coho, and steelhead in 2002 was \$104,400 and no funds were spent from this program.

HCP Program Element: Landsburg Fish Passage Improvements (intake screen, fish ladders and downstream passage construction)

HCP Program Category: Chinook, Coho, Steelhead Mitigation

Contact: Bill Wells, Project Manager, Field Operations Branch

Objectives and Goals

Construct Fish Passage at Landsburg.

Status of Work (2002)

The project is on schedule, and is currently on track to be completed within the construction budget established in GC/CM construction contract. The construction is currently about 85% completed.

Significant accomplishments:

- Completed rock drop fish passage construction at Landsburg Aqueduct crossing August 9, 2002 allowing sockeye and chinook salmon to spawn above the aqueduct this fall for the first time in 70 years.
- All summer 2002 instream construction activities completed on schedule and without any citations or water quality violation notices from regulatory agencies.
- Completed installation of new downstream fish passage gate November 2002.
- Completed Landsburg park improvements and riparian restoration along entrance road December 2002.
- Began construction of new intake fish screen December 2002.

Looking Ahead (Planned 2003 Accomplishments)

- Completed fish ladder exit construction at intake forebay on April 2, 2003. The exit construction was scheduled during a 10 day diversion shutdown and was completed 2 days ahead of schedule.
- New intake screen to be operational by June 2003.
- Completion of ladder/ sorting and holding facilities at Landsburg Dam in summer 2003
- Facilities Start-up and testing summer 2003
- Barring anything unforeseen, the fish passage facilities will be operational by August 31, 2003.

Financial Summary

Landsburg Mitigation – Fish Passage 2002 HCP cost commitment was \$2,900,000. Actual expenditures in 2002 were \$5,196,000 (inclusive of sales tax, SPU staff costs, and \$400,000 in King County permit expenses and imposed construction mitigation).

HCP Program Element: Interim Mitigation for Sockeye Salmon (N663202)
HCP Program Category: Sockeye Mitigation

Contact: Bruce Bachen, Senior Fish Biologist and Paul Faulds, Fish Biologist, Water Management Section

Objectives and Goals

The Washington Department of Fish and Wildlife (WDFW) operates a sockeye broodstock collection facility and hatchery on the Cedar River through an agreement with Seattle Public Utilities. The interim hatchery program first began operations in 1991 and the broodstock collection facility has been in operation since 1993. The interim hatchery will be in operation until 2005, at which time a new facility is expected to start operation. The hatchery program involves the incubation and release of marked unfed sockeye fry into the Cedar River so they can volitionally outmigrate and rear naturally in Lake Washington. To maintain this program, broodstock are collected at a weir and fish trap located at river mile 6.5. The weir is operated to achieve a preset egg take goal based on preliminary counts of returning adult sockeye at the Hiram Chittenden Locks and to avoid adverse impacts to adult chinook salmon. Broodstock are transported to an adult holding facility at Landsburg and spawned when ripe with the goal of having a 1:1 male to female spawning ratio. Weekly targets for gamete collection are based upon the average run timing curve for the Cedar River. Fertilized eggs are then incubated at the hatchery and the resulting emergent fry are released into the river.

Status of Work (2002)

In the fall of 2002 WDFW provided the Anadromous Fish Committee (AFC) and SPU a summary report that detailed the interim hatchery operation from broodstock collection in the fall of 2001 through the last fry release in March of 2002. In 2002 the interim hatchery released 12,532,000 fry in the Cedar River. There were four different release locations and the numbers varied at each site: 2,861,000 at river mile (RM) 21, 2,527,000, at RM 13.5, 2,900,000 at RM 1.9, and 4,244,000 at RM .1.

Preliminary counts at the Hiram Chittenden Locks in June and July indicated a moderate run of sockeye entering Lake Washington for the 2002 brood year. As a result, the hatchery facility adopted an eggtake goal of 17.2 million for broodyear 2002 based upon an average fecundity of 3,200 eggs per female and a 1:1 male to female spawning ratio. Due to a surge of adult sockeye counts at the Locks in the middle of July 2002, State and Tribal fisheries managers concluded that sufficient numbers of sockeye entered the lake to allow for a 3-day tribal and sport harvest from July 26-28. Tribal and sport fisheries harvested over 60,000 fish and WDFW estimated the escapement for the Cedar River was approximately 200,000 sockeye. The sport fishery was sampled and 22.8% of the sampled catch were of hatchery origin. This was the 3rd consecutive year of a relatively good return of sockeye to Lake Washington.

WDFW began trapping fish on September 9th at the weir (RM 6.5) on the Cedar River and removed the weir on November 12th after meeting the eggtake goal of 17.2 million. Incubation proceeded normally at the hatchery until February when routine IHN virus testing detected an outbreak of virus in one incubator. Subsequently, IHN was detected in 5 additional incubators out of a total of 73. Overall, the outbreak of virus caused the direct loss of 942,000 fry that were destroyed while in incubators. In addition, post-release testing results indicated that some virus existed in incubators housing 405,000 fry. All releases were tested and no virus was detected in the remaining 67 incubators, from which 15.6 million fry were released. It appeared that the operating protocols used at the hatchery were effective in preventing a catastrophic loss, which can sometimes occur with IHN, by keeping the disease isolated to specific incubators.

There is an inherent risk of IHN disease in sockeye culture because infectious hematopoietic necrosis virus (IHNV) is found in nearly all anadromous adult sockeye during spawning and can cause severe losses in young alevins and fry in hatcheries. The risk of IHN at the hatchery increased in 2002 with the completion of fish passage over the aqueduct crossing on the Cedar River, which for the first time allowed adult sockeye to migrate and spawn in the river next to the hatchery. Birds and other predators that are attracted to sockeye carcasses, fry, and eggs were potential vectors that could have transported IHNV to the hatchery and its spring water supply. The release of some fry with IHN was in part due to the limited holding capacity at the hatchery. Holding fry for a longer period of time following emergence would provide more time for observation and testing prior to release, but the interim facility lacks facilities to do so.

Looking Ahead (Planned 2003 Accomplishments)

This work will continue annually. Improvements to protect the water supply from IHN virus contamination are needed as soon as possible. This work is being planned, but implementation is affected by the SEPA appeal to the hatchery FEIS.

Financial Summary

The HCP provides support for the operation of the interim sockeye facilities for HCP Years 1-5. The HCP commitment for interim measures for sockeye in 2002 was \$296,960 and \$289,618 of the commitment was spent on this program category. The contractor, Washington Department of Fish and Wildlife, operates under a budget that covers the fiscal year July 1 through June 30.

HCP Program Element: New Sockeye Hatchery - Design and Construction (C100032)
HCP Program Category: Sockeye Mitigation

Contact: Bruce Bachen, Senior Fish Biologist, Water Management Section

Objectives and Goals

The primary goal of this program is to develop an effective, comprehensive, and biologically sound artificial sockeye propagation program consistent with the Cedar River Habitat Conservation Plan. The objectives are to plan, design, permit and construct a sockeye facility to replace the interim sockeye facility that is capable of producing 34 million sockeye fry per year as well as develop the hatchery program documents (biological criteria, operating protocols, adaptive management plan, and capacity analysis).

Status of Work (2002)

The hatchery design team (Tetra Tech/KCM and technical consultants) completed drafts of the facility design and hatchery program documents. The Cedar River Anadromous Fish Committee reviewed the drafts and provided comments. These comments were discussed with the AFC and considered as the draft program documents were reviewed and edited. More detail was added to the implementation plan for the adaptive management program. Design development included consultations with the comanagers and AFC.

Design and siting alternatives were identified and evaluated through a SEPA environmental review process. The Draft EIS was released on September 19, 2002. The draft included environmental review of alternative sites for the hatchery and broodstock facilities and alternative designs for water supply and broodstock collection. Updated analyses of the biological effects of the proposed project were also included in the draft EIS. Various informational meetings were held to provide project information, including a forum in October that was replayed statewide on TV Washington. Public hearings were held in Seattle and Renton in October. The public comment period on the draft EIS closed on November 6. As a result of comments received, changes were incorporated into the FEIS and written responses to all comments were developed.

Initial discussions concerning placement and permitting of the new facilities were conducted with King County, Army Corps of Engineers, and the City of Renton.

Looking Ahead (Planned 2003 Accomplishments)

At the time of this writing (March 2003) the FEIS was released and an appeal was filed by one individual. The staff will be working to resolve the appeal and complete the SEPA process. Once this is accomplished, the FEIS will be used to aid the Parties to the LMA in making their decisions regarding the hatchery program and design. Assuming a timely resolution of the appeal, the permitting process is expected to begin this year. Most design work is expected to be completed in 2003.

Financial Summary

The HCP provides support for this program for HCP Years 1-5. The HCP commitment for the new sockeye hatchery - design and construction in 2002 was \$368,880 and \$310,950 of the commitment was spent on this program.

HCP Program Element: Supplementation Guidelines (C100034)
HCP Program Category: Landsburg Mitigation: Cedar River Sockeye Hatchery

Contact: Bruce Bachen, Senior Fish Biologist, Water Management Section

Objectives and Goals

Develop guidelines to direct the design, construction, operation and monitoring phases of the sockeye fry production program.

Status of Work (2002)

The guidelines were completed in 2001. Three members of the science panel, that produced the hatchery guidelines, participated in a forum in October to describe the hatchery program to the public. This forum was held in Seattle and replayed several times on TV Washington.

Looking Ahead (Planned 2003 Accomplishments)

No further work is expected on the hatchery guidelines.

Financial Summary

The HCP does not provide support for this program for HCP Year 2. There were no funds spent on supplementation guidelines in 2002.

HCP Program Element: Broodstock Collection Solutions and Monitoring (C100033)
HCP Program Category: Sockeye Mitigation

Contact: Bruce Bachen, Senior Fish Biologist, Water Management Section

Objectives and Goals

Evaluate alternative broodstock collection methods and sites as options that would allow the hatchery to meet its egg take goals while minimizing adverse impacts on chinook and other salmonids.

Status of Work (2002)

Northwest Hydraulic Consultants (NHC) provided consultation to SPU on the conceptual design of a replacement broodstock collection facility on the Cedar River focusing on stream hydraulics, geomorphology, and the efficiency of facility operations.

Looking Ahead (Planned 2003 Accomplishments)

This program will continue to develop information that will be useful in identifying the best options for broodstock collection facilities and sites.

Financial Summary

The HCP commitment for broodstock collection solutions and monitoring in 2002 was \$116,000 and \$2,578 of the commitment was spent on this program category.

HCP Program Element: Drinking Water Quality Monitoring, Fish Passage Evaluation (N663504)

HCP Program Category: Passage of Chinook, Coho & Steelhead Above Landsburg Research & Monitoring

Contact: Rich Donner, Senior Water Quality Engineer, Resource Planning Division

Objectives and Goals

The study will provide a basis for evaluating the effects of fish passage on the ecosystem above Landsburg Dam as fish passage is restored. There are two main components: (1) collect baseline nutrient data from water samples, fish and riparian biota for two years and, (2) conduct simulation experiments with small artificial channels to evaluate impact of fish carcasses on stream water quality.

This project does not involve the monitoring of drinking water quality, despite what the title implies. However, it will provide data useful in evaluating the possible role of fish passage in any subsequent drinking water quality problems related to the Cedar source. For example, correlation between the problem and nutrient level changes above Landsburg could be evaluated.

The project is a joint effort of SPU and the National Marine Fisheries Service under a memorandum of agreement.

Status of Work (2002)

The baseline was completed. Staff from NMFS performed the sampling and related field work, and SPU's Water Quality Laboratory analyzed the water samples. Habitat surveys and population estimates of resident fish were done in the Cedar River and tributaries above Landsburg.

Artificial channel experiments were delayed due to difficulty in locating an appropriate site. It has now been determined that they should be sited near the fish ladder currently under construction at Landsburg. The channel experiments will begin in late 2003 with completion projected for 2004. These channels will allow the controlled introduction and tracking of nutrients.

Looking Ahead (Planned 2003 Accomplishments)

The artificial channel experiments will begin in 2003. This field work will also be performed by NMFS.

Financial Summary

Cost commitment expenditures in 2002 totaled \$31,583; there was no HCP Year 2 cost commitment. The HCP Year 1 cost commitment for this work was \$77,000, and Year 1 cost commitment expenditures totaled \$23,250. Remaining unspent commitment is \$22,167.

HCP Program Element: Fry Marking and Evaluation (N663402)
HCP Program Category: Sockeye Monitoring and Research

Contact: Bruce Bachen, Senior Fish Biologist and Paul Faulds, Fish Biologist, Water Management Section

Objectives and Goals

Since the beginning of the Cedar River sockeye salmon hatchery program, the otoliths of all hatchery-produced sockeye salmon fry have been thermally marked. Marks have been induced on the otoliths of incubating sockeye through brief exposure to chilled water (approximately 4°C). Marks are unambiguous and are easily distinguishable from naturally spawning sockeye. The objective of the program has been to provide a source of marked fish that can be used to evaluate the hatchery program and address fundamental questions about the performance of Cedar River hatchery produced sockeye salmon. This type of information is needed to help manage the ongoing sockeye salmon hatchery program as well as to provide information to help develop the permanent sockeye salmon hatchery facility.

Status of Work (2002)

In June, Washington Department of Fish and Wildlife (WDFW) provided Seattle Public Utilities (SPU) with the report: Marking the Otoliths of Sockeye Embryos and Alevins at the Landsburg Hatchery in 2001-2002. This report documented the 26 different thermal codes that were developed to mark the 12,561,000 fry incubating in 46 vessels at the hatchery. The report also included the incubation release date, release location, and number released by thermal marking pattern.

In November SPU contracted with the WDFW for the 2002 marking program. WDFW established a marking plan for the hatchery based on the goals and objectives of the marking program established by the Anadromous Fish Committee (AFC). The main objectives of 2002 marking program were to mark fish for the Short Term Rearing Study resulting in eight marks and mark production fry by release location in the river (lower, middle, and upper) requiring three additional marks. Time of release was also addressed in the final marking strategy. Samples of otoliths were collected from each incubator shortly before each hatchery group was released to verify that the correct marking pattern was actually induced on the otoliths. WDFW also ensured all marking equipment was operational by the middle of November and was maintained throughout the marking period.

Looking Ahead (Planned 2003 Accomplishments)

A draft report that includes the broodyear 2002 marking plan and the results of implementation will be submitted to SPU and the AFC in July of 2003. The report will include a description of the marking patterns used for each release group, how many fish were marked in each group, the start and end date of marking, release location and dates for each mark group. Results of implementation shall describe any deviations from the marking plan, document marks through representative photos of each mark. The draft report will be reviewed and WDFW will produce a final report based on comments by August 2003.

Financial Summary

The HCP provides support for this program for HCP Years 1-8, 24-27 and 42-45. The HCP commitment for fry marking and evaluation in 2002 was \$23,200 and \$21,229 was spent on this program.

HCP Program Element: Fry Trapping and Counting (N663403)
HCP Program Category: Sockeye Monitoring and Research

Contact: Bruce Bachen, Senior Fish Biologist and Paul Faulds, Fish Biologist, Water Management Section

Objectives and Goals

This program supports the operation of a downstream migrant trap in the lower Cedar River to allow the development of estimates of sockeye fry originating from the hatchery and from the river. Upriver hatchery releases are evaluated to estimate the number of fry that reach the trapping site. On nights that catches of sockeye fry may include hatchery produced fry, otoliths are collected according to the protocols established over the previous seasons. These protocols prescribe the method of sampling each hour's catch over the entire night to insure that regardless of time of capture, each fry captured within a night has an equal probability of being sampled. The Anadromous Fish Committee and Washington State Department of Fish and Wildlife (WDFW) determine the number of nights on which otolith samples are collected. In addition, other biological data such as size and migration timing are collected and recorded to characterize these populations.

Status of Work (2002)

Funding was provided to WDFW through a two-year agreement to support fry trapping operations on the Cedar River. This agreement provides the full HCP funding commitment for the period. HCP funding is combined with support from other sources to fully fund the activities and analyses associated with the project. In recent years, interest in assessment of other species, notably chinook, has expanded the scope of juvenile trapping and evaluation efforts in the Cedar River. Two types of traps have been used; an inclined screen trap, which works best for smaller fry and a screw trap that is more effective at catching larger juveniles. Trapping occurs on the lower Cedar River from January to July each year resulting in estimates of the outmigrant salmonids from the river. This is the only estimate of natural fry production available.

Looking Ahead (Planned 2003 Accomplishments)

This work will continue in 2003 and a report for 2002 is expected that provides outmigrant estimates of hatchery and natural origin sockeye.

Financial Summary

The HCP provides support for this program for HCP Years 1-8, 24-27 and 42-45. Expenditures in Year 1 for this project amounted to 33% of the Year 1 commitment. The HCP Year 1 commitment was \$38,500 and the Year 2 commitment was \$40,600. As explained above, a two-year agreement was signed in the fall of 2001, with \$12,852 spent in Year 1 and \$67,837 spent in Year 2 for a total of \$80,689 in the two-year period.

HCP Program Element: Short Term Fry Rearing (N663405)
HCP Program Category: Sockeye Monitoring and Research

Contact: Bruce Bachen, Senior Fish Biologist and Paul Faulds, Fish Biologist, Water Management Section

Objectives and Goals

The objective of the project is to learn more about the feasibility and effects of short-term rearing and use this information to guide future hatchery operations.

Status of Work (2002)

Fry incubation and ponding took place at the Cedar River Hatchery at Landsburg, which is operated by the Washington Department of Fish and Wildlife (WDFW). Following incubation and emergence small samples of fry were removed to calculate the KD index and yolk to body weight ratios (to assess stage of development), and individual weights and lengths (to document fry growth during rearing). Reared groups were released after being held and fed to satiation for approximately 10-14 days. Control groups (unfed fry) were comprised of fry that were released the same day they were removed from incubators, consistent with what has been done in the past at the hatchery. Reared and unfed groups of fry were paired together to form four releases. Each release group involved in the experiment received a unique otolith mark to enable future identification and analysis. Each group included roughly 500,000 fry, however the exact number depended on egg takes and the number of otolith marks available. Fry were released near the mouth of the Cedar River at the boat launch ramp adjacent to the Renton Municipal Airport. The rearing study successfully released over 4,272,000 fry in the winter of 2002. One incubator (A12) experienced significant mortality. The remaining fry experienced expected mortality rates from incubation through emergence and less than 3% mortality during rearing. A project report was completed and provided to the Anadromous Fish Committee in 2002.

Looking Ahead (Planned 2003 Accomplishments)

The Short Term Rearing Study will continue in 2003 with focus on rearing and releasing fry, taking biological samples of fry, data analysis, and final reporting.

Financial Summary

The HCP provides support for this program for HCP Years 1-4 and the HCP cost commitment in 2002 was \$11,600. In addition, the unspent cost commitment from HCP Year 1 (approx. 70%, \$26,950) was made available for facility improvements in HCP Year 2. A total of \$40,533 was spent on this program in 2002.

HCP Program Element: Lake Washington Plankton Studies (year-round) (N663406)
HCP Program Category: Sockeye Monitoring and Research

Contact: Bruce Bachen, Senior Fish Biologist and Paul Faulds, Fish Biologist, Water Management Section

Objectives and Goals

At the June 2002 Anadromous Fish Committee (AFC) meeting, members recommended to the Parties to the Landsburg Mitigation Agreement (LMA) that funding for intensive zooplankton monitoring in HCP Year 2 totaling \$46,400 be provided instead for juvenile sockeye research. The reason behind this recommendation was that an existing non-HCP U. of Washington research program was providing sufficient data to met the intent of the HCP zooplankton studies.

The AFC recommend that 2002 funding for intensive zooplankton monitoring be used instead to support a proposal by Dr. Dave Beauchamp, Investigations of factors influencing sockeye growth and survival in Lake Washington. The proposal objectives were: to conduct a fall juvenile survey to enumerate and obtain growth information for sockeye in Lake Washington, a spring juvenile survey to continue a long-term effort to enumerate and size sockeye close to the time that they are leaving the lake, evaluation methodologies used during the juvenile surveys, and purchase updated software to better analyze hydroacoustic data from surveys. The information generated from the project will assist in the ability to process hydroacoustic data rapidly and efficiently and will be essential for providing timely assessments of abundance and distribution of juvenile sockeye and interacting species.

Status of Work (2002)

The software and fall survey work was completed in 2002. A draft report containing the data and analyses resulting from this work will be submitted to Seattle Public Utilities on or before June 1, 2003.

Looking Ahead (Planned 2003 Accomplishments)

The evaluation of the survey methodology and the spring pre-smolt survey was scheduled for the first quarter of 2003. There is approximately \$45,000 available for additional sockeye monitoring and research for 2003 that could be used for other sockeye research. The AFC is considering predator abundance research in Lake Washington and/or the continuation of spring/fall juvenile surveys.

Financial Summary

The HCP provides support for intensive year-round zooplankton surveys for HCP Years 1-4. The HCP commitment for Lake Washington plankton studies (year-round) in 2002 was \$46,400 and \$47,069 was spent on this program in 2002.

HCP Program Element: Adult Survival Distribution, and Homing Studies (N663407)
HCP Program Category: Sockeye Monitoring and Evaluation

Contact: Bruce Bachen, Senior Fish Biologist and Paul Faulds, Fish Biologist, Water Management Section

Objectives and Goals

The purpose of this activity is to collect otoliths from a representative sample of sockeye spawning in the Cedar River. All sockeye released from the Cedar River Hatchery are exposed to temperature changes during incubation that results in chill markings on the otolith bone. When the otolith samples are analyzed, they provide the data to permit evaluation of marked groups originating from the Cedar River Sockeye Hatchery. The specific evaluations are dependent on the marking strategy employed. Some examples of analyses that will be or have been done are to measure fry to adult survival of hatchery-produced fish, determine the proportion of hatchery-origin sockeye in the return, monitor the spawning distribution of hatchery-produced fish in the Cedar River, and to assess straying in Bear Creek.

Data from these studies will be used to evaluate and modify fry release strategies and other appropriate aspects of the supplementation program to improve performance and minimize the risks of deleterious effects on sockeye spawning in the wild.

Status of Work (2002)

Substantial discussion of evaluation methods associated with adult sampling and results of previous work occurred in 2002. As a result, some changes in sampling methods were implemented. Saggital otolith samples were collected early in October of 2002 and continued until early January 2003. Approximately 3,700 otolith samples were collected from carcasses in three reaches of the river, lower (mouth to river mile 6), middle (river mile 6 to river mile 13), and upper (river mile 13 to the Landsburg Dam) and 2,385 were collected from spawned carcasses at the Cedar River Hatchery. Other data recorded from carcasses included the condition of the fish (1= fresh dead to 5= severely decomposed), sex, length (posterior orbit of the eye to the hypural plate), and where the carcass was sampled (GPS position in the river to the nearest 0.1 mile). Pectoral fin ray samples were also collected from each carcass for future genetic analysis.

Looking Ahead (Planned 2003 Accomplishments)

Otolith collection will continue in 2003. Analysis of samples collected in 2002 is expected to be supported financially by Washington Department of Fish and Wildlife and will result in a report in 2003.

Financial Summary

The HCP provides support for this program for HCP Years 1-8, 24-27 and 42-45. The HCP commitment for adult survival, distribution, and homing studies in 2002 was \$46,400 and \$46,349 of the commitment was spent on this program.

HCP Program Element: Phenotypic and Genetic Studies (N663408)

HCP Program Category: Sockeye Monitoring and Research

Contact: Bruce Bachen, Senior Fish Biologist and Paul Faulds, Fish Biologist, Water Management Section

Objectives and Goals

In 2002 the Anadromous Fish Committee (AFC) did not identify the need for further genetics work on sockeye populations in Lake Washington since HCP funded genetic research was completed by Ingrid Spies, a graduate student at the University of Washington.

Status of Work (2002)

Ingrid Spies Ph.D. thesis, "The Origin of Sockeye Salmon (*Oncorhynchus nerka*) in the Lake Washington Watershed, Washington State: A Reappraisal Based on Microsatellite Data" was completed.

At the February 2002 AFC meeting, members recommended to the Parties to the Landsburg Mitigation Agreement (LMA) that funding for phenotypic and molecular genetic studies in HCP Year 2 be used to support a proposal to evaluate the timing and distribution of adult sockeye as they return to Lake Washington and the Cedar River. The project by Dr. Thomas Quinn and Jenny Newell (School of Aquatic and Fishery Sciences, University of Washington) will generate information to better understand sockeye movement, distribution, and lake entry timing in relation to the timing and location of spawning. The information is expected to be useful to fishery managers as they consider how future fisheries should be structured to control effects on other sockeye populations in Lake Washington and to lower the risk of disproportionate impact to a segment of the run to the Cedar River. The need for the research is identified in the draft Adaptive Management Plan for the Cedar River sockeye hatchery. The Parties to the LMA approved the project.

Looking Ahead (Planned 2003 Accomplishments)

This spring Dr. Thomas Quinn and Jenny Newell will set up a fish trap in the fish ladder at the Hiram Chittenden Locks. Trapped sockeye will be tagged and researchers will record the sample date, sex and length and take a scale sample. The tagging operation will be conducted two days a week June through September 2003 and 2004 for a total of 30 days each year, depending on the abundance and temporal distribution of the salmon. Three types of tags will be used: disc tags, iButton temperature loggers and acoustic transmitters.

Financial Summary

The HCP commitment for phenotypic and genetic studies in 2002 was \$34,800 and no commitment dollars were spent on this program category in 2002. Unexpended 2002 cost commitment and future years' cost commitments will be applied to the \$82,623 total cost of the proposal to evaluate the timing and distribution of adult sockeye as they return to Lake Washington and the Cedar River, which is planned for 2003-05.