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4.1 Introduction to HCP Conservation and Mitigation Strategies

4.1.1 Background and Context

The City's HCP is a multispecies plan developed to meet the requirements of the Endangered Species Act with regard to the 83 species addressed in the HCP, and to address a variety of related natural resource issues. These related issues include: (1) resolution of longstanding issues with the State of Washington regarding the blockage to anadromous fish posed by the Landsburg Diversion Dam; (2) resolution of issues with the Army Corps of Engineers regarding water supplied to Lake Washington that is used to operate the Ballard Locks for navigation and fish passage; and (3) completion of a long-running effort with the state and federal agencies to develop technically sound instream flows in the Cedar River that would protect anadromous salmonids.

The City's HCP covers the area and City activities described in Chapter 1 and Chapter 2 (also see Appendix 1). City activities generally include operation of water supply and hydropower facilities on the Cedar River, management of the Cedar River Municipal Watershed, and mitigation and conservation measures included in this HCP. The geographic area covered includes the 90,546-acre municipal watershed and areas outside the municipal watershed that conservation and mitigation activities will affect under the plan. Additional details on City activities important for this HCP are given in this chapter in the discussion of the various conservation and mitigation measures.

Through the HCP, the City seeks to provide certainty for both current operation and future planning related to its water supply and hydroelectric utilities on the Cedar River, while providing for the conservation of species potentially affected by those public utilities (Section 2.4).

The City's HCP is intended to provide a net benefit for the species addressed by the HCP when compared to current conditions. The City's HCP, thus, should contribute to the recovery of any species addressed in the HCP that are currently listed or that could be listed during the term of the HCP.

The HCP represents an ecosystem-based approach. Jensen et al. (1996) stated that ecosystem management is "the skillful manipulation of ecosystems to satisfy specified societal values." Karr (1993) favors the following definition of ecosystem management: "A science-based approach that conserves species and genetic diversity, while maintaining the structural and functional integrity of ecological systems and providing

economic benefits that can be sustained indefinitely." The major ecosystems affected by City water supply, hydroelectric, and land management activities on the Cedar River include the aquatic, riparian, and forest ecosystems. It is the City's intent that the watershed be operated in a manner that sustains these ecosystems in the watershed (Section 2.4).

The Cedar River Municipal Watershed represents a very important element and opportunity in any regional effort directed at protecting both salmonid fishes and species dependent on late-successional and old-growth conifer forests. The municipal watershed contains the headwaters for the major river that supplies water to Lake Washington and is a large area of key importance to many at-risk fish and wildlife species. The HCP will make a significant contribution to regional efforts to restore and sustain declining salmonid stocks in the Lake Washington basin, and to federal and state efforts to protect and sustain the late-successional and old-growth ecosystem in the central Cascade Mountains.

As a result of a variety of causes, populations of wild sockeye, coho, and chinook salmon, and steelhead trout have declined in the Lake Washington Basin substantially during the last decade (sections 3.5.8-3.5.11). Recent regional trends have perhaps compounded the effects of a radical alteration of the entire hydrologic system when the Lake Washington Ship Canal was built, the lake was lowered 9 ft, and the Cedar River was rerouted from the Duwamish River into Lake Washington.

The risks now facing salmonids in the Lake Washington basin are many and complex, but certainly two rank very high. Perhaps the most serious is the loss and degradation of habitat in this rapidly urbanizing region (King County 1993). Also important, however are alterations of the system that have fragmented the continuity between marine and freshwater habitats – and among different freshwater habitats – by reducing landscape connectivity. The effect of these impediments to movement is perhaps most obvious at the Ballard Locks and the Landsburg Diversion Dam, but it can also be seen throughout the basin at the many and diverse "small" human-created impediments to fish passage, ranging from creation of hostile conditions in wetlands, to poorly designed culverts, to the various physical barriers that now exist in many streams.

Clearly, the cooperation of many entities – municipalities, state and federal agencies, and Indian Tribes – will be needed to be successful in any endeavor to restore regional salmonid populations, and the City's HCP is a key element in that multi-jurisdictional effort. Important to these cooperative efforts will be maintaining adequate stream flows, protecting habitat from the impacts of continued urbanization, restoration of habitats damaged by past human activities, and improvement of connectivity among key aquatic habitats.

The risks to wildlife species that depend on late successional and old-growth forests are also high (Thomas et al. 1993). With virtually all of the old-growth forest in the Puget Sound lowlands now gone, the watershed offers one of the few significant opportunities to protect and reestablish mature and old-growth forest that links to low elevations, and north and south with the federal late successional reserve (Tuchmann et al. 1996). The I-90 corridor, including the watershed, is considered a critical area for species dependent on old-growth ecosystems such as the northern spotted owl (USDI 1992b, c).

Sustaining populations of fish and wildlife dependent on late-successional and old-growth forests will entail the combination of a system of large late-successional *reserves*, careful management of forests in the intervening *matrix* lands, and riparian protection though *buffers* on water bodies and wetlands (FEMAT 1993). Because of the highly fragmented ownership of land in the central Cascade Mountains, the contribution of nonfederal landowners, such as the City of Seattle, may be key to long-term success in protecting species dependent on the late-successional and old-growth forests ecosystem.

The City's HCP has four major components: (1) management of instream flows to provide habitat for anadromous fish; (2) mitigation for the blockage to anadromous fish at the Landsburg Diversion Dam, including provision of upstream passage for three of the four species currently blocked; (3) management of the municipal watershed to protect and restore aquatic, riparian, and late-successional and old-growth habitats; and (4) research and monitoring to support the first three components. In all, the measures included in these four components entail a commitment by the City of approximately $79 million, in 1996 dollars, over the 50-year term of the HCP.

The first three components of the HCP incorporate a variety of measures that collectively contribute to protection and restoration of the species and habitats addressed by this HCP. These measures are designed to control, reduce, or *minimize impacts* from City operations, to *preserve* habitat elements that are relatively undisturbed, and to *restore* the quality and functionality of some other habitats that have been previously disturbed. The term "conservation strategy" is generally used in Chapter 4 to refer to measures that include one or more of the following: preservation, rehabilitation, enhancement, and restoration. The term "mitigation strategy" or "mitigation" is generally used in this section to describe the alleviation of detrimental effects or environmental damage that results from ongoing anthropogenic actions. For a discussion of these terms, see Kaufmann et al. (1997). The term "management strategy" is generally used in Chapter 4 for a mix of both conservation and mitigation strategies.

The mitigation and conservation strategies presented in Chapter 4 of this HCP are intended by the City to meet the standards of the ESA to minimize and mitigate, to the maximum extent practicable, the impacts of any taking of species addressed in the HCP in a manner that will not appreciably reduce the likelihood of survival and recovery of the species in the wild (Section 2.3.2). The City further intends this HCP to provide a net benefit to the species addressed in the HCP and to contribute to the recovery of any species addressed in the HCP that are listed or may be listed under the ESA during the term of the HCP (Section 2.4).

4.1.2 Development of the City's HCP

The HCP was developed cooperatively with state and federal agencies, and the Muckleshoot Indian Tribe, over a three-year period (Chapter 1). In developing the HCP, the City performed literature reviews, held workshops with experts, and conducted a variety of studies and analyses (Chapter 3).

The HCP specifically addresses 83 species that are at-risk, including species that are listed under the ESA, are candidates for listing, or are otherwise at risk in the region (sections 3.4-3.6). Although the HCP includes conservation and mitigation measures developed for particular species, it is an ecosystem-based approach that focuses

primarily on the quality and functioning of the habitats, ecological communities, and ecosystems on which these species rely. Grumbine (1994) defines five goals for maintaining the integrity of ecosystems: (1) maintaining viable populations; (2) representing natural elements of diversity; (3) maintaining ecological processes and natural disturbance regimes; (4) protecting evolutionary (adaptive) potential of species; and (5) accommodating human use in a sustainable fashion.

Because of the relatively small size of the municipal watershed relative to the range of populations of the species addressed, an HCP covering the Cedar River Municipal Watershed is not capable of, in itself, ensuring either that these populations remain viable or that they not lose adaptive potential. However, the City has attempted to design the HCP in a manner that will not reduce the viability or adaptive potential of species addressed in the HCP and that will, in fact, make a positive contribution to their regional viability. Measures developed for the municipal watershed were designed to foster maintenance and restoration of species and community diversity, and the natural ecological, physical, and process and disturbance regimes that create and maintain habitats for species (after Grumbine 1994).

An effort was made to identify key natural processes and disturbance regimes in the municipal watershed, and develop strategies to bring these key natural processes and disturbance regimes back within their normal envelopes of variation, controlling those human-caused processes (e.g., landslides, erosion, and forest disturbance) that impair ecosystem function. A major constraint however, has to do with the scale, intensity, and significance of processes. For example, a large-scale (watershed-wide) forest fire, even if of natural origin, would jeopardize the drinking water supply and the remaining old-growth forest, of critical importance for a number of at-risk species. The HCP was designed, as far as practicable, to limit the risk of such significant disturbance events.

On the other hand, small-to moderate-scale disturbances are often critical to maintaining natural ecosystem functions (Spies and Franklin 1989). The HCP was designed to foster such processes through a combination of measures designed to afford protection to habitats and species and activities designed to rehabilitate degraded habitats or recover species populations. While rehabilitation strategies are key to restoring degraded habitats, active intervention for the purpose of restoration will only be pursued when there is reasonable chance of improving resource conditions and reestablishing natural processes over the long term.

4.1.3 Overall Conservation Objectives

The City's overall planning objectives for the HCP are given in Section 2.4 and in the section above entitled "Background and Context," and more specific conservation objectives are given in the remaining sections of Chapter 4. In general, the HCP is designed to avoid, minimize and mitigate the impacts of any take of species addressed in the HCP; provide a net benefit for all species addressed in the HCP compared to current conditions; contribute to the recovery of at-risk species covered by the plan; and provide a means to deal with uncertainty in an adaptive manner that can meet the overall biological goals of the HCP (sections 4.5.7 and 5.5). In addition to those conservation objectives, the HCP addresses some of the important concerns of scientists and the public about HCPs in general (Section 1.1.3), including the need for broader involvement of the public and scientists (see Section 5.4).

4.1.4 Major Components of the HCP

OVERVIEW

The HCP encompasses overall conservation strategies for three major components of mitigation: (1) watershed management (Section 4.2); (2) mitigation for the Landsburg blockage to anadromous fish (Section 4.3); and (3) instream flows to maintain habitat for anadromous fish (Section 4.4). To support the mitigation strategies, it also includes a monitoring and research program (Section 4.5) to address important uncertainties; to evaluate effectiveness of mitigation, compliance with the plan, and trends in habitats and key species; and to provide for adaptive management. The funding commitments for these components total more than $79 million (in 1996 dollars) over the 50-year term of the HCP, not including the foregone opportunity cost for timber revenues, sale of drinking water, or sale of hydroelectric power, and some additional administrative costs of implementation.

WATERSHED MANAGEMENT MITIGATION AND CONSERVATION STRATEGIES (SECTION 4.2)

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. The northern spotted owl, marbled murrelet, bald eagle, and bull trout are found within the watershed, as well as other terrestrial and aquatic species that are at risk regionally. 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 and habitat features.

The proposed mitigation represents a landscape approach to watershed management that includes 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 City 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.

MINIMIZING AND MITIGATING THE EFFECTS OF THE ANADROMOUS FISH BARRIERS AT THE LANDSBURG DIVERSION DAM (SECTION 4.3)

The anadromous fish conservation strategies are designed to mitigate for the blockage to fish passage created by the Landsburg Diversion Dam. The anadromous fish conservation strategies in this HCP 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.

INSTREAM FLOW MANAGEMENT STRATEGY (SECTION 4.4)

The City manages the Cedar River water supply: (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 will commit the City to binding instream flows designed to improve habitat conditions for chinook, coho, sockeye, and steelhead in the regulated portion of the Cedar River.

Based on an extensive, cooperative, 5-year study and analysis of the needs of all life stages for each of the above four anadromous species, the 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 allocation of supplemental flows above minimums in years when available, through operation of a multi-agency commission.

It is important to note that, as used in this HCP, the term *minimum flow* does not connote an instream flow that provides only minimum habitat or benefit for fish. Rather, such flows represent commitments to minimum levels of instream flows that the City will allow to occur, and they were designed to provide substantial benefits and habitat for the fish species addressed. As used in the HCP, *supplemental flows* are increases above minimums that are believe to provide even greater benefits or habitat during certain time of the year. The combination of minimum and supplement flows are termed *guaranteed flows*.

MONITORING AND RESEARCH (SECTION 4.5)

The monitoring and research program in the HCP 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 HCP also includes a commitment to adaptive management, which will be applied where considerable uncertainty exists and as a general mechanism for responding to new information that can be used to make conservation and mitigation strategies more effective.

EFFECTS OF THE HCP ON SPECIES OF CONCERN (SECTION 4.6)

Section 4.6 summarizes information included in this HCP that is relevant to the biological evaluations the Services made for the species to be covered by the incidental take permit. It presents a summary of the minimization and mitigation measures the City proposes to meet the standards of the ESA and an evaluation of effects on individual species and groups of species, both negative and positive, of the HCP and activities allowed under the HCP. It also includes a determination of whether or not the objective of providing a net benefit for the species addressed is likely to be provided under the HCP.

Note that habitat effects, and some effects on species, of the minimization and mitigation measures presented in sections 4.2-4.4 are discussed in those sections in the context of the specific measures for those components of the HCP. The purpose of Section 4.6 is to evaluate in a consistent manner the effects of all minimization and mitigation measures included in the HCP, taken together, and the City activities that will occur under the HCP.