Biological Opinion

U.S. Fish and Wildlife Service

Reference Number: 13410-2011-F-0202

City of Kent
Clark Springs Water Supply System
Habitat Conservation Plan

Consultation Conducted By:

U.S. Fish and Wildlife Service
Washington Fish and Wildlife Office

Ken S. Berg

Ken S. Berg, Manager
Washington Fish and Wildlife Office

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Date

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INTRODUCTION

This document transmits the U. S. Fish and Wildlife Service's (USFWS) Biological Opinion (Opinion) based on our review of the proposed City of Kent Clark Springs Water Supply System Habitat Conservation Plan (HCP) located in King County, Washington, and its effects on bull trout (*Salvelinus confluentus*), coastal cutthroat trout (*Oncorhynchus clarki clarki*), Pacific lamprey (*Lampetra tridentata*), and river lamprey (*L. ayresi*) in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.).

This Opinion is based on information provided in the December 2010 final HCP and appendices, the February 2011 final Environmental Impact Statement (EIS), and other sources of information. A complete record of this consultation is on file at the Washington Fish and Wildlife Office, Lacey, Washington.

CONSULTATION HISTORY

This HCP is the culmination of more than 5 years of studies and planning and represents a long-term commitment by the City of Kent (Kent) to protect important fish resources that may be impacted by future operations of the Clark Springs Water Supply System and to mitigate those potential impacts to the maximum extent practical. The HCP is the product of a collaborative effort between Kent, USFWS, and the National Marine Fisheries Service (NMFS) (jointly referred to as the Services) to meet the requirements of the Act and the domestic, industrial, commercial, fire, and life safety water supply needs of Kent. The HCP includes eight habitat conservation measures to address instream flows and habitat creation, enhancement, and protection on Rock Creek.

In addition to habitat conservation measures, this HCP includes monitoring and adaptive management programs. The monitoring program is designed to ensure that instream flow commitments and habitat conservation measures are implemented and that the expected benefits to the covered species are achieved. The adaptive management program provides an ongoing process to ensure continued protection for covered fish species, particularly during water years when dry conditions make the balancing of needs for both the covered species and water supply especially difficult and when wet conditions provide opportunities for added benefits to the covered species.

The Services formally initiated an environmental review of the project through publication of a Notice of Intent to prepare a draft EIS and HCP in the Federal Register on June 9, 2006 (71 FR 35286). That notice also announced a public scoping period during which interested parties were invited to provide written comments expressing their issues or concerns relating to the proposal, and to attend a public scoping meeting held in Kent, Washington. Based on public scoping comments, the Services prepared a draft HCP and draft EIS releasing these documents for public comment on April 23, 2010. Public comments from seven different organizations were received on or before July 6, 2010. The final HCP and EIS including the Services' response to public comments were prepared by the Services and Kent, and released for a 30-day public comment period on July 5, 2011.

CONCURRENCE

Bull trout critical habitat is designated for both the upper Cedar River (spawning and rearing) above Masonry Dam and in Lake Washington foraging, migrating, and overwintering (FMO). The upper Cedar River population is geographically isolated by Masonry Dam (man-made barrier) and prior to that Cedar Falls (natural barrier). The proposed action is expected to have "no effect" on this critical habitat designation. Rock Creek is a tributary to the Cedar River which, in turn, is the largest tributary to Lake Washington. Although Rock Creek is not included in this critical habitat designation, it does contribute to the forage base in the lower Cedar River and Lake Washington based on spawner surveys (R2 Resources Inc. 2005). Therefore, the proposed action has the potential to affect Lake Washington critical habitat.

The final revised rule designating bull trout critical habitat (75 FR 63898) identifies nine Primary Constituent Elements (PCEs) essential for the conservation of the species. The following PCE is present in the action area and may be affected by the proposed action:

An abundant food base including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish. The proposed action may affect the food base of the bull trout through the short-term degradation of habitat, the addition of woody material into the channel, and the continued reduction in the availability of spawning and rearing habitat for prey species such as sockeye and coho due to groundwater withdrawals over the permit term. However, impacts to the food base are not expected to be measurable due to the relatively minor contribution Rock Creek provides to the overall spawning population of sockeye, coho, and other salmons in the Cedar River and other tributaries to Lake Washington (R2 Resources Inc. 2005, WDFW 2011); and the inclusion of HCP conservation measures, flow augmentation, Best Management Practices (BMPs), and/or other components of the HCP. Upon implementation of the proposed action, the forage base in the action area is expected to increase through habitat enhancement activities and the continued augmentation of instream flows during the spawning run times of important prey species. Monitoring and adaptive management will ensure conservation measures are properly implemented and functional over the term of the HCP. Therefore, long-term effects to this PCE are considered insignificant.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

Kent is seeking incidental take permits (ITP) for three listed species: bull trout (*Salvelinus confluentus*), Chinook salmon (*Oncorhynchus tshawyscha*), and steelhead (*O. mykiss*), and six unlisted species: coho salmon (*O. kisutch*), sockeye salmon (*O. nerka*), chum salmon (*O. keta*), cutthroat trout (*O. clarki clarki*), Pacific lamprey (*Lampetra tridentata*), and river lamprey (*L. ayresi*). Bull trout, cutthroat trout, and Pacific and river lamprey are under the jurisdiction of the USFWS and will be addressed in this Opinion. The remaining species are under the jurisdiction of the NMFS and will be addressed in a separate biological opinion. The proposed term of the HCP is 50 years.

Proposed Covered Activities

The proposed HCP covered activities include all water withdrawal and maintenance activities related to the Clark Springs Water Supply System, the implementation of eight conservation measures, and the implementation of five monitoring and evaluation measures within the Clark Springs Watershed (City of Kent, 2010). In addition to the avoidance, minimization, and mitigation measures required in the HCP, Kent will follow all applicable regulations, obtain all required permits, and install and use all appropriate and applicable BMPs such as erosion and sedimentation control devices identified in the most recent version of Kent Construction Standards (http://www.ci.kent.wa.us/content.aspx?id=12464) at the time work is conducted and when implementing covered activities.

The proposed HCP covered activities are:

- Water supply withdrawals from the Clark Springs System pursuant to Kent's water rights.
- Operations, maintenance, replacement, monitoring, and improvements to the augmentation system. This includes relocating the augmentation system, maintaining, additions to, and/or replacing all augmentation infrastructures as needed.
- Operations, maintenance, and improvements to the water supply facilities located in the Clark Springs Watershed such as the buildings, wells, access roads, fences and security infrastructure, infiltration gallery, and water transmission main, except for portions within the ordinary high water boundaries of Rock Creek. This includes replacement of the facilities and infrastructure as needed in the future.
- Vegetation management as needed by Kent to maintain its facilities. This includes, but is not limited to, maintaining open areas, service roads, and clearing/trimming fence lines and power line/telephone line areas associated with the facilities. All vegetation management on the Clark Springs property will be via mechanical methods, chemical applications will not be used. Vegetation management may also include relocation of large woody debris (LWD)/vegetation to protect the integrity of the water supply and infrastructure. This activity does not include vegetation management activities conducted by the Bonneville Power Administration to maintain their transmission line right-of-way and easement.
- Operation and maintenance of the Parshall Flume and U.S. Geological Survey (USGS) gaging station (No. 12118400). This includes cleaning of the flume to remove algae and repair and work to maintain the accuracy and integrity of the flume including maintaining the areas immediately up-stream and downstream.
- Wildlife management within the Clark Springs Watershed for the purpose of protecting and enhancing the quality of the water supply. This includes trapping beavers to ensure a healthy municipal water source and removal of beaver dams to prevent stream relocation and damage to Kent's infrastructure or the quality of the water supply.
- Habitat Conservation Measures (HCMs) 1-8 described in Chapter 4 of the HCP and Monitoring and Evaluation Measures (MEMs) 1-5 described in Chapter 5 of the HCP.

- Electrical, control, telemetry operations, maintenance, improvements and replacement of equipment, conduit, cabling, and related infrastructure to meet the needs of the water supply facilities within the Clark Springs Watershed. Portions of this infrastructure are buried at the facility. Current erosion and sediment control BMPs will be used during the implementation of this covered activity.
- The maintenance and replacement of storm water conveyance, control, and distribution facilities within the 320-acre Kent property boundaries at the Clark Springs facility.
- The storage of chemicals, the chemical treatment processes, and the operation, maintenance, replacement, and improvement of equipment, conduit, piping, and sampling infrastructure required to monitor and treat Kent's water supply.
- Kent may also elect to install monitoring wells along the eastern boundary of the Clark Springs property to monitor groundwater quality and provide a network of wells to help detect any contamination that may come from Landsburg Mine, the residential and semi-commercial properties along the eastern boundary of the Clark Springs property.

Conservation Measures

The HCMs that Kent has committed to are summarized in Table 1 and include: 1) flow enhancement measures that are designed directly benefit Rock Creek and covered species; 2) habitat enhancement measures that are designed to directly benefit Rock Creek and covered species; and 3) conservation measures that can be applied basin-wide and may provide both direct and indirect benefits to aquatic ecosystems in Rock Creek and covered species. The purpose of the HCMs is to provide both direct and indirect mitigation for covered activities included in Kent's water withdrawal.

Four of the habitat enhancement measures were listed in the Lake Washington/Cedar/Sammamish Watershed Water Resource Inventory Area Steering Committee Chinook Salmon Conservation Plan (2005). The HCMs providing the most direct benefits to the covered species will be implemented within 10 years after issuance of the ITP. Others, such as those related to easements or land acquisitions would occur as opportunities arise within 6-15 years after issuance of the ITP.

Table 1. Habitat Conservation Measures (HCMs) to be implemented by the City of Kent under the Clark Springs System HCP.

Habitat Conservation Measure	Title	Summary
HCM-1	Flow Augmentation Plan	Augment flows in Rock Creek downstream of the Clarks Springs System from October 1 through December 31, with variations in the amount of augmentation required based on a wet, normal, dry or drought year basis (see description in text); Estimated Range of Costs - $0 to $387,504 per year Estimated Cost to Upgrade and Move Augmentation System - $200,000
HCM-2	Passage improvements at mouth of Rock Creek – Reach 1	Modify Rock Creek channel at the mouth of Rock Creek to provide increased water depth during low flows; Estimated Costs - $55,000
HCM-3	Wetland Improvement and Juvenile Salmonid Habitat Enhancement – Reach 1	Connect existing pond and improve off-channel habitat conditions pond adjacent to Reach 1 of Rock Creek; Estimated Costs - $40,000
HCM-4	Wetland Improvement and Juvenile Salmonid Habitat Enhancement -Reach 2	Improve connectivity and habitat conditions in the existing off channel wetland in Reach 2 of Rock Creek; Estimated Costs - $69,000
HCM-5	Summit-Landsburg Road Culvert replacement-Reach 8/9	Replace the culvert at the Summit-Landsburg Road crossing with a structure that meets existing WDFW fish passage criteria; Estimated Costs - $680,000
HCM-6	LWD Placement – Reach 10 and 12	Place LWD in Reach 10 and Reach 12 of Rock Creek within the City of Kent watershed property to increase hydraulic complexity; Estimated Costs - $62,000
HCM-7	Water conservation program	City of Kent's on-going water conservation program
HCM-8	Riparian Acquisition, Easement, and Enhancement Fund in Rock Creek Basin	Establish a $1.6 million Habitat Fund to mitigate for impacts associated with operations of the Clark Springs Water Supply System.

HCM-1: Rock Creek Flow Augmentation

Kent is proposing to augment Rock Creek during the months of October, November, and December, a period that is biologically important for adult migration and spawning by a number of the covered species. The maximum flow augmentation and Rock Creek flow targets will be based on two-month antecedent precipitation as measured at Landsburg Dam. Kent will commit to augmenting up to the stream flow target, but not more than the maximum augmentation amount defined in Table 2. When instream flows meet or exceed the target flows at the Parshall Flume during October, November, and December then no augmentation would be required. When instream flows are below target flows, water up to the maximum amount committed to in the HCP would be allocated to increase instream flows to the target flow. As part of HCM-1, Kent will move the current location of the augmentation outfall to a location closer to USGS gage 12118400. The initiation of augmentation will be adaptively managed based upon Chinook salmon spawn timing in the Cedar River.

Table 2. Rock Creek flow targets and the maximum augmentation flows to be provided by the City of Kent to meet those targets as determined by seasonal water year type.

Seasonal Water Year Type	Maximum Augmentation	Rock Creek Flow Target[1]
Wet	2.5 cfs	3.5 cfs
Normal	2.0 cfs	3.0 cfs
Dry	1.75 cfs	2.75 cfs
Drought	1.50 cfs	2.50 cfs

[1] Minimum stream flow target to be measured at USGS gage 12118400 on the Clark Springs property with augmentation occurring during the months of October through December only. The augmentation flow rate shall be measured at the flow meter on the augmentation pipe from the Kent's clear well.

HCM-2: Passage Improvement at Mouth of Rock Creek - Reach 1

Kent has committed to complete permitting, final project design, and construction of a habitat enhancement project intended to improve upstream fish passage at the mouth of Rock Creek during low flow periods throughout the term of the HCP. Passage improvements will consist of channel reconfiguration at the mouth of Rock Creek (up to 100 feet (ft)) (Figure 1) to concentrate flows using boulders and/or LWD. To ensure natural geomorphic function and reduce the risk of property damage during floods, structures will not be designed to withstand major flood events (greater than a 100-year event) in Rock Creek and/or the Cedar River. Thus, this measure includes funding for maintenance for the life of the project equal to the replacement cost or reconstruction over the course of the 50-year ITP. If a major failure of the structure occurs, Kent and the Services will meet to evaluate possible fixes and alternative mitigation. A final design package for HCM-2 will be submitted to the Services for review and the project will be permitted and constructed within 5 years of ITP issuance.

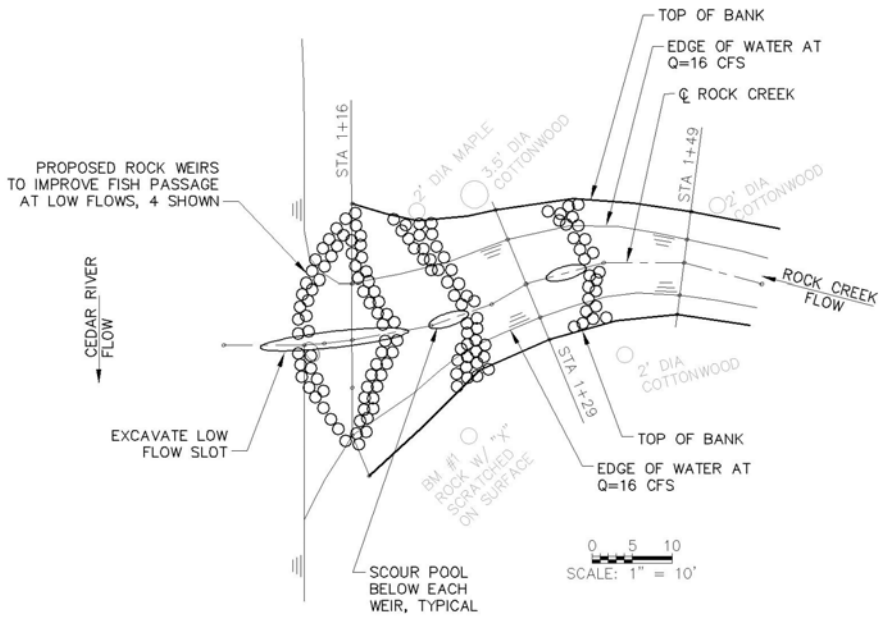


Figure 1. Conceptual drawing of fish passage improvements at the mouth of Rock Creek.

The confluence of Rock Creek and the Cedar River is bordered by land owned by King County to the west (parcel 2222069036) and a private homeowner to the east (King County 2005). Sponsorship and implementation of HCM-2 does not include purchase of property on either side of the project site. Moreover, if the landowner(s) or other entities determine that expansion of the project to incorporate additional project elements (e.g., recreational facilities) or land areas beyond those described in this HCM is desirable, Kent is not committing additional funds to support objectives outside the HCP. If additional data collection indicates that the proposed project is not feasible or will not benefit species covered by the ITP, Kent will likewise make the $55,000 allocated for HCM-2 available to other projects aimed at improving habitat in the Rock Creek basin. If transfer of funds to other projects is proposed, Kent will notify the Services and obtain their approval of the suggested alternative prior to reallocation of funds.

Repair/reconstruction costs are anticipated to be comparable to original construction costs. Post-construction monitoring will be conducted annually to ensure the passage weir is functional. This will consist of directly observing the passage structure at the end of the run-off period (e.g., late May through June) to make sure it is functionally and structurally sound and conducting periodic spawning surveys that document successful adult passage from the Cedar River into Rock Creek. The structure will also be monitored following any flow events greater than 50 cfs.

HCM-3: Wetland Improvement and Juvenile Salmonid Habitat Enhancement – Reach 1

Kent will act as sponsor and provide funding for a habitat enhancement project intended to connect a small wetland and pond located immediately west of Reach 1 of Rock Creek to the main creek channel. The connection of the wetland with Rock Creek will create and make available off-channel rearing and flood refuge habitat that can be used by species covered under

the ITP. Existing pond habitat would be improved by placement of large wood in the pond to provide cover for juvenile salmonids.

The wetland is located on parcel 2222069036, which is currently owned by King County (King County 2005). Kent will work with King County to develop a Memorandum of Understanding regarding the details and funding commitment related to this project. Development of final project designs will require a detailed topographic survey and at least one year of pre-construction temperature and water level monitoring. Pre-project monitoring will be implemented within two years of ITP issuance. A final design package for HCM-3 will be submitted to the Services for review within five years of ITP issuance. Kent's estimated costs for HCM-3 are $40,000 to complete pre-project monitoring, permitting, final project design, and construction as recommended in the HCP. Post-construction monitoring will be conducted as part of this HCM. Sponsorship and implementation of HCM-3 does not include purchase of the subject property. If the landowner or other entities determine that expansion of the project to incorporate additional project elements (e.g., recreational facilities, waterfowl habitat) or land areas beyond those described in this HCM is desirable, Kent is not committing additional funds to support objectives outside the HCP. If additional data collection indicates that the proposed project is not feasible or will not benefit species covered by the ITP, Kent will make the $40,000 allocated for HCM-3 available to other projects aimed at improving habitat in the Rock Creek basin. If transfer of funds to other projects is proposed, Kent will notify the Services and obtain their approval of the suggested alternative project(s).

HCM-4: Wetland Improvement and Juvenile Salmonid Habitat Enhancement – Reach 2

Kent will act as sponsor and provide funding for a habitat enhancement project intended to enhance the quality of the existing wetland habitat and create additional off-channel habitat within a small wetland and pond located just upstream of an existing footbridge. The wetland and pond would be improved by excavating the organic material to a depth of around 2 to 4 ft, constructing an island in the center of the pond that would support trees and shrubs to provide increased shade, and by placing large wood in the excavated pond to provide cover for juvenile salmonids. These improvements will serve to enhance existing habitat and create some additional juvenile salmonid rearing habitat that can be used by several species covered under the ITP.

The wetland is located on parcel 2222069006, which is currently owned by King County (King County 2005). Kent will work with King County to develop a Memorandum of Understanding regarding the details and funding commitment related to this project. Development of final project designs will require a detailed topographic survey and at least one year of pre-construction temperature monitoring. Pre-project monitoring will be implemented within two years of ITP issuance. A final design package for HCM-4 will be submitted to the Services for review within five years of ITP issuance. Implementation of HCM-4 would be in accordance with conceptual design and recommendations for additional survey and monitoring described in the HCP. Kent will commit up to $69,000 to complete pre-project monitoring, permitting, final project design, and construction. Post-construction monitoring of pond habitat will be conducted as part of this HCM.

Sponsorship and implementation of HCM-4 does not include purchase of the subject property. If the landowner or other entities determine that expansion of the project to incorporate additional project elements (e.g., recreational facilities, waterfowl habitat) or land areas beyond those described in this HCM is desirable, Kent is not committing additional funds to support objectives outside the HCP. If additional data collection indicates that the proposed project is not feasible or will not benefit species covered by the ITP, Kent will make the $69,000 allocated for HCM-4 available to other projects aimed at improving habitat in the Rock Creek basin. If transfer of funds to other projects is proposed, Kent will notify the Services and obtain their approval of the suggested alternative project(s).

HCM-5: Summit-Landsburg Road Culvert Replacement – Reach 8/9

Kent will act as sponsor and provide funding (estimated costs up to $680,000) to upgrade the existing Summit-Landsburg Road stream crossing structure to a condition that meets WDFW fish passage criteria as described in WAC 220-110-070. The existing culverts at the Summit Landsburg Road do not meet current WDFW fish passage criteria, which are intended to provide free and unimpeded passage for adult and juvenile fishes, including resident trout and juvenile salmonids (WDFW 2003). Within ten years of issuance of the ITP, Kent will upgrade these culverts to meet WDFW fish passage criteria.

HCM-6: Large Woody Debris Placement – Reach 10 and 12

Kent will act as sponsor and provide funding (estimated cost $62,000) for a habitat enhancement project intended to increase the quantity of salmonid holding, rearing and spawning habitat in the upper segments of Rock Creek via selective placement of LWD. The LWD will be placed in Reach 10 and Reach 12 of Rock Creek, which are both located on Kent's Clark Springs Watershed property. The LWD will be placed in a manner that concentrates moderate to high flows, enhancing local scour of fine sediment from the channel bed thereby promoting pool formation and spawning gravel deposition in proximal areas. Large Woody Debris will not be placed in Reach 11, as this reach contains the water augmentation system, Parshall Flume, and the USGS stream gauge.

If available, the LWD may be obtained from Kent's Clark Springs Watershed property outside of the riparian zone, and will meet key piece criteria for a 25-ft wide stream (i.e., total volume 2.5 meters cubed; 18-30 inches diameter at breast height; 20-42 ft long) as defined by Fox (2001) or comparable criteria approved by the Services. Between three and six pieces of LWD will be placed at each site, depending on the results of channel surveys and analysis conducted during the final design phase.

HCM-7: Water Conservation Program

Kent proposes to adopt its existing water conservation program under the HCP. Water saving measures include, but are not limited to, the following:

- Providing rebates for low flow toilets.
- Providing rebates for low use washing machines.

- Offering businesses rebates to replace old equipment with water saving equipment.
- Distributing low flow shower heads, sink aerators, irrigation measurement devices, and shower timers.
- Completing water audits of Kent facilities.
- Retrofitting Kent facilities with low consumptive devices.
- Providing numerous education materials.
- Reducing unaccounted-for water within Kent's water system above and beyond industry standards.

Conservation is especially important in the summer when stream flows are at their lowest and water use is at its highest. As a part of this HCP, Kent will make a firm commitment to invest resources and educate its customers about the importance of conserving water. Inclusion of the conservation program as an HCP measure will ensure that the conservation program is continued for the duration of the ITP. The overall objective of Kent's Water Conservation Program is to maximize efficiency of existing water supply systems and minimize future increases in water use as a result of population growth. Further, the program is designed to educate the public on the value of water conservation and to promote watershed protection and health.

HCM-8: Riparian Acquisition, Easement, and Enhancement Fund in Rock Creek Watershed

Kent will establish a $1.6 million Habitat Fund. The Habitat Fund will dedicate $1,600,000 in years 6-15 of the HCP with a minimum annual payment of $210,000 per year. The remaining balance shall be adjusted 3 percent per year from the year in which the ITP is signed. The balance of the Habitat Fund, if any, shall be paid in year 15. This will provide funding for various types of habitat conservation projects that may include, but not be limited to, the following:

- Acquisition of lands/property adjoining or influencing the Rock Creek system.
- Securing a conservation easement on properties adjoining or influencing the Rock Creek system.
- Enhancement projects within the Rock Creek basin that protect and/or enhance existing riparian habitats and adjoining flood-plain function and integrity.
- Other habitat projects within the Rock Creek basin that function to protect and/or enhance the populations of salmonids that utilize Rock Creek that are covered under the ITP.

The Habitat Fund must be spent on mitigation/restoration projects that benefit the covered species in the HCP and improve water quality within the Rock Creek basin. Funds can be spent on land acquisition, conservation easements, and the purchase of water rights. Kent will establish a Rock Creek HCP Habitat Fund Committee, which will consist of Kent, USFWS, and NMFS, which will meet twice a year to review progress of the identified projects and make a

determination of future HCP Mitigation/Restoration projects. Kent will make recommendations to USFWS and NMFS on the use of the $1,600,000 Habitat Fund during years 6-15 of the HCP. However, USFWS/NMFS will make the final determination on the mitigation/restoration projects and the expenditure of funds. In the event a mitigation/restoration project is recommended by Kent and approved by the USFWS and NMFS but then deemed not feasible, Kent, USFWS, and NMFS shall consult and select another project as a substitute. Upon spending all of the $1.6 million (adjusted for inflation) in the Rock Creek Habitat Fund, Kent's obligations to the Habitat Fund shall be complete.

Monitoring and Evaluation Measures

Monitoring and evaluation of the HCMs described is integral to the success of the Kent's HCP. Monitoring and evaluation of these measures will provide the Services with certainty that the HCMs identified and described in HCP are implemented and maintained. In addition, the measures allow for an adaptive management approach for certain HCMs whereby modifications can and will be made based on results of the monitoring measures. The MEMs that Kent has agreed to fund as part of the HCP are summarized in Table 3. The overall objectives of the MEMs are to:

- Ensure that the HCP conservation measures comply with appropriate design standards.
- Ensure that measures implemented under the HCP are effective in achieving their anticipated benefits as described in Chapter 4.
- Provide information useful for making adjustments in selected measures within an adaptive management framework.

Table 3. Monitoring and Evaluation Measures (MEM) to be implemented by the City of Kent under the Clark Springs System HCP.

Monitoring and Evaluation Measure	Title	Summary of Measure
MEM-1	Rock Creek and Augmentation Flow Monitoring	Provide funding to maintain USGS gage 12118400 Rock Creek at Highway 516 near Ravensdale and monitor precipitation at the Clark Springs watershed to assist in refining classifications of Wet, Normal, Dry, and Drought conditions. Estimated Costs: $1.86 million
MEM-2	Precipitation Monitoring at Landsburg	Provide funding to the USGS to work cooperatively with Seattle Public Utilities to monitor precipitation at Landsburg, to assist in classifications of Wet, Normal, Dry, and Drought conditions. Estimated Costs: $132,000
MEM-3	Spawning Surveys in Rock Creek	Conduct spawning surveys every fourth year over Index Reaches through the duration of the ITP. Estimated Costs: $410,000
MEM-4	Rock Creek mouth-passage improvements	Document successful project completion and annually check on project functionality. Estimated Costs: $104,000
MEM-5	Wetland fish use monitoring	Document if fish are utilizing the wetlands. Estimated Costs: $3,000

ACTION AREA

The action area is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR § 402.02). In delineating the action area, we evaluated the farthest-reaching physical, chemical, and biotic effects of the action on the environment.

The proposed ITP and HCP coverage area (action area) (Figure 2) includes 1) the 320 acres of land that is owned by the City and collectively called the Clark Springs Facility; 2) Rock Creek, from the eastern edge of Clark Springs Facility property to the confluence with the Cedar River; and 3) areas along Rock Creek and in the Rock Creek basin where mitigation and restoration activities described in Chapter 4 of the proposed HCP would occur.

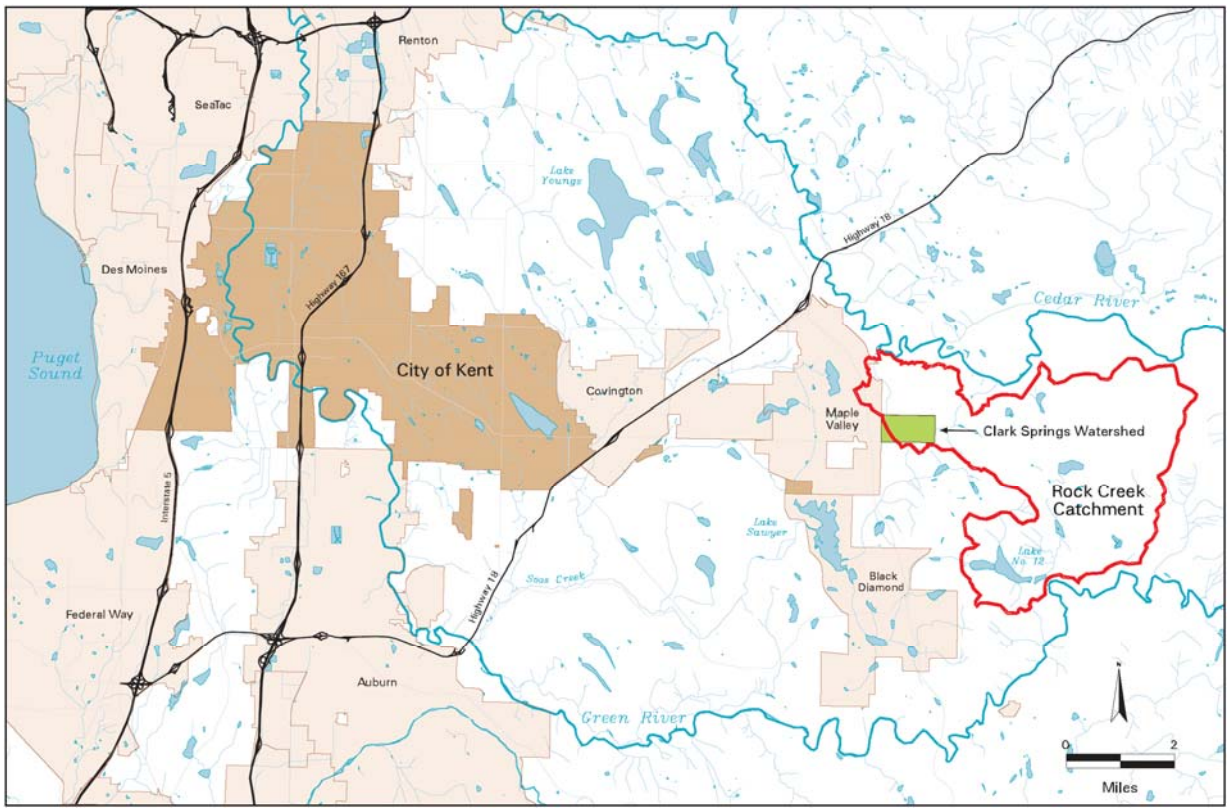


Figure 2. Action Area: Clark Springs Water Supply Facility and Rock Creek Catchment.

ANALYTICAL FRAMEWORK FOR THE JEOPARDY AND ADVERSE MODIFICATION DETERMINATIONS

Jeopardy Determination for Bull Trout

In accordance with policy and regulation, the jeopardy analysis in this Opinion relies on four components: (1) the *Status of the Species*, which evaluates the bull trout's range-wide condition, the factors responsible for that condition, and its survival and recovery needs; (2) the *Environmental Baseline*, which evaluates the condition of the bull trout in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of the bull trout; (3) the *Effects of the Action*, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated or interdependent activities on the bull trout; and (4) *Cumulative Effects*, which evaluates the effects of future, non-Federal activities in the action area on the bull trout.

In accordance with policy and regulation, the jeopardy determination is made by evaluating the effects of the proposed Federal action in the context of the bull trout's current status, taking into account any cumulative effects, to determine if implementation of the proposed action is likely to cause an appreciable reduction in the likelihood of both the survival and recovery of the bull trout in the wild.

Interim recovery units were defined in the final listing rule for the bull trout for use in

completing jeopardy analyses. Pursuant to USFWS policy, when an action impairs or precludes the capacity of a recovery unit from providing both the survival and recovery function assigned to it, that action may represent jeopardy to the species. When using this type of analysis, the Opinion describes how the action affects not only the recovery unit's capability, but also the relationship of the recovery unit to both the survival and recovery of the listed species as a whole.

The jeopardy analysis for the bull trout in this Opinion uses the above approach and considers the relationship of the action area and core area (discussed below under the *Status of the Species* section) to the recovery unit and the relationship of the recovery unit to both the survival and recovery of the bull trout as a whole as the context for evaluating the significance of the effects of the proposed Federal action, taken together with cumulative effects, for purposes of making the jeopardy determination.

STATUS OF THE SPECIES

STATUS OF THE SPECIES: Bull Trout – Rangewide

Listing Status

The coterminous United States population of the bull trout (*Salvelinus confluentus*) was listed as threatened on November 1, 1999 (64 FR 58910). The threatened bull trout generally occurs in the Klamath River Basin of south-central Oregon; the Jarbidge River in Nevada; the Willamette River Basin in Oregon; Pacific Coast drainages of Washington, including Puget Sound; major rivers in Idaho, Oregon, Washington, and Montana, within the Columbia River Basin; and the St. Mary-Belly River, east of the Continental Divide in northwestern Montana (Bond 1992, p. 2; Brewin and Brewin 1997, p. 215; Cavender 1978, pp. 165-166; Leary and Allendorf 1997, pp. 716-719).

Throughout its range, the bull trout are threatened by the combined effects of habitat degradation, fragmentation, and alterations associated with dewatering, road construction and maintenance, mining, grazing, the blockage of migratory corridors by dams or other diversion structures, poor water quality, entrainment (a process by which aquatic organisms are pulled through a diversion or other device) into diversion channels, and introduced non-native species (64 FR 58910). Although all salmonids are likely to be affected by climate change, bull trout are especially vulnerable given that spawning and rearing are constrained by their location in upper watersheds and the requirement for cold water temperatures (Battin et al. 2007, pp. 6672-6673; Rieman et al. 2007, p. 1552). Poaching and incidental mortality of bull trout during other targeted fisheries are additional threats.

The bull trout was initially listed as three separate Distinct Population Segments (DPSs) (63 FR 31647; 64 FR 17110). The preamble to the final listing rule for the United States coterminous population of the bull trout discusses the consolidation of these DPSs with the Columbia and Klamath population segments into one listed taxon and the application of the jeopardy standard under section 7 of the Act relative to this species (64 FR 58910):

> Although this rule consolidates the five bull trout DPSs into one listed taxon,

based on conformance with the DPS policy for purposes of consultation under section 7 of the Act, we intend to retain recognition of each DPS in light of available scientific information relating to their uniqueness and significance. Under this approach, these DPSs will be treated as interim recovery units with respect to application of the jeopardy standard until an approved recovery plan is developed. Formal establishment of bull trout recovery units will occur during the recovery planning process.

Current Status and Conservation Needs

In recognition of available scientific information relating to their uniqueness and significance, five segments of the coterminous United States population of the bull trout are considered essential to the survival and recovery of this species and are identified as interim recovery units: 1) Jarbidge River, 2) Klamath River, 3) Columbia River, 4) Coastal-Puget Sound, and 5) St. Mary-Belly River (USFWS 2002a, pp. iv, 2, 7, 98; 2004a, Vol. 1 & 2, p. 1; 2004b, p. 1). Each of these interim recovery units is necessary to maintain the bull trout's distribution, as well as its genetic and phenotypic diversity, all of which are important to ensure the species' resilience to changing environmental conditions.

A summary of the current status and conservation needs of the bull trout within these interim recovery units is provided below and a comprehensive discussion is found in the USFWS's draft recovery plans for the bull trout (USFWS 2002a, pp. vi-viii; 2004a, Vol. 2 p. iii-x; 2004b, pp. iii-xii).

The conservation needs of bull trout are often generally expressed as the four "Cs": cold, clean, complex, and connected habitat. Cold stream temperatures, clean water quality that is relatively free of sediment and contaminants, complex channel characteristics (including abundant large wood and undercut banks), and large patches of such habitat that are well connected by unobstructed migratory pathways are all needed to promote conservation of bull trout at multiple scales ranging from the coterminous to local populations (a local population is a group of bull trout that spawn within a particular stream or portion of a stream system). The recovery planning process for bull trout (USFWS 2002a, pp. 49-50; 2004a, Vol 1 & 2 pp. 12-18; 2004b, pp. 60-86) has also identified the following conservation needs: 1) maintenance and restoration of multiple, interconnected populations in diverse habitats across the range of each interim recovery unit, 2) preservation of the diversity of life-history strategies, 3) maintenance of genetic and phenotypic diversity across the range of each interim recovery unit, and 4) establishment of a positive population trend. Recently, it has also been recognized that bull trout populations need to be protected from catastrophic fires across the range of each interim recovery unit (Rieman et al. 2003).

Central to the survival and recovery of bull trout is the maintenance of viable core areas (USFWS 2002a, pp. 53-54; 2004a, Vol. 1 pp. 210-218, Vol 2. pp. 61-62; 2004b, pp. 15-30, 64-67). A core area is defined as a geographic area occupied by one or more local bull trout populations that overlap in their use of rearing, foraging, migratory, and overwintering habitat. Each of the interim recovery units listed above consists of one or more core areas. There are 121 core areas recognized across the coterminous range of the bull trout (USFWS 2002a, pp. 6, 48,

98; 2004a, Vol. 1 p. vi, Vol. 2 pp. 14, 134; 2004b, pp. iv, 2; 2005, p. ii).

Jarbidge River Interim Recovery Unit

This interim recovery unit currently contains a single core area with six local populations. Less than 500 resident and migratory adult bull trout, representing about 50 to 125 spawning adults, are estimated to occur in the core area. The current condition of the bull trout in this interim recovery unit is attributed to the effects of livestock grazing, roads, incidental mortalities of released bull trout from recreational angling, historic angler harvest, timber harvest, and the introduction of non-native fishes (USFWS 2004b). The draft bull trout recovery plan (USFWS 2004b) identifies the following conservation needs for this interim recovery unit: 1) maintain the current distribution of the bull trout within the core area, 2) maintain stable or increasing trends in abundance of both resident and migratory bull trout in the core area, 3) restore and maintain suitable habitat conditions for all life history stages and forms, and 4) conserve genetic diversity and increase natural opportunities for genetic exchange between resident and migratory forms of bull trout. An estimated 270 to 1,000 spawning bull trout per year are needed to provide for the persistence and viability of the core area and to support both resident and migratory adult bull trout (USFWS 2004b).

Klamath River Interim Recovery Unit

This interim recovery unit currently contains three core areas and seven local populations. The current abundance, distribution, and range of the bull trout in the Klamath River Basin are greatly reduced from historical levels due to habitat loss and degradation caused by reduced water quality, timber harvest, livestock grazing, water diversions, roads, and the introduction of non-native fishes (USFWS 2002a). Bull trout populations in this interim recovery unit face a high risk of extirpation (USFWS 2002a). The draft Klamath River bull trout recovery plan (USFWS 2002a) identifies the following conservation needs for this interim recovery unit: 1) maintain the current distribution of bull trout and restore distribution in previously occupied areas, 2) maintain stable or increasing trends in bull trout abundance, 3) restore and maintain suitable habitat conditions for all life history stages and strategies, 4) conserve genetic diversity and provide the opportunity for genetic exchange among appropriate core area populations. Eight to 15 new local populations and an increase in population size from about 2,400 adults currently to 8,250 adults are needed to provide for the persistence and viability of the three core areas (USFWS 2002a).

Columbia River Interim Recovery Unit

The Columbia River interim recovery unit includes bull trout residing in portions of Oregon, Washington, Idaho, and Montana. Bull trout are estimated to have occupied about 60 percent of the Columbia River Basin, and presently occur in 45 percent of the estimated historical range (Quigley and Arbelbide 1997, p. 1177). This interim recovery unit currently contains 97 core areas and 527 local populations. About 65 percent of these core areas and local populations occur in central Idaho and northwestern Montana. The Columbia River interim recovery unit has declined in overall range and numbers of fish (63 FR 31647). Although some strongholds still exist with migratory fish present, bull trout generally occur as isolated local populations in

headwater lakes or tributaries where the migratory life history form has been lost. Though still widespread, there have been numerous local extirpations reported throughout the Columbia River basin. In Idaho, for example, bull trout have been extirpated from 119 reaches in 28 streams (IDFG, in litt. 1995). The draft Columbia River bull trout recovery plan (USFWS 2002c) identifies the following conservation needs for this interim recovery unit: 1) maintain or expand the current distribution of the bull trout within core areas, 2) maintain stable or increasing trends in bull trout abundance, 3) restore and maintain suitable habitat conditions for all bull trout life history stages and strategies, and 4) conserve genetic diversity and provide opportunities for genetic exchange.

This interim recovery unit currently contains 97 core areas and 527 local populations. About 65 percent of these core areas and local populations occur in Idaho and northwestern Montana. The condition of the bull trout within these core areas varies from poor to good. All core areas have been subject to the combined effects of habitat degradation and fragmentation caused by the following activities: dewatering, road construction and maintenance, mining, grazing, the blockage of migratory corridors by dams or other diversion structures, poor water quality, incidental angler harvest, entrainment into diversion channels, and introduced non-native species. The USFWS completed a core area conservation assessment for the 5-year status review and determined that, of the 97 core areas in this interim recovery unit, 38 are at high risk of extirpation, 35 are at risk, 20 are at potential risk, 2 are at low risk, and 2 are at unknown risk (USFWS 2005, pp. 2, Map A, pp. 73-83).

Coastal-Puget Sound Interim Recovery Unit

Bull trout in the Coastal-Puget Sound interim recovery unit exhibit anadromous, adfluvial, fluvial, and resident life history patterns. The anadromous life history form is unique to this interim recovery unit. This interim recovery unit currently contains 14 core areas and 67 local populations (USFWS 2004a). Bull trout are distributed throughout most of the large rivers and associated tributary systems within this interim recovery unit. Bull trout continue to be present in nearly all major watersheds where they likely occurred historically, although local extirpations have occurred throughout this interim recovery unit. Many remaining populations are isolated or fragmented and abundance has declined, especially in the southeastern portion of the interim recovery unit. The current condition of the bull trout in this interim recovery unit is attributed to the adverse effects of dams, forest management practices (e.g., timber harvest and associated road building activities), agricultural practices (e.g., diking, water control structures, draining of wetlands, channelization, and the removal of riparian vegetation), livestock grazing, roads, mining, urbanization, poaching, incidental mortality from other targeted fisheries, and the introduction of non-native species. The draft Coastal-Puget Sound bull trout recovery plan (USFWS 2004a) identifies the following conservation needs for this interim recovery unit: 1) maintain or expand the current distribution of bull trout within existing core areas, 2) increase bull trout abundance to about 16,500 adults across all core areas, and 3) maintain or increase connectivity between local populations within each core area.

St. Mary-Belly River Interim Recovery Unit

This interim recovery unit currently contains six core areas and nine local populations (USFWS

2002b). Currently, bull trout are widely distributed in the St. Mary-Belly River drainage and occur in nearly all of the waters that it inhabited historically. Bull trout are found only in a 1.2-mile reach of the North Fork Belly River within the United States. Redd count surveys of the North Fork Belly River documented an increase from 27 redds in 1995 to 119 redds in 1999. This increase was attributed primarily to protection from angler harvest (USFWS 2002b). The current condition of the bull trout in this interim recovery unit is primarily attributed to the effects of dams, water diversions, roads, mining, and the introduction of non-native fishes (USFWS 2002b). The draft St. Mary-Belly River bull trout recovery plan (USFWS 2002b) identifies the following conservation needs for this interim recovery unit: 1) maintain the current distribution of the bull trout and restore distribution in previously occupied areas, 2) maintain stable or increasing trends in bull trout abundance, 3) restore and maintain suitable habitat conditions for all life history stages and forms, 4) conserve genetic diversity and provide the opportunity for genetic exchange, and 5) establish good working relations with Canadian interests because local bull trout populations in this interim recovery unit are comprised mostly of migratory fish, whose habitat is mostly in Canada.

Life History

Bull trout exhibit both resident and migratory life history strategies. Both resident and migratory forms may be found together, and either form may produce offspring exhibiting either resident or migratory behavior (Rieman and McIntyre 1993, pp. 1-18) . Resident bull trout complete their entire life cycle in the tributary (or nearby) streams in which they spawn and rear. The resident form tends to be smaller than the migratory form at maturity and also produces fewer eggs (Fraley and Shepard 1989, p. 1; Goetz 1989, pp. 15-16). Migratory bull trout spawn in tributary streams where juvenile fish rear 1 to 4 years before migrating to either a lake (adfluvial form), river (fluvial form) (Fraley and Shepard 1989, pp. 135-137; Goetz 1989, pp. 22-25), or saltwater (anadromous form) to rear as subadults and to live as adults (Cavender 1978, pp. 139, 165-68; McPhail and Baxter 1996, p. 14; WDFW et al. 1997, pp. 17-18, 22-26). Bull trout normally reach sexual maturity in 4 to 7 years and may live longer than 12 years. They are iteroparous (they spawn more than once in a lifetime). Repeat- and alternate-year spawning has been reported, although repeat-spawning frequency and post-spawning mortality are not well documented (Fraley and Shepard 1989, pp. 135-137; Leathe and Graham 1982, p. 95; Pratt 1992, p. 6; Rieman and McIntyre 1996, p. 133).

The iteroparous reproductive strategy of bull trout has important repercussions for the management of this species. Bull trout require passage both upstream and downstream, not only for repeat spawning but also for foraging. Most fish ladders, however, were designed specifically for anadromous semelparous salmonids (fishes that spawn once and then die, and require only one-way passage upstream). Therefore, even dams or other barriers with fish passage facilities

may be a factor in isolating bull trout populations if they do not provide a downstream passage route. Additionally, in some core areas, bull trout that migrate to marine waters must pass both upstream and downstream through areas with net fisheries at river mouths. This can increase the likelihood of mortality to bull trout during these spawning and foraging migrations.

Growth varies depending upon life-history strategy. Resident adults range from 6 to 12 inches total length, and migratory adults commonly reach 24 inches or more (Goetz 1989, pp. 29-32; Pratt 1984, p. 13) The largest verified bull trout is a 32-pound specimen caught in Lake Pend Oreille, Idaho, in 1949 (Simpson and Wallace 1982).

Habitat Characteristics

Bull trout have more specific habitat requirements than most other salmonids (Rieman and McIntyre 1993, p. 7). Habitat components that influence bull trout distribution and abundance include water temperature, cover, channel form and stability, valley form, spawning and rearing substrate, and migratory corridors (Fraley and Shepard 1989, pp. 137, 141; Goetz 1989, pp. 19-26; Bond in Hoelscher and Bjornn 1989, p. 57; Howell and Buchanan 1992, p. 1; Pratt 1992, p. 6; Rich 1996, pp. 35-38; Rieman and McIntyre 1993, pp. 4-7; Rieman and McIntyre 1995, pp. 293-294; Sedell and Everest 1991, p. 1; Watson and Hillman 1997, pp. 246-250). Watson and Hillman (1997, pp. 247-249) concluded that watersheds must have specific physical characteristics to provide the habitat requirements necessary for bull trout to successfully spawn and rear and that these specific characteristics are not necessarily present throughout these watersheds. Because bull trout exhibit a patchy distribution, even in pristine habitats (Rieman and McIntyre 1993, p. 7), bull trout should not be expected to simultaneously occupy all available habitats (Rieman et al. 1997, p. 1560).

Migratory corridors link seasonal habitats for all bull trout life histories. The ability to migrate is important to the persistence of bull trout (Gilpin, in litt. 1997, pp. 4-5; Rieman and McIntyre 1993, p. 7; Rieman et al. 1997, p. 1114). Migrations facilitate gene flow among local populations when individuals from different local populations interbreed or stray to nonnatal streams. Local populations that are extirpated by catastrophic events may also become reestablished by bull trout migrants. However, it is important to note that the genetic structuring of bull trout indicates there is limited gene flow among bull trout populations, which may encourage local adaptation within individual populations, and that reestablishment of extirpated populations may take a long time (Rieman and McIntyre 1993, p. 7; Spruell et al. 1999, pp. 118-120). Migration also allows bull trout to access more abundant or larger prey, which facilitates growth and reproduction. Additional benefits of migration and its relationship to foraging are discussed below under “Diet.”

Cold water temperatures play an important role in determining bull trout habitat quality, as these fish are primarily found in colder streams (below 15 °C or 59 °F), and spawning habitats are generally characterized by temperatures that drop below 9 °C (48 °F) in the fall (Fraley and Shepard 1989, p. 133; Pratt 1992, p. 6; Rieman and McIntyre 1993, p. 7).

Thermal requirements for bull trout appear to differ at different life stages. Spawning areas are often associated with cold-water springs, groundwater infiltration, and the coldest streams in a given watershed (Baxter et al. 1997, pp. 426-427; Pratt 1992, p. 6; Rieman and McIntyre 1993, p. 7; Rieman et al. 1997, p. 1117). Optimum incubation temperatures for bull trout eggs range from 2 °C to 6 °C (35 °F to 39 °F) whereas optimum water temperatures for rearing range from about 6 °C to 10 °C (46 °F to 50 °F) (Buchanan and Gregory 1997, pp. 121-122; Goetz 1989, pp. 22-24; McPhail and Murray 1979, pp. 41, 50, 53, 55). In Granite Creek, Idaho, Bonneau and Scarnecchia (1996) observed that juvenile bull trout selected the coldest water available in a plunge pool, 8 °C to 9 °C (46 °F to 48 °F), within a temperature gradient of 8 °C to 15 °C (4 °F to 60 °F). In a landscape study relating bull trout distribution to maximum water temperatures, Dunham et al. (2003) found that the probability of juvenile bull trout occurrence does not become high (i.e., greater than 0.75) until maximum temperatures decline to 11 °C to 12 °C (52 °F to 54 °F).

Although bull trout are found primarily in cold streams, occasionally these fish are found in larger, warmer river systems throughout the Columbia River basin (Buchanan and Gregory 1997, pp. 121-122; Fraley and Shepard 1989, pp. 135-137; Rieman and McIntyre 1993, p. 2; Rieman and McIntyre 1995, p. 288; Rieman et al. 1997, p. 1114). Availability and proximity of cold water patches and food productivity can influence bull trout ability to survive in warmer rivers (Myrick et al. 2002). For example, in a study in the Little Lost River of Idaho where bull trout were found at temperatures ranging from 8 °C to 20 °C (46 °F to 68 °F), most sites that had high densities of bull trout were in areas where primary productivity in streams had increased following a fire (Gamett, pers. comm. 2002).

All life history stages of bull trout are associated with complex forms of cover, including LWD, undercut banks, boulders, and pools (Fraley and Shepard 1989, pp. 135-137; Goetz 1989, pp. 22-25; Hoelscher and Bjornn 1989, p. 54; Pratt 1992, p. 6; Rich 1996, pp. 35-38; Sedell and Everest 1991, p. 1; Sexauer and James 1997, pp. 367-369; Thomas 1992, pp. 4-5; Watson and Hillman 1997, pp. 247-249). Maintaining bull trout habitat requires stability of stream channels and maintenance of natural flow patterns (Rieman and McIntyre 1993, p. 7). Juvenile and adult bull trout frequently inhabit side channels, stream margins, and pools with suitable cover (Sexauer and James 1997, pp. 367-369). These areas are sensitive to activities that directly or indirectly affect stream channel stability and alter natural flow patterns. For example, altered stream flow in the fall may disrupt bull trout during the spawning period, and channel instability may decrease survival of eggs and young juveniles in the gravel from winter through spring (Fraley and Shepard 1989, pp. 135-137; Pratt 1992, p. 6; Pratt and Huston 1993, pp. 70-72). Pratt (1992, p. 6) indicated that increases in fine sediment reduce egg survival and emergence.

Bull trout typically spawn from August through November during periods of increasing flows and decreasing water temperatures. Preferred spawning habitat consists of low-gradient stream reaches with loose, clean gravel (Fraley and Shepard 1989, p. 135). Redds are often constructed in stream reaches fed by springs or near other sources of cold groundwater (Goetz 1989, p. 15; Pratt 1992, p. 8; Rieman and McIntyre 1996, p. 133). Depending on water temperature,

incubation is normally 100 to 145 days (Pratt 1992, p. 8). After hatching, fry remain in the substrate, and time from egg deposition to emergence may surpass 200 days. Fry normally emerge from early April through May, depending on water temperatures and increasing stream flows (Ratliff and Howell 1992 in Howell and Buchanan 1992, pp. 10, 15; Pratt 1992, pp. 5-6).

Early life stages of fish, specifically the developing embryo, require the highest inter-gravel dissolved oxygen (IGDO) levels, and are the most sensitive life stage to reduced oxygen levels. The oxygen demand of embryos depends on temperature and on stage of development, with the greatest IGDO required just prior to hatching.

A literature review conducted by the Washington Department of Ecology (WDOE 2002) indicates that adverse effects of lower oxygen concentrations on embryo survival are magnified as temperatures increase above optimal (for incubation). In a laboratory study conducted in Canada, researchers found that low oxygen levels retarded embryonic development in bull trout (Giles and Van der Zweep 1996, pp. 54-55). Normal oxygen levels seen in rivers used by bull trout during spawning ranged from 8 to 12 mg/L (in the gravel), with corresponding instream levels of 10 to 11.5 mg/L (Stewart et al. 2007). In addition, IGDO concentrations, water velocities in the water column, and especially the intergravel flow rate, are interrelated variables that affect the survival of incubating embryos (ODEQ 1995). Due to a long incubation period of 220+ days, bull trout are particularly sensitive to adequate IGDO levels. An IGDO level below 8 mg/L is likely to result in mortality of eggs, embryos, and fry.

Migratory forms of bull trout may develop when habitat conditions allow movement between spawning and rearing streams and larger rivers, lakes or nearshore marine habitat where foraging opportunities may be enhanced (Brenkman and Corbett 2005, pp. 1073, 1079-1080; Frissell 1993, p. 350; Goetz et al. 2004, pp. 45, 55, 60, 68, 77, 113-114, 123, 125-126). For example, multiple life history forms (e.g., resident and fluvial) and multiple migration patterns have been noted in the Grande Ronde River (Baxter 2002). Parts of this river system have retained habitat conditions that allow free movement between spawning and rearing areas and the mainstem Snake River. Such multiple life history strategies help to maintain the stability and persistence of bull trout populations to environmental changes. Benefits to migratory bull trout include greater growth in the more productive waters of larger streams, lakes, and marine waters; greater fecundity resulting in increased reproductive potential; and dispersing the population across space and time so that spawning streams may be recolonized should local populations suffer a catastrophic loss (Frissell 1999, pp. 15-16; MBTSG 1998, pp. iv, 48-50; Rieman and McIntyre 1993, pp. 18-19; USFWS 2004a, Vol. 2, p. 63). In the absence of the migratory bull trout life form, isolated populations cannot be replenished when disturbances make local habitats temporarily unsuitable. Therefore, the range of the species is diminished, and the potential for a greater reproductive contribution from larger fish with higher fecundity is lost (Rieman and McIntyre 1993, pp. 1-18).

Diet

Bull trout are opportunistic feeders, with food habits primarily a function of size and life-history strategy. A single optimal foraging strategy is not necessarily a consistent feature in the life of a fish, because this strategy can change as the fish progresses from one life stage to another (i.e., juvenile to subadult). Fish growth depends on the quantity and quality of food that is eaten (Gerking 1994), and as fish grow, their foraging strategy changes as their food changes, in quantity, size, or other characteristics. Resident and juvenile migratory bull trout prey on terrestrial and aquatic insects, macrozooplankton, and small fish (Boag 1987, p. 58; Donald and Alger 1993, pp. 239-243; Goetz 1989, pp. 33-34). Subadult and adult migratory bull trout feed on various fish species (Brown 1994, p. 21; Donald and Alger 1993, p. 242; Fraley and Shepard 1989, p. 135; Leathe and Graham 1982, p. 95). Bull trout of all sizes other than fry have been found to eat fish up to half their length (Beauchamp and VanTassell 2001). In nearshore marine areas of western Washington, bull trout feed on Pacific herring (*Clupea pallasi*), Pacific sand lance (*Ammodytes hexapterus*), and surf smelt (*Hypomesus pretiosus*) (Goetz et al. 2004, p. 114; WDFW et al. 1997, p. 23).

Bull trout migration and life history strategies are closely related to their feeding and foraging strategies. Migration allows bull trout to access optimal foraging areas and exploit a wider variety of prey resources. Optimal foraging theory can be used to describe strategies fish use to choose between alternative sources of food by weighing the benefits and costs of capturing one source of food over another. For example, prey often occur in concentrated patches of abundance ("patch model") (Gerking 1994). As the predator feeds in one patch, the prey population is reduced, and it becomes more profitable for the predator to seek a new patch rather than continue feeding on the original one. This can be explained in terms of balancing energy acquired versus energy expended. For example, in the Skagit River system, anadromous bull trout make migrations as long as 121 miles between marine foraging areas in Puget Sound and headwater spawning grounds, foraging on salmon eggs and juvenile salmon along their migration route (WDFW et al. 1997). Anadromous bull trout also use marine waters as migration corridors to reach seasonal habitats in non-natal watersheds to forage and possibly overwinter (Brenkman and Corbett 2005, p. 1079; Goetz et al. 2004, pp. 36, 60).

<u>Changes in Status of the Coastal-Puget Sound Interim Recovery Unit</u>

Although the status of bull trout in Coastal-Puget Sound interim recovery unit has been improved by certain actions, it continues to be degraded by other actions, and it is likely that the overall status of the bull trout in this population segment has not improved since its listing on November 1, 1999. Improvement has occurred largely through changes in fishing regulations and habitat-restoration projects. Fishing regulations enacted in 1994 either eliminated harvest of bull trout or restricted the amount of harvest allowed, and this likely has had a positive influence on the abundance of bull trout. Improvement in habitat has occurred following restoration projects intended to benefit either bull trout or salmon, although monitoring the effectiveness of these projects seldom occurs. On the other hand, the status of this population segment has been

adversely affected by a number of Federal and non-Federal actions, some of which were addressed under section 7 of the Act. Most of these actions degraded the environmental baseline; all of those addressed through formal consultation under section 7 of the Act permitted the incidental take of bull trout.

Section 10(a)(1)(B) permits have been issued for Habitat Conservation Plans (HCP) completed in the Coastal-Puget Sound population segment. These include: 1) the City of Seattle's Cedar River Watershed HCP, 2) Simpson Timber HCP (now Green Diamond Resources), 3) Tacoma Public Utilities Green River HCP, 4) Plum Creek Cascades HCP, 5) Washington State Department of Natural Resources (WSDNR) State Trust Lands HCP, 6) West Fork Timber HCP, and 7) WSDNR Forest Practices HCP. These HCPs provide landscape-scale conservation for fish, including bull trout. Many of the covered activities associated with these HCPs will contribute to conserving bull trout over the long-term; however, some covered activities will result in short-term degradation of the baseline. All HCPs permit the incidental take of bull trout.

Changes in Status of the Columbia River Interim Recovery Unit

The overall status of the Columbia River interim recovery unit has not changed appreciably since its listing on June 10, 1998. Populations of bull trout and their habitat in this area have been affected by a number of actions addressed under section 7 of the Act. Most of these actions resulted in degradation of the environmental baseline of bull trout habitat, and all permitted or analyzed the potential for incidental take of bull trout. The Plum Creek Cascades HCP, Plum Creek Native Fish HCP, Storedahl Daybreak Mine HCP, and WSDNR Forest Practices HCP addressed portions of the Columbia River population segment of bull trout.

Changes in Status of the Klamath River Interim Recovery Unit

Improvements in the Threemile, Sun, and Long Creek local populations have occurred through efforts to remove or reduce competition and hybridization with non-native salmonids, changes in fishing regulations, and habitat-restoration projects. Population status in the remaining local populations (Boulder-Dixon, Deming, Brownsworth, and Leonard Creeks) remains relatively unchanged. Grazing within bull trout watersheds throughout the recovery unit has been curtailed. Efforts at removal of non-native species of salmonids appear to have stabilized the Threemile and positively influenced the Sun Creek local populations. The results of similar efforts in Long Creek are inconclusive. Mark and recapture studies of bull trout in Long Creek indicate a larger migratory component than previously expected.

Although the status of specific local populations has been slightly improved by recovery actions, the overall status of Klamath River bull trout continues to be depressed. Factors considered threats to bull trout in the Klamath Basin at the time of listing – habitat loss and degradation caused by reduced water quality, past and present land use management practices, water diversions, roads, and non-native fishes – continue to be threats today.

Changes in Status of the Saint Mary-Belly River Interim Recovery Unit

The overall status of bull trout in the Saint Mary-Belly River interim recovery unit has not changed appreciably since its listing on November 1, 1999. Extensive research efforts have been conducted since listing, to better quantify populations of bull trout and their movement patterns. Limited efforts in the way of active recovery actions have occurred. Habitat occurs mostly on Federal and Tribal lands (Glacier National Park and the Blackfeet Nation). Known problems due to instream flow depletion, entrainment, and fish passage barriers resulting from operations of the U.S. Bureau of Reclamation's Milk River Irrigation Project (which transfers Saint Mary-Belly River water to the Missouri River Basin) and similar projects downstream in Canada constitute the primary threats to bull trout and to date they have not been adequately addressed under section 7 of the Act. Plans to upgrade the aging irrigation delivery system are being pursued, which has potential to mitigate some of these concerns but also the potential to intensify dewatering. A major fire in August 2006 severely burned the forested habitat in Red Eagle and Divide Creeks, potentially affecting three of nine local populations and degrading the baseline.

STATUS OF THE SPECIES: Coastal Cutthroat Trout – Rangewide

The coastal cutthroat trout (*Oncorhynchus clarki clarki*) is listed as a Federal species of concern in Washington. Washington State considers the cutthroat trout to be a Species of Recreational, Commercial, and/or Tribal Importance. Species of Recreational, Commercial, and/or Tribal Importance are defined as native and non-native fish and wildlife species of recreational or commercial importance, and recognized species used for tribal ceremonial and subsistence purposes, whose biological or ecological characteristics make them vulnerable to decline in Washington or that are dependent on habitats that are highly vulnerable or are in limited availability (WDFW 2011 website).

Natural coastal cutthroat trout habitat ranges from the Eel River of northern California to Prince William Sound in southern Alaska, rarely penetrating more than 100 miles inland (Behnke 2002; Johnston 1982). It is a common native species in western Washington, often referred to as sea-run cutthroat. The coastal cutthroat trout exhibits four life-history variations: sea-run (anadromous), resident stream populations, fluvial populations, and lake-adapted (adfluvial) populations (Behnke 2002). All variations may be exhibited within the same stream. While it is likely anadromous populations once existed historically in the Cedar River, they are most likely not present in the Lake Washington watershed today. The cutthroat trout in Rock Creek are considered adfluvial fish from Lake Washington, as there are no records of sea-run cutthroat use at the Ballard Locks (City of Seattle et al. 1999). These adfluvial cutthroat trout reside in Lake Washington and migrate in late winter into tributaries, including the Cedar River and Rock Creek, to spawn. Adult adfluvial cutthroat trout have been observed in Rock Creek as early as the third week in November through mid-February (R2 Resource Consultants 2005a); however, most observations tend to occur in late-December into January.

In 2000, the WDFW released its Salmonid Stock Inventory Coastal Cutthroat Trout (WDFW 2000) for Washington State. This inventory identified 40 “stock complexes” within Washington State. A stock complex is a group of stocks typically located within a single watershed, or other relatively limited geographic area, and believed to be closely related to one another (WDFW

2000). Of these 40 stock complexes, one was considered to be healthy, seven were considered to be depressed and the status of the other 32 complexes was unknown (Table 4). The seven depressed stocks are located in the lower Columbia River area (WDFW 2000).

Table 4. WDFW State Salmonid Inventory Coastal Cutthroat Trout Status Summary.

	Healthy	Depressed	Critical	Unknown	Extinct
Puget Sound					
North Puget Sound	**1**	**0**	**0**	**7**	**0**
South Puget Sound	**0**	**0**	**0**	**4**	**0**
Hood Canal	**0**	**0**	**0**	**2**	**0**
Strait of Juan de Fuca	**0**	**0**	**0**	**3**	**0**
Total	**1**	**0**	**0**	**16**	**0**
Coastal					
North Coast	**0**	**0**	**0**	**6**	**0**
Grays Harbor/Willapa Bay	**0**	**0**	**0**	**6**	**0**
Total	**0**	**0**	**0**	**12**	**0**
Columbia River					
Lower Columbia	**0**	**7**	**0**	**4**	**0**
Washington State					
40 Total Stock Complexes	**1**	**7**	**0**	**32**	**0**
Percent Total	**2%**	**18%**	**0%**	**80%**	**0%**

In 2002, USFWS determined that the southwest Washington/Columbia River coastal cutthroat trout population was not warranted for listing under the Act. The most recent status assessments for coastal cutthroat trout in the Olympic Peninsula and Puget Sound areas are found in the Johnson et al. (1999) status review (64 FR 16407) and in the 2000 Washington State Salmonid Stock Inventory: Coastal Cutthroat Trout (WDFW 2000). The following status summary is largely based on information from those two reviews.

Puget Sound Population

Few data exist concerning historical and present abundance of coastal cutthroat trout in Puget Sound and almost no estimates of adult population sizes exist. Anecdotal reports suggest low abundance of coastal cutthroat trout in southwestern Puget Sound. The NMFS concluded that population levels in Puget Sound appear to be relatively stable over the past 10 to 15 years, although many of the populations are believed to be smaller relative to historic levels. Juvenile coastal cutthroat trout are relatively well distributed in the Skagit and Stillaguamish River basins and along the Strait of Juan de Fuca.

Although trends in smolt numbers were mixed in both Hood Canal and southern Puget Sound, increases in smolt numbers in some urban streams coincided with declines in coho salmon abundance. In these streams it is possible that a relaxation of competition with coho has occurred, allowing for an increase in coastal cutthroat trout. To some degree, cutthroat trout abundance is determined by interactions with sympatric species, particularly coho salmon. In developed urban watersheds, where alterations of natural flow patterns and water quality have occurred due to the expansion of storm water runoff, the changes in run-off patterns have put fall spawning salmonids at a disadvantage relative to spring spawners (Seiler et al. 2005). In these streams, even moderate rainstorms become redd scouring torrents in the fall and winter. Furthermore, lack of wetlands and groundwater storage can result in extreme low summer flows. Because cutthroat trout spawn in the spring as flows are generally declining, their eggs survive at apparently much higher rates than those of coho. In these areas, it appears that fall spawners, such as coho, are at a disadvantage to spring spawners, such as coastal cutthroat trout.

STATUS OF THE SPECIES: Pacific Lamprey – Rangewide

Pacific lamprey (*Lampetra tridentatus*) is listed as a Federal species of concern in Washington. Washington State considers the Pacific lamprey to be a Species of Recreational, Commercial, and/or Tribal Importance.

Pacific lamprey is a member of the *Petromyzonidae* family, which is ancestral to most vertebrates and all fish. The three large supraoral lamina teeth cusps in the sucker-like mouth identify adult Pacific lamprey. Females have a well-developed ventral fin fold and males do not. Larvae or ammocoetes have a dark line of pigment above and below the tip of the tail (Wydoski and Whitney 1979).

Range

The Pacific lamprey is distributed from Hokkaido, Japan, through the Bering Sea and Aleutian Islands to Baja California, Mexico (Ruiz-Campos and Gonzalez-Guzman 1996, pages 144-146; Wydoski and Whitney 1979). Scott and Crossman (1973) describe this species as penetrating all major rivers, often to headwaters. Pacific lampreys have been seen in the Green River, Pierce County, Washington, sometimes spawning on steelhead redds.

Life History

Pacific lampreys exhibit an anadromous life history. Although, landlocked populations have been reported from California, Oregon, Idaho, and British Columbia (Wallace and Ball 1978 pages 545-546; Wydoski and Whitney 1979). Adults are parasitic on a wide variety of fish, including benthic groundfish species as well as pelagic species such as Pacific herring (*Clupea harengus*) and Pacific salmon (*Oncorhynchus* spp.) (Beamish 1980, page 1908-1911; Scott and Crossman 1973; Stewart 1981). Pacific lampreys appear not to be piscvorous during metamorphosis or the spawning migration (Richards and Beamish 1981; Whyte et al. 1993). Pacific lamprey generally attach to their prey ventrally, especially near the pectoral fins, while river lamprey commonly attach dorsally (Cochran 1986). Adult Pacific lampreys are at times a very important food source for both saltwater and freshwater predators. In the Rogue River estuary in Oregon, Roffe and Mate (1984) documented that California sea lion (*Zalophus californianus*), Steller (or Northern) sea lion (*Eumetopias jubatus*), and the Pacific harbor seal (*Phoca vitulina richardsi*) fed heavily upon Pacific lampreys. Beamish (1980) cited observations of Pacific lamprey in the stomachs of sperm whales (*Physeter catodon*). Blue heron (*Ardea herodias*) and mink (*Mustela vison*) have been observed eating Pacific lamprey in fresh-water environments (Beamish 1980).

After spending approximately 3.5 years in salt water, adults enter natal streams between July and October, and gradually move upstream to spawn the following spring (Beamish 1980; Hart 1973). Migrating adults have been known to pass vertical barriers such as dams by slowly ascending smooth walls by the use of their sucker-like mouth (Wydoski and Whitney 1979). The length of sexually mature adults in Canada has ranged from 16-72 cm, but adults will atrophy approximately 20 percent of their maximum length prior to spawning (Beamish 1980, page 1918). The spawning nest or redd usually consists of a shallow depression built in sand and gravel substrates at the upstream edge of a low gradient riffle (Close et al. 1995, page 13; Hart 1973; Scott and Crossman 1973). Flow and depth seems to be important in redd site selection, where velocities range from 1.6 to 3.3 ft/sec (0.5 to 1.0 m/sec) and depths of 1.3 to 3.3 ft (0.4 to 1.0 m) have been observed (Close et al. 1995, page 13). Lake spawning has been observed, but is uncommon (Russell et al. 1987). Adults generally die soon after spawning, although Michael (1980) has observed some occurrence of repeat spawning returns of marked adults in traps within Puget Sound, Washington. After fertilization, eggs hatch in 2 - 4 weeks (19 days at 59EC (15EC) and newly hatched larvae (ammocoetes) remain in their nests for 2 - 3 weeks before drifting downstream and burying themselves in mud at the bottom of pools, or other areas of soft mud and sand (Hart 1973; Moyle 1976).

Ammocoetes are filter feeders that subsist on algae or other organic matter for up to 5-6 years in their freshwater habitat (Moyle 1976; Wydoski and Whitney 1979). Under experimental conditions, emergent larvae 0.3 to 0.4 inches (7 to 10 mm) in length preferred mud to sand and gravel substrates (Close et al. 1995, page 15). Current velocities greater than 1.0 ft/sec (0.31 m/sec) prohibited burrowing by emergent larvae in all substrates, but larger larvae 1.6 to 2.0 inch (40 to 50 mm) are capable of burrowing in sand. In Oregon, the current over ammocoete beds

ranged from 0.3 to 1.6 ft/sec (0.1 to 0.5 m/sec) (Close et al. 1995, page 15). Metamorphosis begins in July and the known period of entry into salt water is from December to June, parasitic life starts soon after saltwater entry (Beamish 1980, page 1916; Whyte et al. 1993). Increased water flows during runoff can encourage outmigration, by washing away sand and silt the larvae require for anchoring themselves to the bottom (Hardisty and Potter 1971).

STATUS OF THE SPECIES: River Lamprey – Rangewide

River lamprey (*Lampetra ayresi*) is a Federal species of concern in Washington State. Washington State considers the river lamprey to be a Priority State-listed species, which are native fish and wildlife species legally designated as Endangered (WAC 232-12-014), Threatened (WAC 232-12-011), or Sensitive (WAC 232-12-011). State Candidate species are fish and wildlife species that will be reviewed by WDFW (POL-M-6001) for possible listing as Endangered, Threatened, or Sensitive according to the process and criteria defined in WAC-232-12-297.

River lamprey is a member of the *Petromyzonidae* family, which is ancestral to most vertebrates and all fish. The two large supraoral lamina teeth cusps in the sucker-like mouth can identify adult river lamprey. Larval river lampreys have a black blotch in the membrane at the tip of the caudal fin (Wydoski and Whitney 1979).

Range

River lampreys have been collected from coastal streams and rivers from San Francisco Bay north to Juneau, Alaska (Wydoski and Whitney 1979). Scott and Crossman (1973) report that this species has been found in fresh and salt water across the same range. According to Wydoski and Whitney (1979), no detailed distribution records are available for Washington, but the species probably occurs in most major rivers. The regional distribution or river lamprey is relatively unknown because species identification of juvenile fish is rarely performed during river and stream surveys.

Life History

Biological information is not as well defined for river lamprey as it is for the larger-sized Pacific lamprey. Salt-water mature adults are parasitic almost exclusively on pelagic species such as Pacific herring (*Clupea harengus*) and Pacific salmon (*Oncorhynchus* spp.) (Beamish 1980, 1908-1911; Beamish and Neville 1995; Scott and Crossman 1973). In most British Columbia streams, river lampreys become parasitic before reaching the ocean (Stewart 1981). In Lake Washington, sockeye (*O. nerka*) salmon smolts are thought to be the preferred prey for recently metamorphosed river lamprey). In 1991, Beamish and Neville (1995) concluded that river lamprey in the Fraser River killed approximately 65 percent and 25percent of the total Canadian hatchery and wild production of coho and Chinook salmon, respectively. This predation is considered

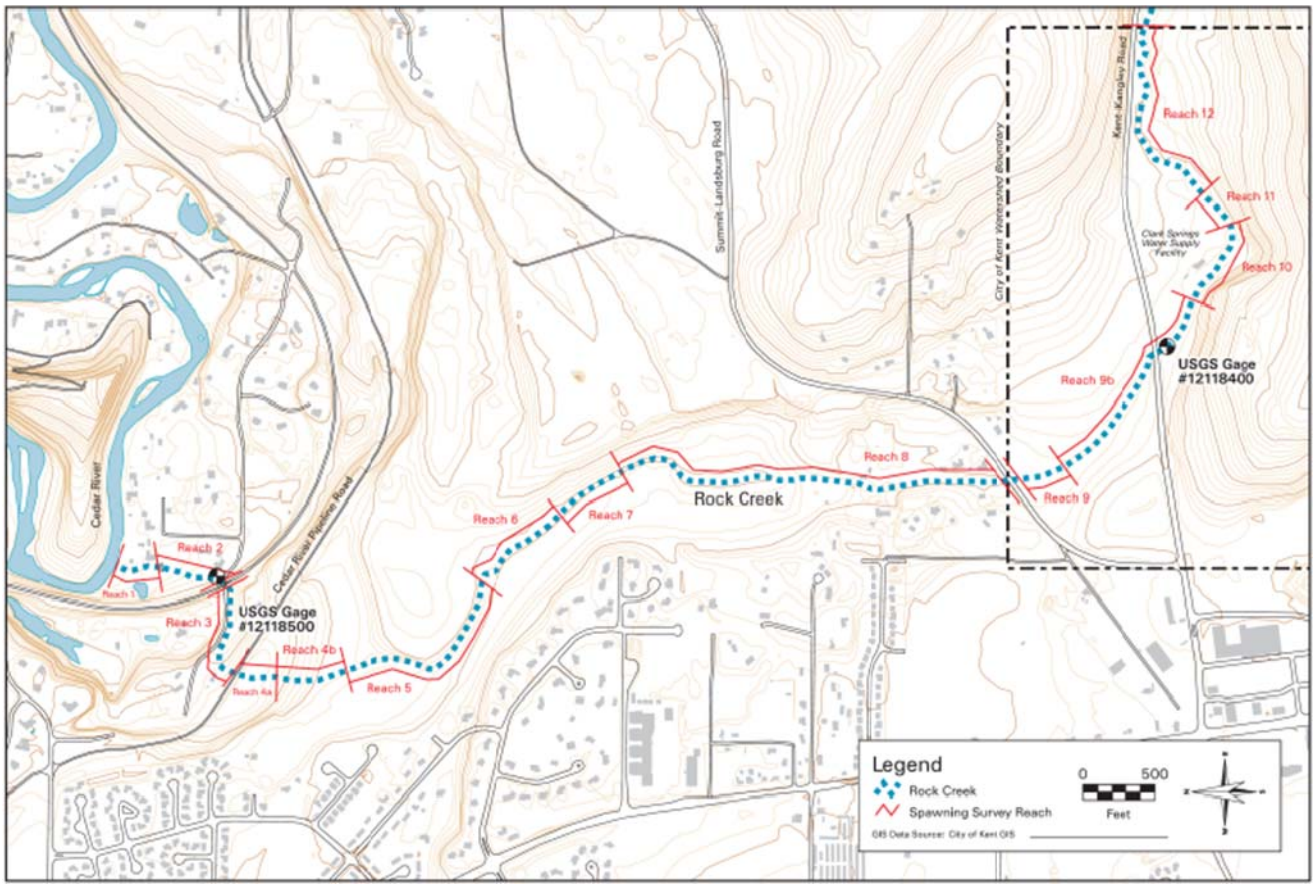
significant upon commercially important fish stocks in British Columbia (Stewart 1981). River lamprey generally attach to their prey dorsally, while Pacific lamprey tend to attach ventrally, near the pectoral fins (Cochran 1986). Unlike numerous reports on Pacific lamprey, the extent of other animals feeding on river lampreys is unknown.

Between September and late winter, river lamprey return to freshwater after spending approximately two years in salt water (Beamish 1980). Spawning occurs during winter to spring in clean gravel areas of small tributaries (Beamish 1980; Moyle et al. 1995). The mean lengths of mature marine adults in Canada were 9.8 inches (25 cm) in September, but adults atrophy approximately 20% of their maximum length prior to spawning (Beamish 1980, page 1920). River lamprey larvae (ammocoetes) may remain in their natal streams for several years, usually in silt-sand backwaters and eddies near the bank (Hart 1973). The ammocoetes are toothless, and they feed on microscopic plants and animals (Scott and Crossman 1973; Hart 1973). Metamorphosis occurs in late July with downstream migration occurring the following year from May to July (Beamish 1980, page 1908; Beamish and Youson 1987). In the final stages of metamorphosis, lampreys congregate just upstream from salt water, entering the ocean in late spring (Moyle et al. 1995). From June until September they increase in size by an estimated 4.3 to 5.5 inches (11-14 cm) and 0.4 to 0.6 ounces (12-18 g).

ENVIRONMENTAL BASELINE

Regulations implementing the Act (50 CFR 402.02) define the environmental baseline as the past and present impacts of all Federal, State, or private actions and other human activities in the action area. Also included in the environmental baseline are the anticipated impacts of all proposed Federal projects in the action area that have undergone section 7 consultation, and the impacts of State and private actions which are contemporaneous with the consultation in progress.

The mouth of Rock Creek is located at latitude 47°22'54" N and longitude 122°1'00" W, in King County, Washington (Figure 2). The drainage basin is approximately 15.7 square miles, with a perennial stream length of approximately 2.8 miles. Rock Creek drains into the Cedar River on the left bank (looking downstream) at RM 18.2 and is about 3.6 miles downstream of the City of Seattle’s Landsburg Diversion Dam. The Rock Creek basin drains towards the northwest. The basin is relatively narrow (about 1.5 miles wide) northwest of Ravensdale, but widens to about 5 miles wide further to the southeast.



Reach	Start River Miles	Length (ft)
1	0.00	359
2	0.07	495
3	0.16	642
4a	0.28	289
4b	0.33	699
5	0.47	994
6	0.67	721
7	0.81	560
8	0.90	3298
9	1.58	158
9b	1.61	1977
10	1.94	719
11	2.07	464
12	2.15	1322

Figure 3. Rock Creek stream reaches and estimated lengths.

Included within WRIA 8 are some of the most highly urbanized areas of western Washington. In addition, anthropogenic activities have resulted in dramatic changes in the hydrologic regime and river routing, which have caused a major disruption to the historic migration route of anadromous salmon and trout from the Cedar River Basin. According to U.S. EPA (2005), "Historically, the Cedar, Black and White Rivers all joined the Green/Duwamish River. In 1907,

the White River was permanently diverted into the Puyallup River, causing the loss of over 50 percent of the river flow. The Black River was the outlet channel of Lake Washington and the Cedar River. When the Lake Washington Ship Canal and Hiram Chittenden Locks were built in 1916, Lake Washington was lowered nine ft, and the Black River was cut off from the Duwamish. The Cedar River was redirected to Lake Washington, disconnecting it as well. Now the Green River becomes the Duwamish at the historic confluence of the Green and Black." Despite these changes, portions of the upper Cedar River and Rock Creek contain some of the highest quality habitats and watershed conditions in WRIA 8.

The upper Cedar River Basin has been a regional source of water for more than a century (City of Seattle 1999). Seattle began diverting Cedar River water for municipal supplies in 1901. Shortly after the construction of the Landsburg Diversion Dam, water storage was developed through the construction of Masonry Dam, which incorporates a hydroelectric facility that is capable of producing 30 megawatts of electricity. Unsupervised access to the Cedar River Municipal Watershed, which is upstream of Landsburg, ceased in 1917 to protect the integrity of the watershed and maintain its' high water quality characteristics. In addition to water and electricity supplies, the City of Seattle historically harvested timber within the Municipal Watershed. However, this practice has ceased since the development of Seattle's Cedar River Habitat Conservation.

In 2000, the City of Seattle implemented a 50-year HCP for the Cedar River (City of Seattle 2000). Conservation measures include large wood placement, removal of culvert migration barriers, providing fish passage to 17 miles of habitat upstream of the Landsburg Diversion Dam that has been inaccessible since the early 1900s, funding for projects at the Ballard Locks designed to increase survival of emigrating smolts, and maintaining beneficial flows and suitable water quality that will help ensure the continuous provision of high quality fish habitat throughout the Cedar River between Lower Cedar Falls and Lake Washington (City of Seattle 2000). In our findings and record of decision, USFWS determined that this HCP would maintain, enhance, or protect habitat in the Cedar River, allowing anadromous salmonids and resident native fishes to fulfill their life history requirements (USFWS 2000). USFWS concluded that implementation of the Cedar River HCP (and the associated Instream Flow and Landsburg Mitigation Agreements) would likely contribute to the protection of habitat and the conservation of several species of fish in the Cedar River, including bull trout. Many of these same species would also be covered under Kent's HCP. Thus, conditions resulting from the Cedar River HCP will complement the habitat conservation measures proposed by Kent's HCP in Rock Creek.

Land cover within the Rock Creek basin is primarily forested, an important factor contributing to its high watershed quality. Different sources have estimated the level of forested cover in the basin between 45 percent (Simmonds et al. 2004) and 72 percent (Friends of Rock Creek 2004, page 1). In 1999, approximately 67 percent of the basin was estimated to be forested, followed by about 26 percent grass or pasture (MGS unpublished data). Only about 3 percent of the land cover was considered impervious surface in 1999 and the remaining 4 percent was water and wetlands (MGS unpublished data). The King County Comprehensive Plan land-use designations along lower Rock Creek are for rural, residential, and forestry activities. The lower portion of Rock Creek flows through the 141.2-acre Rock Creek Natural Area (RCNA) (RM 0.25 to RM

1.10), which has been owned by King County since 1995. The area below the RCNA was dedicated permanent open space through the King County 4:1 open space program with the development of the Maple Ridge Highlands subdivision located just south of the Clark Springs Facility (Figure 4). The next reach (RM 1.10 to RM 2.60) flows through the 320-acre Kent's Clark Springs. Several residential properties exist at the mouth of Rock Creek, just downstream of the stream crossing of Summit-Landsburg Road and immediately upstream of the Kent watershed property.

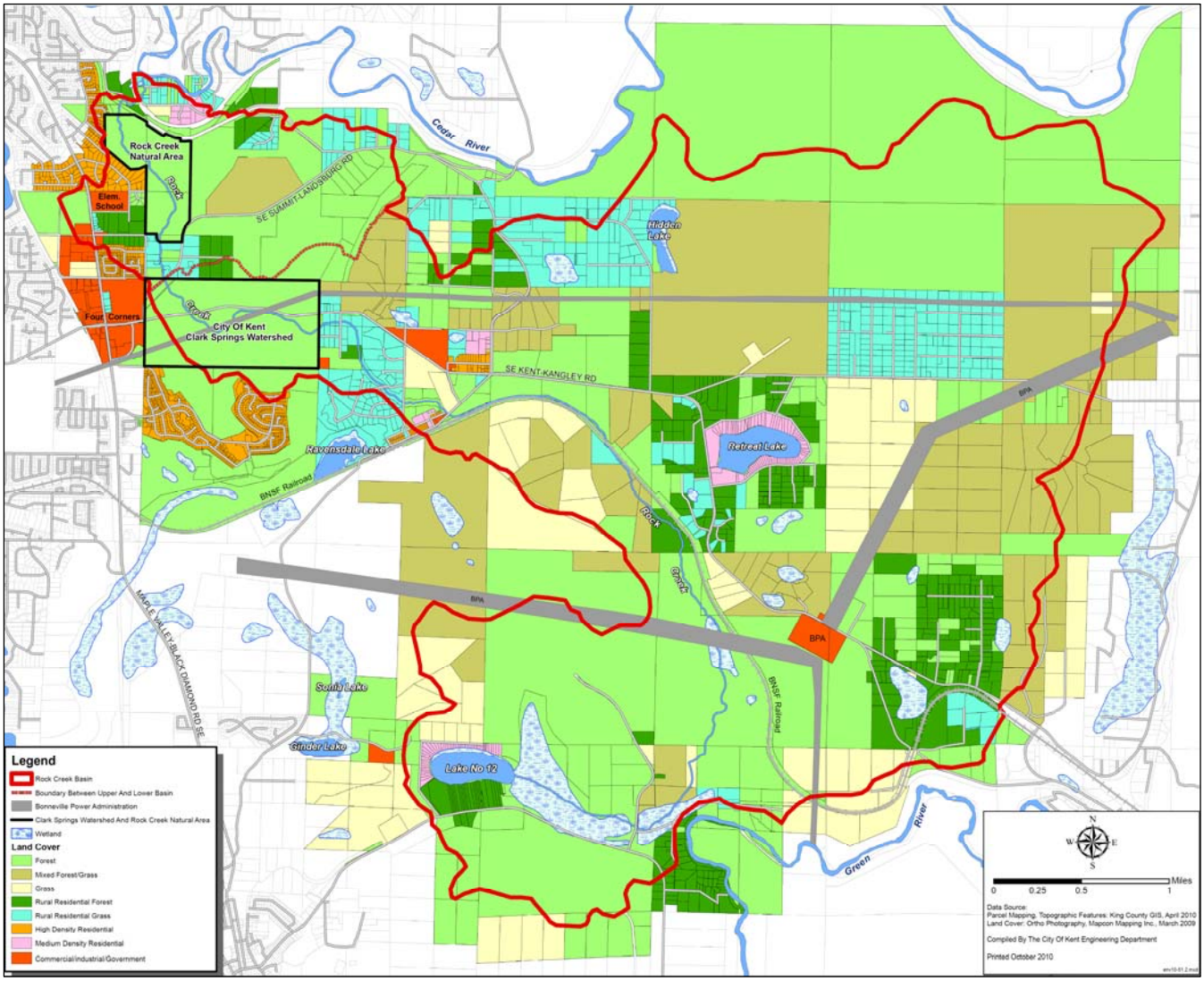


Figure 4. Land Cover in Rock Creek Basin.

The Rock Creek basin is located near the eastern edge of the Puget Sound Lowland Ecoregion (Omernik 1987). The marine waters of the Pacific Ocean influence the climate of the Rock Creek basin and Puget Sound located to the west, and the topographic effects of the Cascade Mountains to the east, which are part of the Cascades Ecoregion. Regional climate is characterized by cool, wet winters and mild dry summers. Precipitation is mostly derived from cyclonic storms generated in the Pacific Ocean and Gulf of Alaska that move inland in a southwest to northeast direction across western Washington. Over 80 percent of precipitation

falls between the months of October and April. During summer months, a regional high-pressure system generally resides over most of the Pacific Northwest, which diverts storms and associated precipitation to the north.

This regional climatic pattern is modified by the presence of the Cascade Mountains, which rise to an elevation of approximately 5,000 ft at the eastern margin of the Cedar River basin. Moist, maritime air cools and condenses as it moves up in elevation from west to east, resulting in decreasing temperatures and increasing precipitation up this elevation gradient. The elevation of the Rock Creek basin ranges from approximately 405 ft above mean sea level (msl) at the confluence of Rock Creek with the Cedar River to approximately 1,000 ft msl at Sugarloaf Mountain.

Temperature and precipitation data are available from the (URL:http://www.wrcc.dri.edu), but no known weather stations are located within the Rock Creek basin other than the USGS station (12118400) installed in May 2001 within Kent's Clark Springs watershed. Long term climate information from the closest weather stations located in Landsburg, Buckley (near Enumclaw), and Palmer can be found in Table 5. The Rock Creek basin experiences an orographic effect due to the elevation changes that result in increasing precipitation levels from west to east (City of Kent 2010, Appendix C). Additional precipitation information, obtained from the parameter-elevation regressions on independent slopes model (PRISM; Oregon Climate Service 1997), suggests that precipitation ranges from 52 to 56 inches per year in the western part of the basin and 60 to 70 inches per year in the east (Table 5). Precipitation falls primarily in the form of rain, but occasional snowfall can occur during colder periods with accumulations that rarely last longer than a few days, except in the higher elevations in the eastern part of the basin. Similarly, ground freezing is relatively uncommon or short-lived.

Table 5. Temperatures and precipitation at three weather stations near the Rock Creek basin.

Location	Elevation (feet)	Period of Record	Mean July Max. Temperature (ºF)	Mean Jan. Min. Temperature (ºF)	Mean Annual Precipitation (inches)	Mean Annual Snowfall (inches)
Landsburg	540	1931-2003	76	31	57	10
Buckley	690	1931-2003	76	33	49	12
Palmer	900	1931-2003	74	32	90	40

Source: Western Regional Climate Center, 2003.

Much of the upper portion of the watershed rests upon glacial outwash that remained following the retreat of the Vashon Glacier about 12,000 years ago, while higher elevations are bedrock overlaid with Vashon Till on their lower slopes (Hart Crowser 2003, page 6). Due to the highly porous nature of the recessional glacial outwash, nearly all precipitation in the upper watershed infiltrates into the groundwater, except during extremely high precipitation events.

Groundwater and surface runoff during precipitation events are the major sources of water to Rock Creek. The seasonality of rainfall combined with the time required to recharge the groundwater aquifer following the dry season results in Rock Creek having most of its discharge in the winter and spring months. The climatic pattern and topography interact to determine a runoff pattern that results in wet winters and dry summers. This runoff pattern affects the availability of water for augmenting late summer/fall instream flows and municipal water supplies.

Current Kent Operations and Water Production

Kent has collected daily flow data since 1978, from flow meters on each of the three wells, and a master flow meter located on the main transmission pipeline that records either total flow from the wells or gravity flow from the infiltration gallery. Data on water production at Clark Springs from 1986 through 1997 are summarized as monthly average flow rates in Figure 5. These data show an overall rate of extraction that averages 6.2 cfs during this period. In some years, the wells at Clark Springs have been used to provide a significant portion of water production, but in most years, water production has been primarily from the infiltration gallery.

A pumping system for augmentation of stream flows in Rock Creek during the fall months was implemented by Kent on a voluntary basis beginning in 1997. This augmentation was designed to improve streamflows as part of Kent's Rock Creek Resource Protection Program. At times, beginning in 1997, Kent has augmented low flows in Rock Creek by pumping water from the infiltration gallery directly into the creek (via the clear well). In some years (e.g., 2002), because of low flow conditions, Kent extended the duration of the augmentation over several months. This has had a direct effect on Kent's ability to supply water from the Clark Springs System.

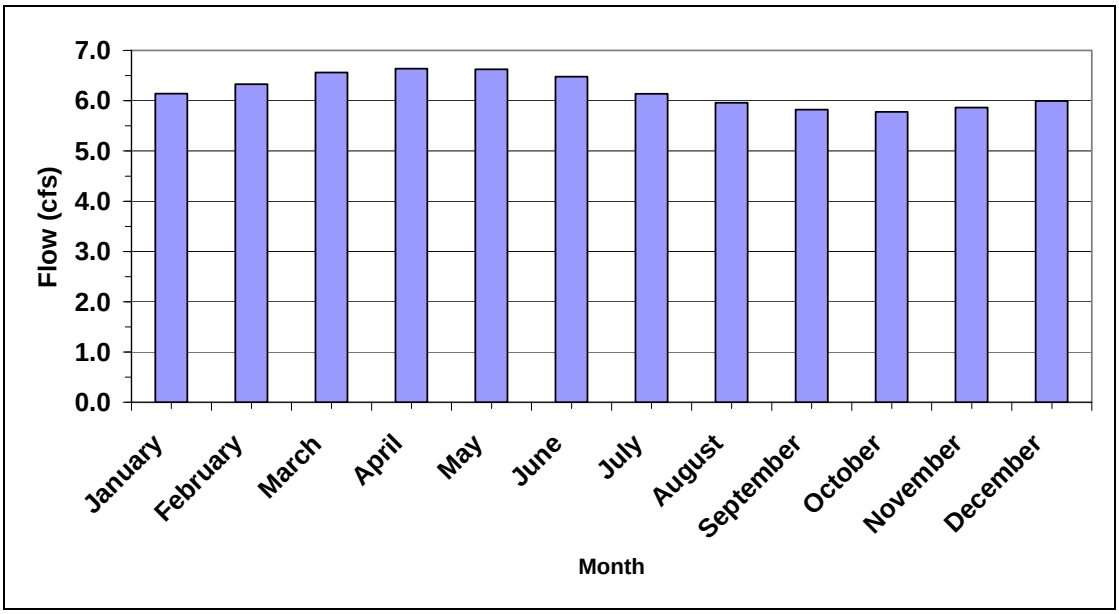


Figure 5. Mean monthly water supply withdrawals between 1986 and 1998.

Fish and Fish Habitat in Rock Creek Basin

The historical fisheries habitat within the lower 2.6 miles of Rock Creek is presumed to have been excellent for anadromous salmon and trout, resident trout, and other cold-water species native to the area. However, specific documentation of historic conditions and the presence of fish and fauna are limited. Recently, native stocks of Chinook and coho salmon, steelhead, and cutthroat trout have been documented to utilize Rock Creek (MCS Environmental 2003; R2 Resource Consultants 2005a). A small kokanee (landlocked sockeye) population is believed to have been historically present in the Cedar River, which could be indicative of a historic anadromous population as well (Anderson 1997). The current sockeye salmon population was built through introduction of Baker River stock to the basin during the 1930s (City of Seattle et al. 1999, page 3.4-13). An electrofishing survey performed during August 2002 identified the presence of coho salmon, trout (cutthroat and unidentified cutthroat or rainbow trout), sculpin, and one unidentified lamprey (MCS Environmental, unpublished data).

In addition to the covered species, warm water fish species also inhabit the project area. King County (1993) has indicated that unidentified warm-water fish have been observed in Hidden Lake. However, it is unclear if conditions are suitable for maintenance of a persistent warm-water fish community. Jones and Stokes (1993) reported the Washington Department of Fisheries had collected three crappie (*Pomoxis* spp.) in Rock Creek during surveys conducted in 1982, but the exact locations of these surveys is not known. The Cedar River flows into Lake Washington, which contains a number of exotic warm-water fish species including largemouth bass (*Micropterus salmoides*), smallmouth bass (*Micropterus dolomieui*), yellow perch (*Perca flavescens*), sunfish (*Lepomis gibbosus*), black crappie (*Pomoxis nigromaculatus*), and brown bullhead (*Ameiurus nebulosus*), as well as a number of minnow species of (*Cyprinidae*) (Edmondson 1991)**.**

Status of Bull Trout in the Action Area

The Lake Washington FMO habitat consists of the lower Cedar River below Cedar Falls, the Sammamish River, Lakes Washington, Sammamish and Union, the Lake Washington Ship Canal, and all accessible tributaries. Population status information, extent of use, and complete recovery value of this area is currently unknown. Adult and subadult size individuals have been observed infrequently in the lower Cedar River (below Cedar Falls), Carey Creek (a tributary to Upper Issaquah Creek), Lake Washington, and at the Hiram H. Chittendon (Ballard) Locks. No spawning activity or juvenile rearing has been observed and no distinct spawning populations are known to exist in Lake Washington FMO outside of the upper Cedar River above Lake Chester Morse (see Chester Morse Lake core area).

The potential for spawning in the Lake Washington basin is believed to be very low as a majority of accessible habitat is low elevation, below 152 meters (500 ft), and thus not expected to have the proper thermal regime to sustain successful spawning. There are, however, some coldwater springs and tributaries that may come close to suitable spawning temperatures and that may provide thermal refuge for rearing or foraging during warm summer periods. These include Rock Creek (tributary to the Cedar River below Landsburg Diversion) and Coldwater Creek, a tributary to Cottage Lake Creek immediately below Cottage Lake. Both Coldwater and Rock Creeks are relatively short (1.6 to 4.5 kilometers (1 to 2.8 miles)), have high quality riparian forest cover, and are formed by springs emanating from glacial outwash deposits.

The upper reaches of Holder and Carey Creeks, the two main branches of Issaquah Creek, have good to excellent habitat conditions and may hold potential for bull trout spawning due to their elevation and aspect. However, despite survey efforts by King County (Berge and Mavros 2001; KCDNRP 2002), no evidence of bull trout spawning or rearing has been found. Holder Creek drains the eastern slopes of Tiger Mountain, elevation 914 meters (3,000 ft), and the southwestern slopes of South Taylor Mountain. Coho are found in Holder Creek up to an elevation of about 360 meters (1,200 ft) and cutthroat trout occur up to 427 meters (1,400 ft) in elevation.

Carey Creek originates at an elevation of roughly 700 meters (2,300 ft) in a broad saddle on the southeastern slopes of South Taylor Mountain. It is the only stream in the north Lake Washington/Sammamish drainage with a relatively recent (within the past 10 years) char sighting. The single observation of a pair of native char in the fall of 1993 (WDFW 1998) was about 0.8 kilometer (0.5 mile) downstream from an impassable, approximately 12-meter (40-foot) high falls, which is at an elevation of approximately 256 meters (840 ft). Thus, the habitat in which this pair of char was observed was potentially too low in elevation for successful spawning. Upstream of the falls, significant numbers of resident cutthroat trout exist up to an elevation of approximately 396 meters (1,300 ft).

Aside from spawning, the Lake Washington drainage has both potential benefits and challenges to adult and subadult bull trout. Two large lakes with high forage fish availability are dominant parts of the lower watershed, and provide significant foraging habitat. A number of observations of subadult and adult sized bull trout have been made in Lake Washington (Shepard and Dykeman 1977; KCDNR 2000; H. Berge, King County Department of Natural Resources and Parks, pers. comm. 2003a). The connection with the Chester Morse Lake core area (population

located in the upper Cedar River) is one-way only, and currently the level of connectivity with other core areas is unknown. Observations of bull trout in the Ballard Locks suggest migrations from other watersheds into Lake Washington are likely occurring at some level.

Bull trout have been caught in Shilshole Bay and the Ballard Locks during late spring and early summer in both 2000 and 2001. In 2000, up to eight adult and subadult fish (mean size 370 millimeters; 14.5 inches) were caught in Shilshole Bay below the locks between May and July. These fish were found preying upon juvenile salmon (40 percent of diet) and marine forage fish (60 percent of diet) (Footen 2000, 2003). In 2001, five adult bull trout were captured in areas within the Ballard Locks and immediately below the locks. One bull trout was captured within the large locks in June, and one adult was captured in May migrating upstream through the fish ladder in the adult steelhead trap at the head of the ladder. Three adult bull trout were also captured below the tailrace during the peak of juvenile salmon migration on June 18 (Goetz, pers.comm. 2003).

Bull trout have not been observed in Rock Creek. A population of bull trout is located in the upper Cedar River Watershed above Masonry Dam, located at RM 35.7, and outmigrants or juveniles are occasionally flushed downstream. Even before construction of Masonry Dam, this population was located above a natural fish passage barrier (Cedar Falls). However, no populations of bull trout have become established below Masonry Dam and only a few bull trout sightings have been documented in the reach downstream of Cedar Falls in the recent past (see below). Over the term of the ITP, it is likely that bull trout could forage, overwinter, and potentially spawn and rear in Rock Creek, although it is not possible to determine when this may happen.

Observation in the lower Cedar River below Cedar Falls:

- One bull trout has been documented near the powerhouse at Cedar Falls during 1997 (City of Seattle et al. 1999, page 3.4-20).
- Three adult bull trout were observed in the tailrace to the Cedar Falls powerhouse during July 2000 (USFWS 2004, page 108-109).
- Three adult char assumed to be bull trout in the tailrace to the Cedar Falls powerhouse during August 2003 (USFWS 2004, page 108-109).
- One adult bull trout passed above ladder at Landsburg Dam in December 2006 (Paul Faulds, Seattle Public Utilities, Seattle, WA, in litt. December 2006).
- Three adult bull trout observed at Barnston Bridge (~5 miles below the Cedar Falls powerhouse August 2009 (Peter Kiffney, NOAA Fisheries, Seattle, in litt. August 2009).

Status of Coastal Cutthroat Trout in the Action Area

The coastal cutthroat trout exhibits four life history variations: sea-run (anadromous), resident stream populations, fluvial populations and lake-adapted (adfluvial) populations (Behnke 2002, pages 69-72). All variations may be exhibited within the same stream. While it is likely anadromous populations existed historically in the Cedar River system including Rock Creek, they are most likely not present in the Lake Washington watershed today. The cutthroat trout in Rock Creek are considered adfluvial fish from Lake Washington, as there are no records of sea-run cutthroat use at the Ballard Locks (City of Seattle et al. 1999, page 3.4-26). These adfluvial cutthroat trout reside in Lake Washington and migrate in late winter into tributaries, including the Cedar River and Rock Creek, to spawn. Adult adfluvial cutthroat trout have been observed in Rock Creek as early as the third week in November through mid-February (R2 Resource Consultants 2005a); however, most observations tend to occur in late-December into January.

Status of Lamprey Species in the Action Area

The degree of utilization of Rock Creek by Pacific and river lamprey is not well understood. No information is available on the population size or trends of these species in the Cedar River Watershed or Rock Creek. Pacific lampreys have been documented in the Cedar River below Landsburg Dam (City of Seattle et al. 1999, page 3.6-25). One lamprey was captured during electrofishing surveys in Rock Creek during August 2002, but it was not identified (MCS Environmental, Inc., unpublished data). Rock Creek contains suitable spawning and rearing habitat for both species with no migration barriers.

Climate Change

Climate change has the potential to profoundly alter aquatic habitat throughout the Puget Sound (Bisson et al. in press). These effects would be expected to be evident as alterations of water yield, peak flows, and stream temperature. Other effects, such as increased vulnerability to catastrophic wildfires, may occur as climate change alters the structure and distribution of forest and aquatic systems. Given the increasing certainty that climate change is occurring and accelerating (IPCC 2007, Battin et al. 2007), we can no longer assume that climate conditions in the future will resemble those in the past.

In Washington State, most models predict warmer air temperatures, increases in winter precipitation, and decreases in summer precipitation and snow pack. Average temperatures are likely to increase between 1.7 °C and 2.9 °C (3.1 °F and 5.3 °F) by 2040 (Casola et al. 2005, page 10). Warmer air temperatures will lead to more precipitation falling as rain rather than snow. As the snow pack diminishes, seasonal hydrology will shift to more frequent and severe early large storms, changing streamflow timing and increasing peak river flows, which may limit salmonid survival (NMFS 2008, page 60).

Higher water temperatures, lower spawning flows, and higher magnitude of winter peak flows are all likely to increase salmonid mortality in the Cedar Basin and in hydrologically similar watersheds throughout the region. This is expected to make recovery targets for salmonid populations more difficult to achieve. Recommendations to mitigate the adverse effects of

climate change on salmonids include: 1) restoring connections to historical floodplains and freshwater and estuarine habitats to provide fish refugia and areas to store excess floodwaters; 2) protecting and restoring riparian vegetation to ameliorate stream temperature increases; and 3) purchasing or applying easements to lands that provide important cold water or refuge habitat (ISAB 2007, page 82; Battin et al. 2007, page 6723).

Higher ambient air temperatures will likely cause water temperatures to rise (ISAB 2007, page 2). Salmonids, particularly bull trout, require cold water for spawning and incubation. Suitable spawning habitat is often found in accessible higher elevation tributaries and headwaters of rivers. Thus, as climate change progresses and stream temperatures warm, thermal refugia will be essential to the persistence of many salmonid populations, particularly bull trout. Thermal refugia provide important patches of suitable habitat for salmonids that will allow them to undertake migrations through or to make foraging forays into areas with greater than optimal temperatures. To avoid warmer waters, juvenile rearing may be increasingly found only at the confluence of colder tributaries or other areas of cold water refugia.

There is still a great deal of uncertainty associated with in the timing, location, and magnitude of future climate change. It is likely that the intensity of effects will vary by region (ISAB 2007, page 12); however, several studies indicate that climate change has the potential to affect ecosystems in nearly all tributaries throughout the State (ISAB 2007, page 29; Battin et al. 2007, page 6721; Rieman et al. 2007, page 1558). The cumulative effects from land use change combined with climate change may further hinder bull trout survival and recovery as well as the other covered species.

EFFECTS OF THE ACTION

Kent's groundwater withdrawals reduce instream flows which, in turn, reduces the amount of available habitat on which covered species rely upon to complete their life histories in the action area. Operations under the HCP involve continued water withdrawal to serve as the municipal water supply for Kent. To address the risk of continued effects of operations on covered species and their habitats, the HCP requires Kent to implement HCMs which, while addressing the adverse effects of water supply operations, may also result in their own adverse effects to habitat quality and quantity, albeit temporarily.

Specifically, the HCMs requiring in-channel work will temporarily isolate portions of the channel, alter water quantity and quality, disturb substrate, and/or change channel morphology. Each of these actions has the potential to affect covered species in Rock Creek, even though the intent of the HCMs is to minimize and mitigate the effects of take of covered activities to the maximum extent practicable over the term of the ITP. In addition to groundwater withdrawals, covered activities and HCMs that have the potential to affect covered species and their habitats include improving passage at the mouth of Rock Creek, connecting off-channel habitat to Rock Creek, replacing the culverts at Summit-Landsburg Road, installing LWD, and removing beaver dams. The following effects analyses are organized by Project component and species, and address the effects of the covered activities, which include: 1) water withdrawal and flow argumentation, 2) other HCMs and 3) maintenance activities related to the Clark Springs Water Supply System. Not all covered activities, HCMs, or MEMs addressed in the Description of the

Action have the potential to adversely affect covered species.

Water Withdrawal and HCM 1 - Flow Augmentation

Kent has been withdrawing groundwater at the Clark Springs facility since 1957. Daily withdrawal measurements recorded by Kent between October 1985 and September 1998 indicate the long-term average production rate from the three sources at Clark Springs has been about 6.2 cfs. Kent anticipates that HCP water withdrawals from Clark Springs from June through December will be similar to those during the 1985-1998 baseline period because of limits placed on their water rights. The typical amount of withdrawal varied between 4.9 and 7.6 cfs. During high flow periods, primarily January to May but also late November or December during wet falls, additional withdrawals over the baseline amount may occur under the HCP. Additional withdrawals during these periods will likely require the use of wells. The water right for this use requires Kent to maintain the following minimum instream flows when the wells are pumped: 15 cfs between November 1 and April 30, 2 cfs between July 1 and October 31, and minimum instream flows that decline arithmetically from 15 cfs and 2 cfs between May 1 and June 30.

To minimize the potential effects of groundwater withdrawal, Kent is proposing to augment low flows in Rock Creek during the months of October, November, and December, periods that are biologically important for adult migration and spawning for a number of the covered species (HCM-1). Kent will commit to augmenting up to the stream flow targets, but not more than the maximum augmentation amount defined in Table 2. When instream flows meet or exceed the target flows at the Parshall Flume during October, November, and December, no augmentation would be required. When instream flows are below target flows, water up to the maximum amount would be allocated to increase instream flows to meet the target flow.

The beginning of the augmentation period under HCM-1 will be adaptively managed based upon a periodic assessment of the timing of Chinook salmon spawning in the Cedar River Basin. The available spawn timing information currently suggests that October 1 is an appropriate time to begin augmentation and corresponds with the October 1 flow increases in the Cedar River required under the City of Seattle's HCP. On five-year intervals, Kent and the Services will evaluate whether a significant shift in Chinook salmon spawn timing has occurred based upon the available spawning survey information from the Cedar River mainstem and its tributaries. If a significant shift has occurred, the beginning of augmentation may occur as early as September 17 or as late as October 15. The initiation of bull trout spawning in the upper Cedar River basin (the closest spawning population) roughly coincides with Chinook salmon spawn timing for Rock Creek.

Kent's groundwater withdrawals reduce instream flows, which reduces the amount of habitat available on which covered species rely to express their life histories in the action area. Operations under the HCP involve continued water withdrawal to serve the municipal water supply. Kent modeled the effects of these reduced flows on habitat availability on covered species, using weighted usable area (WUA) (City of Kent 2010, Chapter 4 and Appendix F) as an index to compare the amount of suitable habitat at different flows. Table 6 shows the optimal amount of WUA (i.e., if there were no water withdrawals by Kent), and the WUA under the current water withdrawal program with and without augmentation. During October through

December, there are significant decreases in the WUA for covered species, compared to optimal WUA (Kent 2010, page 4.3 to 4.30). Decreases in spawning and rearing habitat from reduced instream flows can result in decreased productivity and abundance of covered species including bull trout and cutthroat trout. With the proposed flow augmentation, the amount of WUA increases above baseline conditions, but still below the amount that would be provided without water withdrawals. To address the loss of habitat that would be provided without continued water withdrawals, the HCP requires Kent to augment flows in October, November, and December and to implement the set of HCMs described earlier (Table 1).

Table 6. Estimated median weighted usable area (WUA) for various bull trout and cutthroat trout life stages in Rock Creek under baseline and flow augmentation conditions (sq. ft. = square feet). Compiled from data in Chapter 4 and Appendix F of City of Kent (2010).

Species	Life stage	Month	Flows Without Withdrawal WUA (sq. ft.)	Median Baseline Flows WUA (sq. ft.)	Median Baseline with flow augmentation (sq. ft.)	Increase from Baseline WUA with flow augmentation (sq. ft.)
Bull Trout	Spawning	October	101,000	28,000	41,000	13,000
		November	102,000	25,000	41,000	16,000
	Rearing	October	7,000	2,000	3,000	1,000
		January	22,000	18,000	N/A	N/A
		April	18,000	14,000	N/A	N/A
		July	8,000	4,000	N/A	N/A
Cutthroat Trout	Spawning	January	34,000	36,000	N/A	N/A
		February	32,000	37,000	N/A	N/A
	Rearing	October	1,500	300	700	400
		January	4,600	3,700	N/A	N/A
		April	3,600	2,800	N/A	N/A
		July	1,800	900	N/A	N/A

Bull Trout

Median baseline flows (Kent water withdrawal with no augmentation) provide for the least amount of potential bull trout spawning and rearing habitat in Rock Creek and could create a migration barrier for bull trout at the mouth of Rock Creek in some years. If this condition was

allowed to persist into the future and bull trout numbers in the lower Cedar River increased, adverse conditions in Rock Creek could prevent bull trout from utilizing Rock Creek for migrating, foraging, overwintering, and possibly spawning and rearing habitat.

To reduce these potential effects, Kent is proposing to augment low flows in Rock Creek during October, November, and December with flow augmentation measures as described in Table 2. The proposed flow augmentation will increase potential spawning habitat for bull trout during October and November (Table 6) over current median baseline flows over the permit term. During October, flow augmentation will also slightly increase rearing habitat for bull trout (Table 6). Flow augmentation will also help maintain adequate depths at the mouth of Rock Creek, facilitating upstream migration of bull trout in October through December in combination with HCM-2. Flow augmentation, although not fully compensating for instream flows absent Kent's water withdrawal, does partially address the adverse effects of groundwater withdrawal continuing under the HCP by providing higher instream flows than median baseline flows during the bull trout spawning season. Still, when compared to flows without withdrawal, median baseline with flow augmentation represents a substantial decrease in the amount of available habitat for potential bull trout spawning and rearing. Other habitat conservation measures will be implemented to address the quality and quantity of habitat in Rock Creek.

Coastal Cutthroat Trout

According to Kent's analysis, median baseline flows (Kent water withdrawal with no augmentation) provide better spawning conditions for cutthroat trout in Rock Creek than instream flows absent Kent's water withdrawals. Cutthroat trout spawn in Rock Creek in January and February when median baseline flows tend to be relatively high. Kent's water withdrawals have a small, but positive effect on the amount of spawning habitat available for cutthroat trout by slightly decreasing instream flows (Table 6). Kent's analysis indicates that the opposite is true for rearing cutthroat trout. Median baseline flows (Kent water withdrawal with no augmentation) provide for less rearing habitat in Rock Creek than instream flows absent Kent water withdrawals. In October when Kent's withdrawals have the greatest adverse effect on available rearing habitat, the proposed flow augmentation increases the available habitat by more than two-fold over median baseline flows. In addition, other habitat conservation measures will be implemented to address the quality and quantity of habitat in Rock Creek.

Lamprey spp.

The necessary species-specific information is not available to develop similar WAU table for the two species of lamprey. Therefore, the following analysis is qualitative rather than quantitative. Both species of lamprey spawn between April and June. Spawning occurs in shallow gravel nests with stream velocities of 1.6 to 3.3 ft/sec (Close et al. 1995). This is a period characterized by a declining hydrograph and median flows in Rock Creek of around 10 cfs. Although average channel velocities are expected to be generally lower than the range observed by Close et al. (1995), velocities of 1.6 to 3.3 ft/sec will be present in some areas and would likely provide suitable spawning areas for lamprey utilizing Rock Creek. It is not anticipated that baseline flow conditions under the HCP would adversely affect lamprey spawning.

Larval lamprey, called ammocoetes, rear in slow-moving waters with high levels of fine organic materials. The ammocoetes burrow into the substrate and feed on suspended materials, such as diatoms and desmids (single-celled green algae) (Torgersen and Close 2004; Moyle 1976) filtered from the water. Flow reductions resulting from withdrawals for water supply could have two potentially offsetting effects on lamprey rearing. First, a reduction in instream flows as a result of water withdrawals for water supply could subsequently reduce a stream's wetted perimeter that consequently could result in reductions in the area of habitat available to larval lamprey particularly during low flow periods. On the other hand, flow reductions could also reduce water velocities in some areas, which could increase the area where fine organic materials and sediment settle out resulting in an increase in suitable habitat. Moore and Mallatt (1980) reported that larval lamprey have specific velocity requirements (0.16 to 0.49 ft/sec) that are suitable for the settling of fine materials. Overall, continued water withdrawals under the HCP are not anticipated to substantially alter the amount of available habitat for lamprey spawning and rearing from median baseline flows.

HCM 2 - Passage Improvements at the Mouth of Rock Creek – Reach 1

When flows in both the Cedar River and Rock Creek are low (i.e., Cedar River flows <200 cfs; Rock Creek flows < 4cfs), the mouth of Rock Creek becomes perched approximately three ft above the confluence with the Cedar River resulting in a 40-foot-long section composed of large cobble and boulders that has a gradient of seven percent. At its juncture with the Cedar River, the mouth of Rock Creek is over 20 ft wide. This creates a condition in which low flows become quite shallow and diffuse as they enter the Cedar River. Although the area is readily passable at moderate to high flows (flows > 6-7 cfs in Rock Creek), as flows decline, they become spread out and water depths become increasingly shallower. Although successful adult salmonid passage has been documented at flows as low as 1.5 cfs as evidenced by spawning survey data (R2 2004, 2005), the prevailing conditions at these low flows are clearly sub-optimal for adult passage.

The adult fish-passage improvement project (HCM-2) would be accomplished by constructing a series of low rock weirs or weirs incorporating large wood with a center slot that concentrates flow. Concentrated flow would provide sufficient depth for fish to move upstream, while the weirs would act to slightly pond water. Swift velocity in the concentrated flow path is not anticipated to be a concern because of the relatively short length of the section and areas behind the weirs of relatively calm water. HCM-2 would be implemented according to the conceptual design depicted in the HCP (Figure 1) with further refinements made in coordination with the USFWS and other permitting agencies. Boulder placement would be accomplished using a small rubber-tired track backhoe and hand adjustments. Access to the site is available via the King County property on the west bank of Rock Creek using a footpath from SE 246th Street. Minimal vegetation clearing would be required for access and construction. Cleared areas (if any) would be restored with native vegetation. BMPs including in-water work windows employed during any construction and maintenance activities are anticipated to minimize potential adverse effects of passage improvements, but are not expected to completely eliminate them. It is anticipated there will be one or more pulses of suspended sediment in Rock Creek immediately following construction and during the first high flow event post-construction. Increased suspended sediment concentrations can cause lethal, sublethal, and behavioral effects

in juvenile and adult salmonids (Newcombe and Jensen 1996). Behavioral effects can include an abandonment of cover or avoidance of the higher suspended sediment concentration areas potentially facilitating increased predation. Sub-lethal effects may include reductions in feeding rates, and physiological stress. Lethal effects may include reduced growth rates leading to increased susceptibility to predation and severe habitat degradation, such as sedimentation that reduces egg to fry survival (Newcombe and Jensen 1996).

Bull Trout

It is anticipated that this project will be constructed within the first five years of ITP issuance. Currently, bull trout are unlikely to utilize Rock Creek based on available observation data for the lower Cedar River and current habitat conditions in lower Rock Creek, and colonization of the site by bull trout is not expected to occur in the near term; as a result adverse effects to bull trout from construction are not anticipated to occur. Improving access to Rock Creek during the fall migration period (typically a low flow period), would benefit adult bull trout if they choose to colonize and/or forage and overwinter in Rock Creek.

Coastal Cutthroat Trout

Juvenile, subadult, and adult cutthroat trout could be present in Rock Creek during construction activities. It is anticipated that this project will be constructed during the proper instream work windows using the BMPs to minimize the project footprint and the amount of sediment that could be generated during construction. Cutthroat trout in Rock Creek could be exposed to most of the adverse effect described above during construction activities and following the first high flow event in lower Rock Creek. Suspended sediments effect to eggs and fry are not anticipated because of the anticipated timing of work activities. Any suspended sediment entering the Cedar River would likely be redistributed over a larger area in the Cedar River, resulting in no measurable effects to cutthroat trout. The construction of a series of weirs at the mouth of Rock Creek would facilitate adult cutthroat trout passage under low flow conditions by concentrating flows that would normally be diffuse and widely distributed at the stream mouth, toward the center of the weirs. This should provide a more direct passage portal for cutthroat migrating from the Cedar River into Rock Creek at other times of the year as well. In addition, the weirs will create some deeper water areas above each of the structures that can be used as adult holding habitat. Upstream and downstream passage of subadult and juvenile cutthroat trout is not expected to be affected by passage improvements.

Lamprey spp.

Adult lampreys cannot jump, but instead pull themselves over obstacles using their suctorial disk. The suctorial disk allows lampreys to cling to wetted surfaces, thus propelling themselves forward with a burst and attach pattern, especially in higher velocities. Based on their mode of locomotion, neither the current configuration nor the proposed fish passage improvements at the mouth of Rock Creek would impede adult lamprey from migrating into Rock Creek.

Lamprey of all ages can be impacted by construction activities necessary to install the fish passage improvements at the mouth of Rock Creek. Ammocoetes spend most of their time

burrowed in stream substrates, moving during flow events and mostly at night. Many age classes of juvenile lamprey can concentrate together in the same areas because of habitat preference, making lamprey particularly susceptible to activities that involve dredging/excavating and dewatering. Adults also prefer to move at night, hiding in large rock and boulder substrate during the day (USFWS 2010, page 10). Excavation activities or boulder/large wood placement necessary to construct the fish passage structure could injure or kill juvenile lamprey buried in the substrate or adults hiding under larger substrate.

Wetland Improvement and Juvenile Salmonid Habitat Enhancement – Reach 1and 2

Establishing direct hydrologic connectivity between the wetlands and ponds identified and Rock Creek would provide approximately 0.50 acres off-channel habitat, doubling the amount of this type of habitat associated with lower Rock Creek. Reach 1 wetland and pond complex is currently not connected to Rock Creek, and represents the lowermost, potentially available off-channel rearing and holding habitat in lower Rock Creek. Reach 2 wetland and pond complex is currently the only available off-channel juvenile rearing habitat of any significance in lower Rock Creek. Juvenile coho have been observed using this wetland and pond during spawning surveys (R2 2005a). Providing a more permanent connection between this wetland and pond complex and Rock Creek will increase its temporal availability to juvenile fish and ammocoetes rearing in Rock Creek. Because these two sites are located 200-ft and 500-ft upstream from the Cedar River, they could also benefit fish attempting to avoid high velocity flows in the mainstem Cedar River. These types of off-channel habitats represent important winter rearing habitat for juveniles, newly emerged fry, and juvenile lamprey.

It is anticipated that these projects will be constructed during the proper instream work windows using the BMPs to minimize the project footprint and suspended sediment that could be generated during construction. We anticipate that most of the work needed to connect the off-channel wetlands and ponds to Rock Creek will be conducted outside the wetted perimeter of Rock Creek and/or during periods of the year when the wetlands are likely dry and disconnected from Rock Creek (Reach 2 wetland complex). We do anticipate that connecting Rock Creek to the wetlands and ponds will result in some limited suspended sediment entering Rock Creek. Construction activities associated with the lowermost wetland complex could result in sediment delivery to the Cedar River. Any sediment that would enter the Cedar River would likely be redistributed over an even larger area downstream of the mouth of Rock Creek, resulting in no measurable effects to covered species.

Bull Trout

It is anticipated that this project will be constructed within the first five years of ITP issuance. Currently, bull trout are unlikely to utilize Rock Creek based on available observation data for the lower Cedar River and current habitat conditions in lower Rock Creek, and colonization of the site by bull trout is not expected to occur in the near term. Therefore, we would not

anticipated bull trout being exposed to any adverse effects associated with off-channel wetland improvements. Improving off-channel wetland habitat would benefit bull trout by potentially increasing the prey base in Rock Creek.

Coastal Cutthroat Trout

Juvenile, subadult, and adult cutthroat trout could be present in Rock Creek during construction activities. BMPs including in-water work windows employed during any construction activities are anticipated to minimize potential adverse effects. Most of the proposed work will be accomplished outside of the wetted perimeter of Rock Creek and only minimal amount of excavation will be needed to connect Rock Creek to the wetlands. Subsequently, any suspended sediment generated by construction activities is expected to be limited in scope. Therefore, we anticipate that any increases in sediment that may result from this proposed activity are not likely to adversely affect cutthroat trout.

Lamprey spp.

Juvenile lampreys could be present in Rock Creek during construction activities. Most of the proposed work will be accomplished outside of the wetted perimeter of Rock Creek and only minimal amount of excavation will be needed to connect Rock Creek to the wetlands. Any excavation in the stream channel has the potential to adversely affect any lamprey buried in the substrate at the site where the wetlands and Rock Creek are joined. The footprint of any excavation or dredging necessary to connect Rock Creek is expected to be limited in scope. Ammocoetes spend most of their time burrowed in stream substrates, moving during flow events and mostly at night. Many age classes can concentrate together in the same areas because of habitat preference, making ammocoete populations particularly susceptible to activities that involve dredging/excavating (USFWS 2010, page 10). Creating backwater areas like the two projects described that recruit fine sands and silts downstream of spawning areas, can provide rearing areas for lamprey ammocoete.

<u>Summit-Landsburg Road Culvert Replacement</u>

Summit-Landsburg Road culvert represents a significant fish passage impediment on Rock Creek. Although there is no statutory timeline regarding the replacement of barrier culverts on public roads, accelerating the upgrade of the existing culvert under the HCP will improve upstream passage of both adult and juvenile fishes in Rock Creek. Project plans will include a description of procedures to be used for removing fish from the project area prior to construction and for maintaining flow and fish passage through the site during construction. Plans for fish handling, water management, and proposed mitigation or enhancement measures (if any) will be provided to the USFWS and other appropriate regulatory agencies for review prior to initiating construction. We estimate that approximately 100 ft of channel will be disturbed during culvert replacement activities.

Because adult and/or juveniles of the covered species could be present in Rock Creek year round, they could be exposed to effects of suspended sediment, channel dewatering, worksite isolation, and fish capture and handling. Although some of these measures are typically included in many actions to reduce the extent of fish exposed to in-water work, the measures themselves are likely to adversely affect some individuals. In-water work would likely cause short-term turbidity plumes and sedimentation, and may result in some injury or mortality to fish, particularly young-of-the-year salmonids. BMPs including in-water work windows employed during any construction and maintenance activities are anticipated to minimize potential adverse effects of culvert replacement, but are not expected to completely eliminate them. Even if the channel is dewatered or the worksite isolated for activities requiring in-channel excavation, there will still likely be one or more pulses of suspended sediment in Rock Creek after the site is re-watered, or during the first high flow events following construction. Increased suspended sediment concentrations have been shown to cause lethal, sublethal, and behavioral effects in juvenile and adult salmonids (Newcombe and Jensen 1996). Behavioral effects can include an abandonment of cover or avoidance of the higher suspended sediment concentration areas potentially facilitating increased predation. Sub-lethal effects may include reductions in feeding rates, and physiological stress. Lethal effects may include reduced growth rates leading to increased susceptibility to predation and severe habitat degradation, such as sedimentation that reduces egg to fry survival (Newcombe and Jensen 1996).

During channel dewatering (and possibly worksite isolation), some juveniles are reasonably certain to become stranded in the dewatered channel (e.g. hidden under instream structure) and not properly salvaged. These stranded individuals are likely to die because they will lack access to flowing water for several days during in-water construction activities. Some of the rescued individuals may be injured or killed by stress responses to capture and handling. Capturing and handling individuals can cause short-term stress, increasing plasma levels of cortisol and glucose (Frisch and Anderson 2000; Hemre and Krogdahl 1996). Even short-term, low intensity handling may cause reduced predatory avoidance for up to 24 hours (Olla et al. 1995).

Bull Trout

It is anticipated that this project will be constructed within the first ten years of ITP issuance. Currently, bull trout are unlikely to utilize Rock Creek and colonization of the site by bull trout is not expected to occur in the near term and, therefore, we would not anticipated bull trout being exposed to any adverse effects associated with Summit-Landsburg Road culvert replacement. Providing access to spawning and rearing habitats within Kent's watershed property at all flows would benefit all life-history stages of bull trout if they choose to colonize Rock Creek.

Coastal Cutthroat Trout

Juvenile, subadult, and adult cutthroat trout are likely present year-round in Rock Creek including the location of the above referenced culvert. The USFWS expects individual cutthroat trout to be exposed to the range of effects described above with juvenile cutthroat being more

susceptible to lethal effects than subadult or adult fish. Providing access to spawning and rearing habitats within Kent's watershed property at all flows would benefit all life-history stages of cutthroat trout.

Lamprey

The current culvert configuration represents a significant barrier to adult lamprey migration in Rock Creek. Lampreys are likely present year-round in Rock Creek including the location of the above referenced culvert. Providing access to spawning and rearing habitats within Kent's watershed property at all flows would benefit all life-history stages of lamprey.

Ammocoetes spend most of their time burrowed in stream substrates, moving during flow events and mostly at night. Many age classes can concentrate together in the same areas because of habitat preference, making ammocoete populations particularly susceptible to activities that involve dredging/excavating and dewatering/stranding. Adults also prefer to move at night, hiding in large rock and boulder substrate during the day (USFWS 2010, page 10). De-watering as a result of a culvert replacement can cause rapid fluctuations in stream water levels stranding ammocoetes in the substrates and adults beneath rocks. A single event can have a significant effect on a local lamprey population and nests can be dewatered, killing eggs or larvae (USFWS 2010, page 10). Current work windows developed for salmonids do not fully protect all life-history stages of lamprey. Salvaging individual lamprey could prove difficult because they could remain buried in the substrate making them difficult to locate in a timely manner. Depending on the quality of the habitat involved, dredging with a backhoe or trackhoe could remove several hundred lampreys per bucket load (USFWS 2010, page 10). Although, the USFWS does not anticipate densities to be this robust, we do expect that some lamprey will be injured and/or killed during culvert replacement as a result of dewatering of the channel, dredging, and/or capture or handling efforts.

<u>Large Wood Placement – Reach 10 and 12</u>

Kent will place individual pieces of large wood in Reach 10 and Reach 12 of Rock Creek, which are both located on Kent's Clark Springs Watershed property. The wood will be placed in a manner that concentrates moderate to high flows enhancing local scour of fine sediment from the channel bed thereby promoting pool formation and spawning gravel deposition in proximal areas as well create local cover and pool areas for adult holding and juvenile rearing habitat.

Bull Trout

It is anticipated that this project will be constructed within the first five years of ITP issuance. Currently, bull trout are unlikely to utilize Rock Creek based on available observation data for the lower Cedar River and current habitat conditions in lower Rock Creek, and colonization of the site by bull trout is not expected to occur in the near term. Therefore, we would not

anticipated bull trout being exposed to any adverse effects associated with the placement of the large wood in Reaches 11 and 12. Providing additional large wood pieces within Kent's watershed property would benefit all life-history stages of bull trout if they choose to colonize, forage, or overwinter in Rock Creek.

Coastal Cutthroat Trout

Cutthroat trout are likely present year-round in Rock Creek including Reaches 11 and 12. Providing additional large wood pieces within Kent's watershed property would benefit all life-history stages of cutthroat trout. The USFWS expects that placement of individual pieces of large wood will result in only minimal disturbance to the bank causing minor releases of suspended sediment into Rock Creek. BMPs, including in-water work windows employed during any construction and maintenance activities, are anticipated to minimize potential adverse effects from LWD placement. Therefore, we anticipate that any increases in sediment that may result from this proposed activity are not likely to adversely affect cutthroat trout.

Lamprey spp.

Lampreys are likely present year-round in Rock Creek including Reaches 11 and 12. Providing additional large wood pieces within Kent's watershed property would benefit all life-history stages of lamprey. The USFWS expects that placement of individual pieces of large wood will result in only minimal disturbance to the bank causing minor releases of suspended sediment into Rock Creek. BMPs employed during any construction and maintenance activities are anticipated to minimize potential adverse effects from LWD placement. Excavation activities or large wood placement could injure or kill juvenile lamprey buried in the substrate or adults hiding under larger substrate.

<u>Maintenance Activity - Beaver Dam Removal</u>

Beaver dams are removed periodically from Kent-owned property upstream of its water supply facilities. Removal is and, under the HCP, will be consistent with conditions in Kent's Hydraulic Program Approval (HPA) issued by WDFW renewable every 5 years. Beaver dams elsewhere on Kent-owned property and on other reaches of Rock Creek are unaffected by the HPA or HCP. Conditions of the HPA include but are not limited to the following: remove dam material in a manner that releases water slowly to prevent fish stranding and to control downstream erosion and sedimentation; limit disturbance of riparian vegetation; not remove embedded wood from the streambank; and vegetate areas disturbed by dam removal activities. Such actions will occur infrequently throughout the term of the permit.

Bull Trout

Currently, bull trout are unlikely to utilize Rock Creek based on available observation data for the lower Cedar River and current habitat conditions in lower Rock Creek. Therefore, colonization of the site by bull trout is not expected to occur in the near term. If the number of bull trout increase in the lower Cedar River and habitat conditions improve in lower Rock Creek, bull trout may utilize Rock Creek later in the permit term. Based on the minimal sediment levels

anticipated to be generated during and following beaver dam removal, and the limited vegetation removal that may occur, we do not anticipate that the proposed activities will result in measurable effects to bull trout or their habitat.

Cutthroat Trout

Cutthroat trout are likely present year-round in Rock Creek and exposed to the effects of beaver dam removal. Based on minimal sediment levels anticipated to be generated during and following beaver dam removal and the limited vegetation removal that may occur, we do not anticipate that the proposed activities will result in measurable effects to cutthroat trout or their habitat.

Lamprey spp.

Lampreys are likely present year-round in Rock Creek and exposed to the effects of beaver dam removal. Based on minimal sediment levels anticipated to be generated during and following any beaver dam removal and the limited vegetation removal that may occur, we do not anticipate that the proposed activities will result in measurable effects to lamprey or their habitat.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, Tribal, local, or private actions that are reasonably certain to occur in the action area considered in this Opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

The lower Rock Creek basin includes Kent's 320-acre Clark Springs property and the 141-acre Rock Creek Natural Area owned by King County. This ownership pattern assures that land use adjacent to the lower 2.6 miles of Rock Creek will remain largely unaltered for the foreseeable future. In contrast, there is potential for continued build-out and development in the upper watershed. Based upon predicted build-out conditions, future land use is estimated to include approximately 51 percent forested, 40 percent grass and pasture, and 5 percent impervious surface (MGS unpublished data). In 1999, approximately 67 percent of the basin was estimated to be forested, followed by about 26 percent grass or pasture, and about 3 percent of the land cover was considered impervious surface (MGS unpublished data). Loss of forest cover and a slight increase in impervious surface within the watershed could have a small, but unknown effect on the amount and timing of flows in Rock Creek.

Of the threats to the covered species in the Rock Creek basin, the following may be exacerbated by the continued conversion of forested lands to pasture and undeveloped landscapes to developed areas:

- Low flows and high temperatures during the summer may affect holding and rearing habitat for migrants and resident fish in Rock Creek, and
- Water quality impairment including high stream temperatures and contaminated run-off.

As such, future non-Federal actions reasonably certain to occur in the action area are expected to adversely affect covered species through impacts to water quality and fish habitat in the action area.

CONCLUSION

After reviewing the current status of bull trout, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is the USFWS's Opinion that the action, as proposed, is not likely to jeopardize the continued existence of bull trout. This determination is based on the following rationale:

We anticipate the passage improvements at the mouth of Rock Creek and the replacement of the culverts on Rock Creek at the Summit-Landsburg Road stream crossing will provide unimpaired movement of bull trout throughout the lower 2.8 miles of Rock Creek under all flow conditions over the term of the HCP should they choose to colonize the basin.

- We anticipate bull trout will benefit from other habitat conservation measures required in the HCP including instream flow augmentation during October, November, and December; wetland improvements in Reaches 1 and 2; installation of large wood in Reaches 11 and 12; and the creation of a habitat fund to purchase or place conservation easements on land adjacent to Rock Creek, should the choose to colonize the basin.
- The adverse effects resulting from the implementation of most habitat conservation measures will occur early in the term of the HCP, when it is unlikely that bull trout would be present in the action area.
- Critical habitat for this species has been designated only in Lake Washington (FMO) and above Masonry Dam in the upper Cedar River Watershed (spawning and rearing). This action does not adversely affect these areas and therefore, no destruction or adverse modification of that critical habitat will occur as a result of this action.

After reviewing the current status of cutthroat trout, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is the USFWS's Opinion that the action, as proposed, is not likely to jeopardize the continued existence of cutthroat trout. This determination is based on the following rationale:

- We anticipate the passage improvements at the mouth of Rock Creek and the replacement of the culverts on Rock Creek at the Summit-Landsburg Road stream crossing will provide unimpaired movement of cutthroat trout throughout the lower 2.8 miles of Rock Creek under all flow conditions over the term of the HCP.

- We anticipate cutthroat trout will benefit from other habitat conservation measures required in the HCP including instream flow augmentation during October, November, and December; wetland improvements in Reaches 1 and 2; installation of large wood in Reaches 11 and 12; and the creation of a habitat fund to purchase or place conservation easements on land adjacent to Rock Creek.
- The adverse effects resulting from the implementation of most habitat conservation measures are expected to persist for less than one year following construction.
- The capture and handling of cutthroat trout for salvage purposes may result in direct take (kill, capture, injury) of a few individuals; however, the direct take resulting from salvage operations will minimize the incidental take of cutthroat trout from stream diversion/dewatering activities during the restoration of fish passage at Summit-Landsburg stream crossing. Finally, the anticipated number of individuals taken is not expected to have significant impacts to this coastal cutthroat population.
- No critical habitat has been designated for this species in the action area; therefore, none will be affected.

After reviewing the current status of Pacific lamprey, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is the USFWS's Opinion that the action, as proposed, is not likely to jeopardize the continued existence of Pacific lamprey. This determination is based on the following rationale:

- We anticipate the replacement of the culverts on Rock Creek at the Summit-Landsburg Road stream crossing will provide unimpaired movement of Pacific lamprey throughout the lower 2.8 miles of Rock Creek under all flow conditions over the term of the HCP.
- We anticipate Pacific lamprey will benefit from other habitat conservation measures required in the HCP including instream flow augmentation during October, November, and December; wetland improvements in Reaches 1 and 2; installation of large wood in Reaches 11 and 12; and the creation of a habitat fund to purchase or place conservation easements on land adjacent to Rock Creek.
- The adverse effects resulting from the implementation of most habitat conservation measures are expected to persist for less than one year following construction.
- The capture and handling of Pacific lamprey for salvage purposes may result in direct take (kill, capture, injury) of a few individuals; however, the direct take resulting from salvage operations will minimize the incidental take of Pacific lamprey from stream diversion/dewatering activities during the restoration of fish passage at Summit-Landsburg stream crossing. Finally, the anticipated number of individuals taken is not expected to have significant impacts to this Pacific lamprey population.
- No critical habitat has been designated for this species in the action area; therefore, none will be affected.

After reviewing the current status of river lamprey, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is the USFWS's Opinion that the action, as proposed, is not likely to jeopardize the continued existence of river lamprey. This determination is based on the following rationale:

- We anticipate the replacement of the culverts on Rock Creek at the Summit-Landsburg Road stream crossing will provide unimpaired movement of river lamprey throughout the lower 2.8 miles of Rock Creek under all flow conditions over the term of the HCP.
- We anticipate river lamprey will benefit from other habitat conservation measures required in the HCP including instream flow augmentation during October, November, and December; wetland improvements in Reaches 1 and 2; installation of large wood in Reaches 11 and 12; and the creation of a habitat fund to purchase or place conservation easements on land adjacent to Rock Creek.
- The adverse effects resulting from the implementation of most habitat conservation measures is expected to persist for less than one year following construction activities.
- The capture and handling of river lamprey for salvage purposes may result in direct take (kill, capture, injury) of a few individuals; however, the direct take resulting from salvage operations will minimize the incidental take of river lamprey from stream diversion/dewatering activities during the restoration of fish passage at Summit-Landsburg stream crossing. Finally, the anticipated number of individuals taken is not expected to have significant impacts to this river lamprey population.
- No critical habitat has been designated for this species in the action area; therefore, none will be affected.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. *Harm* is further defined by the USFWS to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. *Harass* is defined by the USFWS as intentional or negligent actions that create the likelihood of injury to a listed species by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be a prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The proposed City of Kent HCP and its associated documents clearly identify anticipated impacts to affected species likely to result from the proposed taking and the measures that are necessary and appropriate to minimize and mitigate those impacts. All conservation measures

described in the proposed HCP, together with the terms and conditions described in any associated Implementing Agreement and any section 10(a)(1)(B) permit or permits issued with respect to the proposed HCP, are hereby incorporated by reference as reasonable and prudent measures and terms and conditions within this Incidental Take Statement pursuant to 50 CFR 402.14(i). Such terms and conditions are non-discretionary and must be undertaken for the exemptions under section 10(a)(1)(B) and section 7(o)(2) of the Act to apply. If the City of Kent fails to adhere to these terms and conditions, the protective coverage of the section 10(a)(1)(B) permit and section 7(o)(2) may lapse. The amount or extent of incidental take anticipated under the proposed City of Kent HCP is as described below and in the HCP and its accompanying section 10(a)(1)(B) permit. Associated reporting requirements and provisions for disposition of dead or injured animals are described in the section 10(a)(1)(B) permit.

The amount or extent of incidental take of bull trout, cutthroat trout, Pacific lamprey and river lamprey caused by implementation of covered activities under the City of Kent HCP will be difficult to detect or quantify for the following reasons: 1) the low likelihood of finding dead or injured adults, subadults, or juveniles; 2) delayed mortality; and 3) the relationship between habitat conditions and the distribution and abundance of individuals is imprecise such that a specific number of affected individuals cannot be practically obtained. For those reasons, and as explained in the preceding "Effects of the Action" section of this document, instream flows, length of dewatered stream reaches, and habitat conditions for a specified distance downstream of habitat restoration projects will be used as surrogates for assessing and monitoring take of listed species under this HCP. As specified in the HCP, the City of Kent will be monitoring the extent of take of covered species during HCP implementation by monitoring instream flows, dewatered stream reaches, and habitat conditions for a specified distance downstream of habitat restoration projects.

FORM AND AMOUNT OR EXTENT OF TAKE OF BULL TROUT

Based on the analysis in the "Effects of the Action" section of this Opinion, the USFWS anticipates that juvenile, subadult, and adult bull trout in Rock Creek are likely to be taken in the form of harass due to a reduction in spawning and rearing habitat as a result of groundwater withdrawals. Bull trout spawning habitat is anticipated to be reduced by 61,000 sq. ft. annually during the months of October and November over the permit term. In addition, bull trout rearing habitat is anticipated to be reduced by an average of 4,000 sq. ft. per month over the permit term.

FORM AND AMOUNT OR EXTENT OF TAKE OF CUTTHROAT TROUT

Based on the analysis in the "Effects of the Action" section of this Opinion, the USFWS anticipates that juvenile, subadult, and adult cutthroat trout within approximately 100 linear ft of Rock Creek are likely to be taken in the form of harm due to stream diversion and channel dewatering associated with the removal of culverts at the Summit-Landsburg Road crossing. In addition, the capture and handling of cutthroat trout for salvage purposes will result in direct take by kill and capture within 100 linear ft of Rock Creek; however, the direct take resulting from salvage operations is likely to reduce the amount of incidental take of the cutthroat trout from stream diversion/dewatering activities. The USFWS also anticipates that any juvenile, subadult, and adult cutthroat trout 200 feet downstream of Summit-Landsburg Road will be subject to take

in the form of harass immediately following construction and during the first high flow event post-construction.

The USFWS anticipates that any juvenile, subadult, and adult cutthroat trout in the first 100 ft of Rock Creek is likely to be taken in the form of harass due to sediment impacts immediately following construction, and during the first high flow event post-construction, of the fish passage improvement project on Rock Creek.

FORM AND AMOUNT OR EXTENT OF TAKE OF PACIFIC LAMPREY

Based on the analysis in the "Effects of the Action" section of this Opinion, the USFWS anticipates that all life history stages of Pacific lamprey within approximately 100 linear ft of Rock Creek are likely to be taken in the form of harm during stream diversion and channel dewatering activities associated with the removal of culverts at the Summit-Landsburg Road crossing. In addition, the capture and handling of Pacific lamprey for salvage purposes will result in direct take by kill and capture within 100 linear ft of Rock Creek; however, the direct take resulting from salvage operations is likely to reduce the incidental take of the Pacific lamprey from stream diversion/dewatering activities.

The USFWS anticipates that all life history stages of the Pacific lamprey in the first 100 ft of Rock Creek are likely to be taken in the form of harm during dredging and material placement activities. All life history stages of the Pacific lamprey will also be subject to harm during dredging associated with connecting the off-channel wetland improvement project with Rock Creek.

FORM AND AMOUNT OR EXTENT OF TAKE OF RIVER LAMPREY

Based on the analysis in the "Effects of the Action" section of this Opinion, the USFWS anticipates that all life history stages of the river lamprey within approximately 100 linear ft of Rock Creek will be subject to harm during stream diversion and channel dewatering activities associated with the removal of culverts at the Summit-Landsburg Road crossing. In addition, the capture and handling of river lamprey for salvage purposes is likely to result in direct take by kill and capture within 100 linear ft of Rock Creek; however, the direct take of the river lamprey resulting from salvage operations will reduce the incidental take of river lamprey caused by stream diversion/dewatering activities.

The USFWS anticipates that all life history stages of river lamprey in the first 100 ft of Rock Creek will be subject to harm during dredging and material placement activities. All life history stages of the river lamprey will also be subject to harm during dredging associated with connecting the off-channel wetland improvement project with Rock Creek.

EFFECT OF THE TAKE

In the accompanying Opinion, the USFWS determined that the above levels of anticipated take are not likely to result in jeopardy to bull trout, cutthroat trout, Pacific lamprey, or river lamprey. No critical habitat has been designated in the action area for any of the covered species addressed in the HCP and analyzed in this Opinion.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. We have no additional recommendations beyond what is included in the HCP.

REINITIATION NOTICE

This concludes formal consultation on the USFWS's proposed issuance of a section 10(a)(1)(B) permit for the City of Kent HCP. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: 1) the amount or extent of incidental take is exceeded; 2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this Opinion; 3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this Opinion; or 4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

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Biological Opinion

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City of Kent
Clark Springs Water Supply System
Habitat Conservation Plan

Consultation Conducted By:

U.S. Fish and Wildlife Service
Washington Fish and Wildlife Office

Ken S. Berg

Ken S. Berg, Manager
Washington Fish and Wildlife Office

8/23/2011

Date