Chapter 2. Introduction and Background

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The Bull Run Water Supply Habitat Conservation Plan (HCP) has been prepared in support of the City of Portland's application to the National Marine Fisheries Service (NMFS) for an Incidental Take Permit (ITP) to cover the continued operation and maintenance of the Bull Run water supply system. The City of Portland (City) prepared the HCP in accordance with Section 10(a)(2)(A) of the federal Endangered Species Act (ESA), which allows for the approval of incidental take of threatened and endangered fish and wildlife species during the performance of otherwise lawful activities, provided certain conditions are met. One of those conditions is the preparation of an HCP. The City's HCP describes actions the City will take to improve habitat conditions in the Bull Run and Sandy rivers and thereby contribute to the recovery of native fish populations.

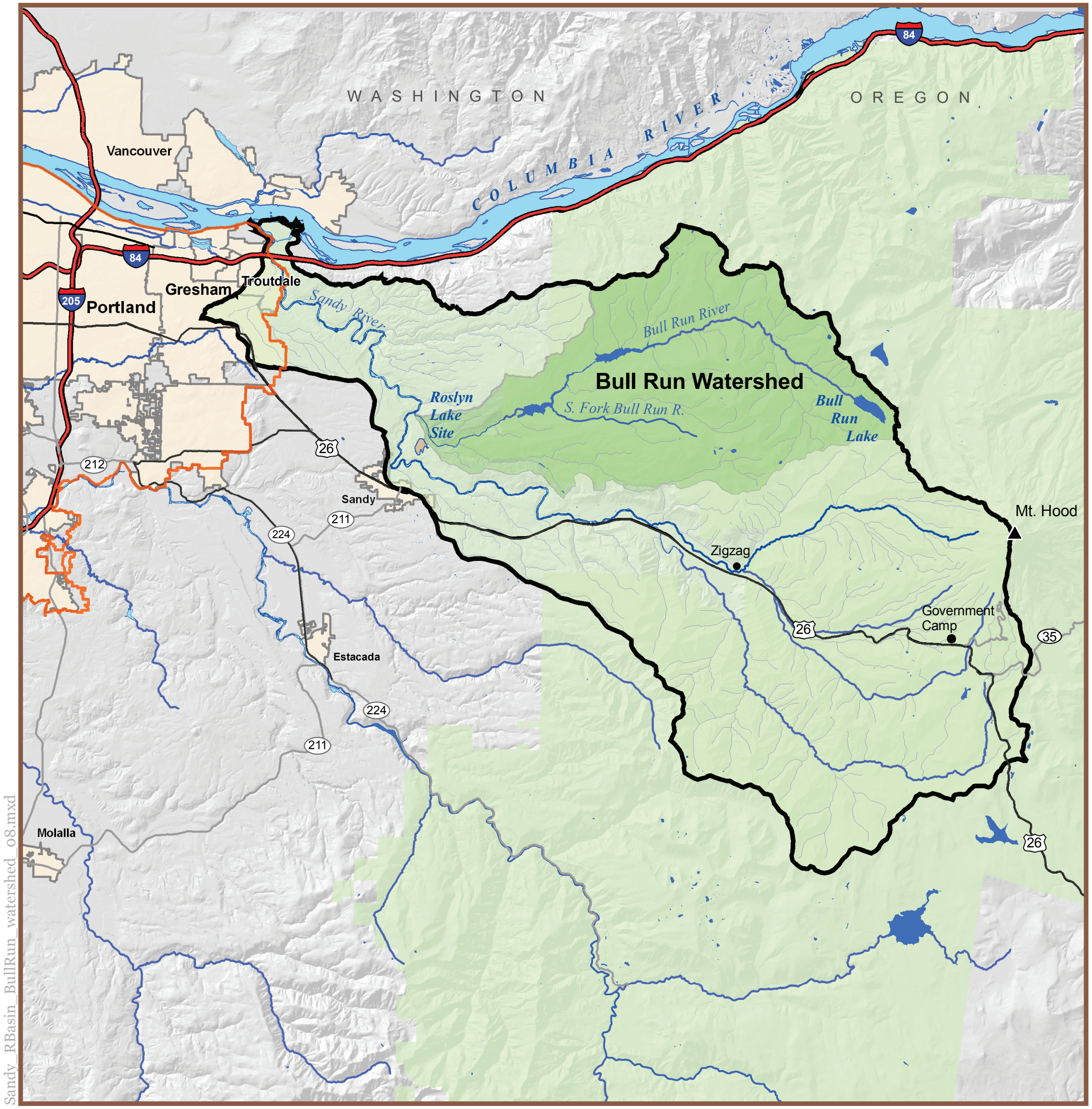
The City prepared this HCP in coordination with NMFS and the U.S. Fish and Wildlife Service (USFWS), the federal agencies responsible for implementation and enforcement of the ESA. The City is confident that this HCP satisfies the requirements of Section 10 and appropriately addresses the habitat conservation needs of the species for which the City seeks coverage.

This chapter provides background information on recent history leading to the HCP, the Bull Run water system, the need for an ITP, related laws and regulations, and the City's habitat conservation approach for the HCP. The effectiveness of the HCP and the content of the HCP chapters are also briefly introduced.

2.1 Recent History Leading to the HCP

The Bull Run watershed has provided water to the Portland metropolitan area since 1895. Only recently, however, has the City begun to fully understand the role that the Bull Run River plays in supporting the larger aquatic ecosystem of the Sandy River Basin (Figure 2-1). The listings of Chinook salmon, coho salmon, and steelhead as threatened species under the federal ESA were key indicators that the Sandy River Basin is facing challenges. The Oregon Department of Environmental Quality (ODEQ) also designated several segments of the Sandy River, including six miles of the lower Bull Run River, as "water quality limited" because summer water temperatures are too high for salmon and steelhead. These regulatory decisions recognized problems that have developed over decades and continue to threaten the sustainability of the native fish populations. These decisions also made it clear that the City needed to assess conditions in the Bull Run River and develop a proposal to meet the requirements of the law, secure the continued availability of the water supply, and make a responsible contribution to sustaining the aquatic ecosystem on which both people and salmon depend.

In 1998, the City began discussions with other public and private organizations involved in salmon recovery in the Sandy River Basin. Those discussions resulted in a Memorandum of Understanding (MOU) signed by NMFS and USFWS (collectively, the Services), the Mt. Hood National Forest, the U.S. Department of the Interior's Bureau of Land Management,



Key Boundaries

Bull Run Watershed
Sandy River Basin
Urban Areas
Urban Growth Boundary
Mt. Hood National Forest

Roads

Interstate Highway
U.S. Highway
State Highways

Water Features

Major Rivers
Streams
Lakes
Former Lake Site

N

Projection:
State Plane, Oregon North
North American Datum 1983

1:449,743

Miles: 0, 1.5, 3, 6, 9, 12, 15

Kilometers: 0, 2.5, 5, 10, 15, 20, 25

Figure 2-1. Location of the Bull Run Watershed in the Sandy River Basin

the Oregon Department of Fish and Wildlife (ODFW), Portland General Electric (PGE), and the Portland Water Bureau. The MOU signers pledged to work together to recover wild fish populations in the whole of the Sandy River Basin. Since 1999, more than a dozen organizations have joined in the effort and are now known as the Sandy River Basin Partners.

The City developed this HCP in the spirit of the 1999 MOU and with the help of many dedicated individuals, both members of the Sandy River Basin Partners and others engaged in related salmon recovery work.

2.2 Overview of the Bull Run Water System

The Bull Run water system infrastructure consists of three major components: storage, transmission, and distribution. Storage includes the dams and reservoirs located in the Bull Run watershed. Transmission includes the facilities that transport water from the Bull Run watershed into the City. Distribution includes the facilities involved in delivering water supply directly to homes and businesses.

The Bull Run water system is one of only a few large unfiltered water systems in the United States. This is a reflection of the very high quality water available from Bull Run, as well as the unusually high level of protection of the watershed from pollution sources. The watershed has been closed to public access for more than 100 years. Recreation, commercial uses, and residential development are not allowed in the watershed.

The Portland Water Bureau provides both retail and wholesale water service. Retail service provides water supply to homes and businesses within the incorporated city limits of Portland (Figure 2-2). Wholesale service provides water supply to 19 cities and water districts in the Portland area, which in turn sell and distribute the water to their own customers. Some of these wholesale customers rely entirely on the City supply, and some have other sources in addition to the supply they purchase from the City. The Bull Run water system is the largest water supply in the state of Oregon and serves approximately one-quarter of the state's population.

In addition to the water supply facilities in Bull Run, the City also owns a groundwater supply system that is located adjacent to the Columbia River and near the Portland International Airport. This supplemental supply provides an additional source of water in dry summers and during circumstances, such as a strong winter storm, when turbidity in the Bull Run increases above U.S. Environmental Protection Agency (EPA) drinking water standards.

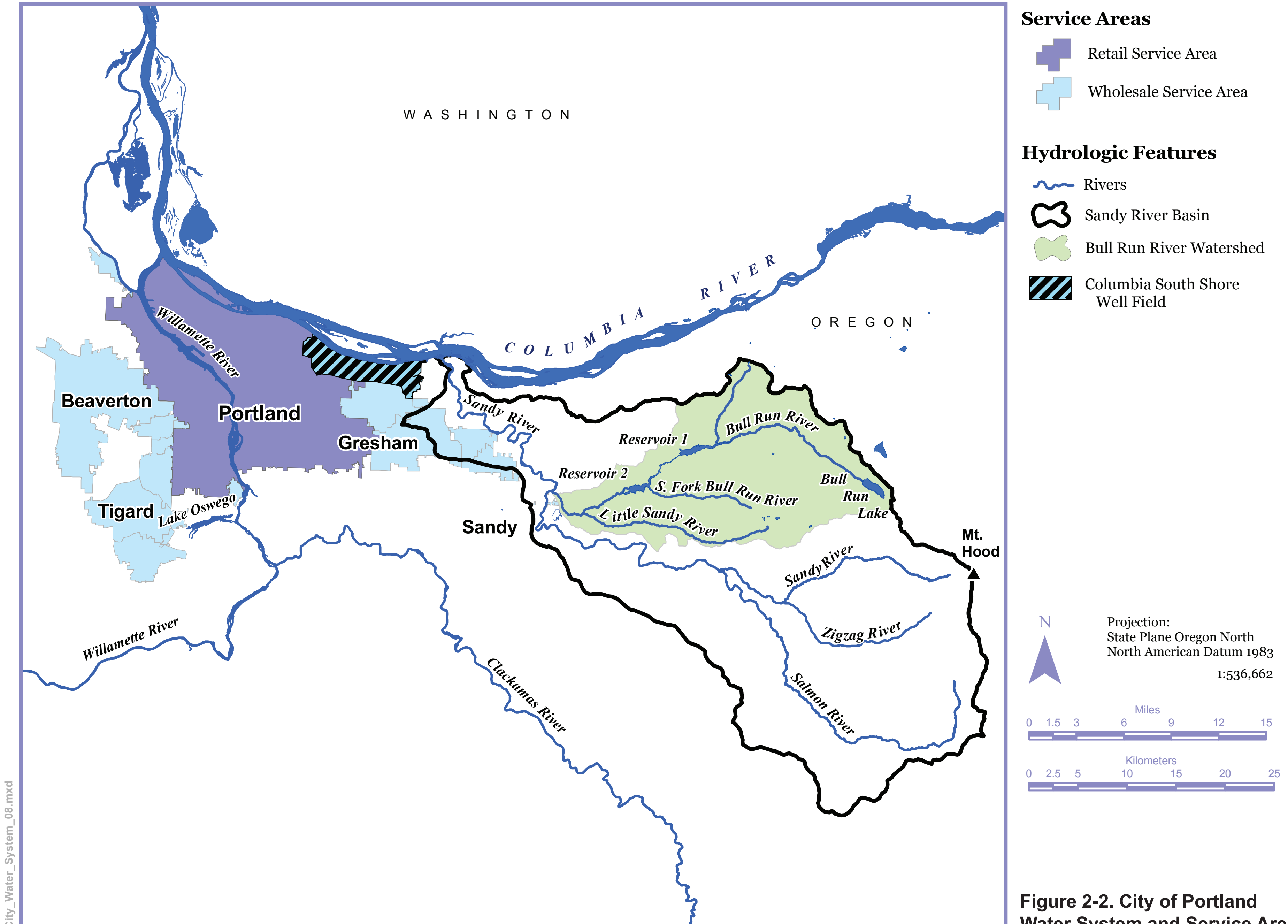


Figure 2-2. City of Portland Water System and Service Area

2.2.1 Storage

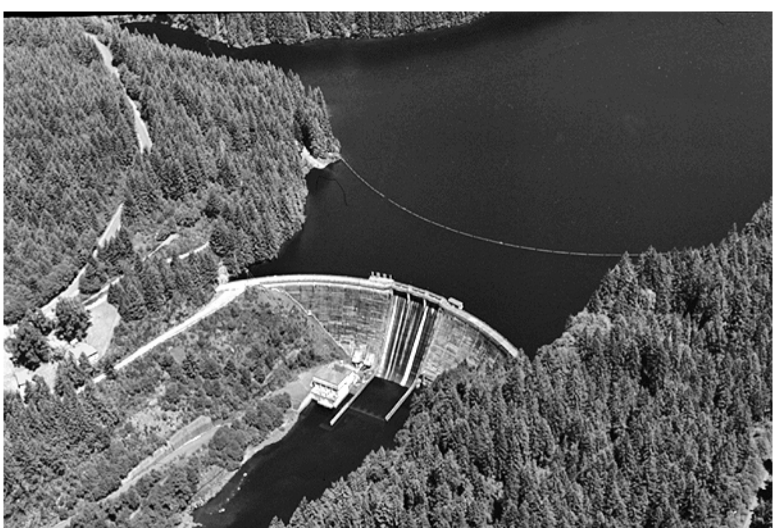
Storage facilities in the Bull Run include the reservoirs behind Dam 1, completed in 1929, and Dam 2, completed in 1962, as well as Bull Run Lake. The combined capacity of the reservoirs in Bull Run is approximately 17 billion gallons. Approximately 10 billion gallons of that capacity is usable storage. Bull Run Lake is used periodically as a supplemental source.

The City relies most heavily on the storage in the reservoir behind Dam 1. The maximum capacity of the reservoir is 10 billion gallons. The surface elevation is raised in the spring by dropping gates in the spillway opening. This occurs after the winter storms are over because the gates are not sturdy enough to withstand overtopping. During the dry season, typically early July to mid-October, the City draws the reservoir down as much as 75 feet. The surface elevation in Reservoir 1 varies between 970 and 1,045 feet above mean sea level. When storms return in the fall, the reservoirs refill—often very quickly (within a few days) but sometimes slowly (over several months). The City attempts to refill the reservoirs before the most intense storms begin in November because sediment accumulated at tributary deltas can be disturbed by high flows and cause turbidity problems.

Bull Run Dam 1, a concrete gravity arch dam, is located at river mile (RM) 11.1. The reservoir behind the dam is about 4 miles long and as much as 190 feet deep. Water passes Dam 1 in one of three ways: through the penstocks in the powerhouse, through needle valves at the bottom of the dam, or over the spillway. Most of the time, flow is through the powerhouse. The needle valves are old and infrequently used. Water flows over the spillway during the few large winter storms that exceed the capacity of the powerhouse. Water that passes Dam 1 flows into the river for a short distance before it pools again in the reservoir behind Dam 2.

Dam 1 is equipped with an intake structure that allows selective withdrawal at different water elevations in the reservoir. This structure enables the City to avoid turbid water near the bottom of the reservoir, and also permits more managed use of cold water to meet downstream objectives.

Dam 2, an earthfill dam, is located at RM 6.5. The reservoir behind the dam is about 4.5 miles long and as much as 130 feet deep. Maximum capacity is 6.8 billion gallons. Water is



withdrawn from elevations close to the bottom of Dam 2 at two intake towers, north and south. The current structures of these intakes do not allow for selective withdrawal at multiple elevations, which results in rapid loss of temperature stratification of this reservoir.

Water passes from the intake towers in one of three ways: through the penstocks in the powerhouse into the diversion pool, through two Howell-Bunger valves into the diversion pool, or over the spillway bypass into the lower river. Water in the diversion pool is directed through the Headworks facility and into the transmission system, or it flows over the diversion dam into the lower Bull Run River.

Figure 2-3 is a simplified illustration of the infrastructure and land features in the Bull Run watershed.

Figure 2-3. Infrastructure and Land Features in the Bull Run Watershed

The Water Bureau attempts to keep the reservoir at Dam 2 as full as possible throughout the year, including the summer months. The surface elevation varies between 840 and 860 feet above mean sea level. This strategy allows for any upstream turbidity to dilute and settle out before the water is diverted for water supply.

Bull Run facilities related to Dam 2 include a spillway structure to bypass winter storm flows past Dam 2, a diversion dam below Dam 2, and a rock weir and pool below the Dam 2 spillway used for energy dissipation. At the Headworks, the water is screened to remove debris, and chlorine is added to the water supply for disinfection. Operators staff the Headworks facility 24 hours a day/seven days a week, and they make the operational adjustments necessary to manage downstream river flows and temperatures.

The original man-made barrier to anadromous fish in the Bull Run River was the diversion dam completed in 1921. The diversion dam, located below Dam 2 at RM 5.9, is 37 feet high. The current lowermost barrier is the spillway weir at RM 5.8. This weir forms a pool and helps dissipate the energy of the flow over the spillway. The spillway weir was completed in 1965 and is 15 feet high.

Hydropower

The City owns hydropower facilities that generate electricity as a byproduct of water supply operations. These facilities are licensed (License No. 2821) by the Federal Energy Regulatory Commission (FERC) and are operated, under a long-term power sales agreement, by PGE. Powerhouse 1 is located immediately downstream of Dam 1 and has an installed capacity of 24 megawatts. Powerhouse 2 is located immediately downstream of Dam 2 and has an installed capacity of 12 megawatts. Electric power generated by these facilities is sold directly to PGE. The City's current hydropower license is valid until 2029. The hydropower facilities are not included as covered facilities in the HCP (see Chapter 3).

Bull Run Lake

Bull Run Lake (see Figure 2-1) does not have a surface connection to the Bull Run River. Because the lake is formed in part by a porous landslide that occurred thousands of years ago, its surface elevation declines every summer as water seeps through the landslide and emerges at springs to form the headwaters of the mainstem Bull Run River. The City maintains a small dam at Bull Run Lake that raised the level of the natural lake approximately 10 feet.

Bull Run Lake represents a supplemental water supply that can be used in unusually dry years. Water supply discharges from the lake, which occur occasionally, primarily change the timing of water availability in the Bull Run River, rather than add to the total amount. None of the covered species (Chinook, steelhead, coho, chum, and eulachon) is found at the lake. Facilities at Bull Run Lake are operated under the terms of a U.S. Forest Service (USFS) easement and are not included as a covered facility in the HCP (see Chapter 3).

2.2.2 Transmission

The Bull Run water system includes three transmission pipelines (known as conduits) that carry water from Headworks to a reservoir at Powell Butte in east Portland and to wholesale connections located to the west. These conduits are buried in a right-of-way, but in some locations they are hung on trestles and bridges (e.g., across the Bull Run River and the Sandy River). At two locations, water can be transferred from one conduit to another. Facilities at these locations are known as interties. The conduits have a combined total capacity of approximately 210 million gallons per day (mgd). At approximately 120 locations, at low points on the conduit corridor, water can be drained from the conduits for maintenance reasons. Chlorinated water is dechlorinated before discharge into storm drains or waterways.

2.2.3 Distribution

The distribution system includes more than 2,100 miles of pipes that carry water to customers, as well as in-town reservoirs, tanks, and pump stations. The distribution portion of the system is located entirely outside the Sandy River Basin, and therefore is not evaluated in the HCP and no ESA coverage is requested in the HCP.

2.2.4 Water Supply, Demand, and Related Operations

Yield from the watershed varies annually and seasonally, as does water demand. Both factors are driven primarily by weather. In warm dry summers, yield tends to be lower and water demand tends to be higher. Conversely, in cool wet summers, yield tends to be higher and water demand is lower. The duration of the dry season is also important because it determines the time period during which the City will rely on the limited storage in the reservoirs. Long dry seasons make it more challenging to provide reliable water supply and increase the probability of needing groundwater to supplement the amount available before fall rains return. During the winter, the Bull Run system is operated as “run of the river.” The reservoirs are kept full and the amount of water not needed for water supply is released into the lower river. The Bull Run reservoirs have no flood control capacity.

Figure 2-4 illustrates seasonal water supply and water demand in the Bull Run—for the drawdown period of June to October—since the mid-1940s.

Water Supply

Approximate median annual water yield from the Bull Run watershed (measured at Headworks, RM 6.5) is 180 billion gallons. Annual yield, 1940 to 2000, ranged from 98 to 258 billion gallons. The median annual diversion for water supply over the same period was about 36 billion gallons, or approximately 20 percent of the total yield. Monthly and daily yields (and diversion percentages) vary seasonally. The two Bull Run reservoirs are relatively small in comparison to precipitation and stream discharge in the watershed. The reservoirs are not large enough to provide a multi-year water supply. Refill each winter is necessary to ensure supply for the following summer.

Figure 2-4 indicates a declining trend in reservoir supply since 1946. The City is monitoring this trend to determine whether it continues and to assess the implications it might have for supply availability into the future. Chapter 10 (Section 10.2.1) describes the City's approach for monitoring and responding to changes in the hydrology of the Bull Run River during the term of the HCP.

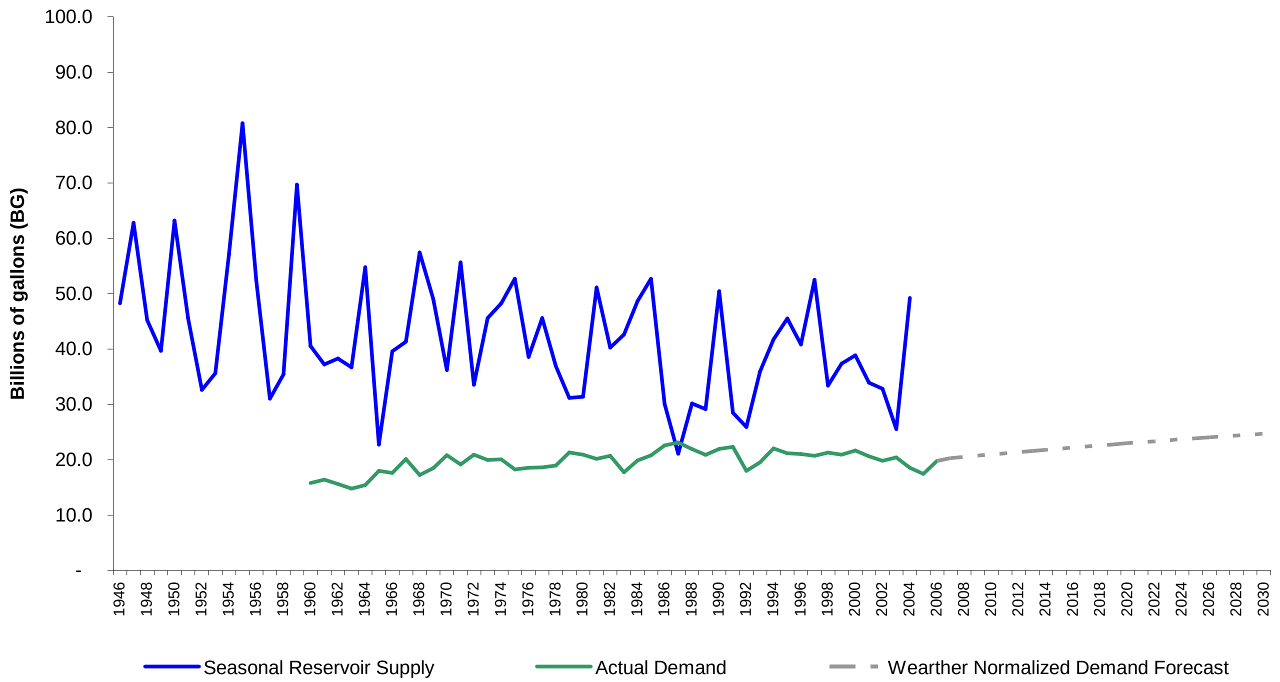


Figure 2-4. Seasonal Reservoir Supply, Actual Demand, and Weather-Normalized Demand Forecast

Sources: Seasonal reservoir supply is total reservoir inflow plus 9.9 BG reservoir supply with no groundwater (for June–October 1946–2004). Total reservoir inflow is the total of the daily mean flows of four gauges (USGS Gauges No. 14138850, Bull Run River at RM 14.8; No. 14138870, Fir Creek at RM 0.6; No. 14138900, North Fork Bull Run River at approximately RM 0.2; and No. 14139800, South Fork Bull Run River at RM 0.6) multiplied by 1.2, to account for the ungauged area of reservoir inflows in the Bull Run watershed. Actual demand data are from Water Bureau consumption data (1960–2005). Weather-normalized demand forecasts (2006–2030) were created using weather patterns from 1940–2005 weather data measured at Portland International Airport and Metro Regional Government population projections.

Groundwater

The City's Columbia South Shore Well Field provides a supplemental supply to the Bull Run watershed. This groundwater supply is used to provide water when the Bull Run supply is shut down and in years when the Bull Run supply is not enough to meet demand. The well field will play a key role in implementing the HCP by providing an additional reliable source of water to meet water demand when needed.

The Bull Run supply is occasionally shut down to avoid serving water to customers that exceeds EPA standards for turbidity in drinking water. These shutdowns have occurred periodically since the wellfield became operational in the mid-1980s. The most notable shutdown occurred in 1996 during a large-scale regional flood event. As of June 2008, turbidity-related shutdowns and related groundwater pumping have occurred six times since 1984 and have varied in duration from 3 to 23 days.

Groundwater also provides capacity to augment Bull Run supplies. In 1987, the City pumped approximately 5.3 billion gallons during the summer months to help meet water demand. As of June 2008, the City has used the well field 13 times for summer season supply since 1984. The duration of use has varied from 12 to 89 days.

The marginal cost of groundwater is substantially greater than the marginal cost of Bull Run surface water. The two most significant groundwater-related costs are electricity to pump water out of the ground and up to the reservoir at the top of Powell Butte, and maintenance and repair of all the moving parts in the wells and pump station.

The well field has a role in meeting increasing water demand resulting from population growth. The well field infrastructure represents supply capacity already in place and ready to use. Other options at similar magnitudes will not be available until demand (as moderated by conservation programs) grows enough to enable financing and construction of new storage or supply. Given uncertainties about the pace of urban growth and future wholesale water customer behavior, the City is likely to need groundwater capacity to meet its responsibilities to customers as demand on the system increases.

Future Water Storage in the Bull Run

Over the last 20 years, the City has examined a number of options for increasing water storage in the Bull Run system. In the future, the City will continue to explore these and other options to meet long-term water supply needs. These options are speculative at this time, so they are not addressed in this HCP, and the City will not seek coverage for them in the ITP.

Water Demand

During fiscal year 2005-2006 the Bull Run water system served a population of approximately 800,000 people. Retail water demand was approximately 60 percent, and wholesale demand was 40 percent. Per capita daily water demand has hovered around approximately 115 gallons per day since fiscal year 2004-2005. Water demand during the summer months (median 140 mgd) is typically about 1.5 to 2 times the winter season demand (median 94 mgd), primarily due to outdoor landscape irrigation.

Figure 2-4 shows measured water demand from the Water Bureau's service area. The data reflect interim reductions in demand that have occurred due to changes in state plumbing codes, land use, and water-use behavior, as well as shifts in the regional economy. Although the population of the area that the Water Bureau serves has grown since 1992, per capita demand has gone down by approximately 20 percent during the same period.

Projected demands to 2030, as shown in Figure 2-4, are based on an econometric model forecast using Metro population projections. Uncertainties in the demand projections include wholesale water customers' future decisions about developing other water sources in the region, as well as future economic and social shifts that may affect water use behaviors and level of use.

Water Conservation

Demand data shown in Figure 2-4 incorporate the effects of the City's ongoing water conservation programs. These programs are implemented by the Water Bureau and the Regional Water Provider's Consortium (City of Portland, Seasonal Water Supply Augmentation and Contingency Plan, 2006) and include media campaigns during the summer season, partnerships and programs focused on outdoor irrigation and landscaping, education and outreach programs for both children and adults (including multiple brochures and web pages), and pilot testing of water-efficient technology. The City also works with business customers, including outreach programs, water audits to guide operation and equipment improvements to save water, and technology studies. In 2005, for example, resulting water savings by businesses approached 10 million gallons for the year.

Water conservation will continue to be a key tool for the City to use in responding to population growth and associated potential increases in water demand. Water conservation programs need to be adaptable over time to target specific changes in residential and business/industrial water use behaviors and technologies, and to respond to changes in conditions and available incentives. Targeted conservations programs will moderate water use, delay the time when the City will need to develop new water supplies, and enable the City to implement the HCP.

2.2.5 Water Rights

The State Legislature enacted ORS 538.420 in 1909. This statute grants to the City "the exclusive rights to the use of waters of the Bull Run and Little Sandy Rivers." The City also has filed claims to pre-1909 water rights, with a priority date of 1886 on the Bull Run River and a priority date of 1892 on the Little Sandy River. The City currently diverts about 20 percent of the annual flow of the Bull Run River, but it has not made use of its water right on the Little Sandy River. The City and PGE are the only entities with water claims or rights on the Little Sandy River. PGE's pre-1909 water claim for diversion from the Little Sandy River will be converted to instream use when the Little Sandy Dam is decommissioned in 2008.

2.2.6 Land Ownership and Land Use Permits

The City owns about 5,000 acres of land in the Bull Run watershed, most of which is located around Reservoir 2 and downstream along the Bull Run River. Approximately 90 percent of the watershed is federally owned land administered by the Mt. Hood National Forest. Management of the national forest land is governed by a variety of federal forest management statutes, the Northwest Forest Plan, and the Bull Run Act (P.L. 95-200) enacted in 1977 and amended in 1996 and 2001.

The City holds multiple special-use permits and easements to allow operation of water system related facilities on federal land. The City and the USFS signed a new Bull Run Watershed Management Unit (BRMWU) Agreement in late 2007. The agreement outlines a framework for roles and responsibilities, provides a model for joint operations, and lays the groundwork for supplemental functional plans for managing the BRMWU.

As part of the partnership agreement, the City and USFS are considering a land exchange that would trade approximately 2,500 acres of City-owned land for comparable acres of federal land in the watershed. If this exchange is implemented, the ownership changes might require minor modification, and/or an amendment, of the HCP to incorporate new covered lands. The land exchange is not expected, however, to change the habitat conservation measures in the HCP or change the nature of activities that affect aquatic and riparian habitat. The amendment, if needed, would likely apply the existing measures to additional lands.

2.3 Need for the Incidental Take Permit (ITP)

Section 9 of the ESA prohibits the ‘‘taking’’ of listed species. NMFS may, however, issue permits to take federal listed species when such a taking is incidental to, and not the purpose of, otherwise lawful activities. As defined there, the term ‘‘take’’ means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct. The term can also include modification to the habitat of a listed species that results in the death or injury of that species, or the impairment of essential life functions. While the City does not intentionally "take" listed species, ongoing impacts of the water supply system can affect the habitat of these species.

The City is seeking an ITP from NMFS. Section 10(a)(1)(B) of the ESA, and regulations at 50 CFR 17.32, contain provisions that allow issuance of ITPs to nonfederal entities. To issue a permit, NMFS must determine that the following criteria are met:

1. The taking will be incidental to otherwise lawful activities.
2. The applicant will, to the maximum extent practicable, minimize and mitigate the impacts of such taking.
3. The applicant will develop an HCP and ensure that adequate funding for the HCP will be provided.
4. The taking will not appreciably reduce the likelihood of the survival and recovery of the species in the wild.
5. The applicant will comply with any other measures that NMFS may require as being necessary or appropriate.

The City's purposes in preparing this HCP are twofold: to comply with the ESA and to manage the Bull Run water supply system on a long-term basis. More specific goals and objectives toward achieving these purposes are described in Chapter 6. The habitat conservation measures in Chapter 7 (along with related monitoring and adaptive management measures in Chapter 9) describe the manner in which the City intends to meet the ITP issuance criteria.

2.4 Relationship to Other Laws and Regulations

The habitat conservation measures described in this HCP will be implemented in the context of several other federal laws and regulations. The most directly related of these is the Clean Water Act (CWA) requirement to manage water temperature in the Bull Run River to meet ODEQ standards and protect cold water fish. Appendix G provides the ODEQ approved Temperature Management Plan, which describes the ODEQ requirements and how the HCP water temperature measures will be used to also achieve CWA compliance.

The Bull Run water supply reservoirs are equipped with hydropower generation facilities under the authority of FERC. As mitigation required under the license, the City annually provides funding to ODFW to support hatchery production of spring Chinook salmon and winter steelhead. Production of hatchery salmon and steelhead helps ensure sport fishing opportunities in the lower Sandy River Basin, while the HCP is focused on improving habitat that will benefit naturally producing salmon and trout. The City's HCP measures are compatible with the City's FERC license and are not expected to require a FERC license amendment. Neither the City's FERC-regulated hydropower facilities in Bull Run nor the related funding for the ODFW hatchery facilities are included as covered in the HCP (see Chapter 3).

Some of the facilities and activities affected by the HCP are located on national forest land and subject to federal forest management laws, regulations, and permits, as described above (see Section 2.2.6, Land Ownership and Land Use Permits). Additional information about land management and regulation, especially on nonfederal land, is provided in Chapter 4.

A variety of other permits (federal, state and local) may be required as part of implementing the HCP. The City will obtain permits as needed and will work to ensure compatibility of the permit terms with the HCP.

2.5 Approach to Habitat Conservation Planning

This HCP represents a new and important milestone in the City's 100-year history of Bull Run watershed stewardship. Protecting species affected by the water supply system is a necessary extension of these stewardship responsibilities. The HCP provides a framework and a set of specific habitat conservation commitments that will guide the City's work for 50 years.

When developing the HCP, the City looked first at the habitat conservation measures that could be feasibly implemented in the Bull Run watershed while also continuing to operate the City's primary water supply. The Bull Run measures described in the HCP substantially improve conditions for fish in the lower Bull Run River. Some impacts in the Bull Run River could not feasibly be avoided, however, so the City also evaluated opportunities to improve conditions for ESA-listed fish in the larger Sandy River Basin. In selecting offsite measures, the City considered the impacts not fully mitigated in Bull Run, the regional importance of the Sandy River fish populations, and the limiting factors affecting productivity of those populations. The limiting factors analysis was derived from a basin-wide assessment of habitat conditions generated from empirical data, the judgment of field biologists familiar with the Sandy River, and application of the Ecosystem Diagnosis and Treatment (EDT) methodology used widely across the Columbia River Basin.

From the very early stages, the City also sought the participation of others involved in protecting and restoring fish populations in the Sandy River Basin. Since 1999, more than a dozen organizations have joined together as the Sandy River Basin Partners (Partners). The Partners played a key role in helping the City identify measures for the HCP that could complement and leverage the ongoing basin-wide restoration effort.

The City's habitat conservation planning approach is described in more detail below. The City is confident that this approach has helped to prepare an HCP that will meet Section 10 requirements for ITP coverage, will fully address the impacts of the Bull Run water supply system, and will be an important part of the partnership effort to protect and restore habitat conditions in the Sandy River.

2.5.1 Sharing the Bull Run River

Both people and fish depend on the Bull Run River. This HCP reflects the actions the City will take to protect and improve habitat for fish and other species, while also ensuring that the City can continue to use water from the Bull Run watershed for generations to come. Sharing the water to meet both needs is a key element of the HCP.

Because the water system is located on the Bull Run River, the HCP is focused on addressing the impacts of system operations on fish in this particular river. Chapter 8 describes in detail how the flow, temperature, and habitat measures will improve habitat and fish population conditions in the Bull Run River. The City's intent is to provide biological improvements commensurate with water system impacts.

Water system operations in the future will be different from those in the past. The City's obligation as a water supplier is to ensure that future changes will be both practical and feasible, and will allow for ongoing operation of the water system to meet customer needs. Clarifying the amount of water needed to meet ESA requirements in the HCP helps the City plan more effectively for water supply. Chapter 7 describes the individual measures the City will take to ensure that it meets both the regulatory and the water supply requirements. Defining the City's financial obligation for habitat conservation and species protection also helps the City plan for and manage the associated financial impacts to ratepayers.

The HCP was designed to retain tools to meet future demand for water without compromising the City's ability to provide instream flows for fish. Water conservation and groundwater use provide flexible and cost-effective means to meet increased human needs over time. These tools will also help the City deal with year-to-year weather variability.

The HCP does not include measures to provide fish passage into Bull Run River habitat above the dams. The City has concluded that the investment required to provide passage is too much when compared to the amount of habitat available above the Bull Run dams and the productivity that would result from access to that habitat. This conclusion is based on the EDT model analysis of the habitat available above the dams (Mobrand Biometrics 2005) and estimates of what would be required financially and operationally (Tappel 1998, CH2M Hill

2008a) to provide such passage. In lieu of fish passage, the HCP compensates for lost habitat in the Bull Run by implementing measures elsewhere in the Sandy Basin.

Sharing the Bull Run River with people means that impacts of the water system on fish are not entirely offset by the HCP measures for the Bull Run River alone. This HCP therefore includes habitat conservation measures that will be implemented elsewhere within the Sandy River Basin. These measures will enable the City to address the effects of the Bull Run water supply on ESA-listed fish species and provide a meaningful contribution to the eventual recovery of those species. Because the fish that use the Bull Run River are part of larger populations in the Sandy River Basin, it makes sense for the City to join in a larger effort to help restore habitat in the Sandy River and its tributaries.

2.5.2 Stewardship of the Sandy River Basin

The offsite measures described in Chapter 7 of the HCP were selected to provide improved habitat conditions for ESA-listed fish species in the larger Sandy River Basin. Three key factors in this analysis were the regional importance of protecting the Sandy River populations of fall Chinook, coho, and steelhead; the difficulty involved in supporting spring Chinook spawning in the Bull Run River; and the City's intent is to take action in locations the Partners have identified as important for sustaining native fish populations.

NMFS has concluded that only two potentially viable populations of native fall Chinook remain in the Lower Columbia River Ecologically Significant Unit (ESU). One of these populations persists in the Sandy River and one in the Lewis River (McElhany et al. 2003). For this reason, the City has included measures in the HCP to benefit the Sandy River population of fall Chinook.

The coho salmon population in the Sandy River Basin is one of only two known self-sustaining populations in the Lower Columbia River ESU (Iwamoto et. al. 2003). HCP measures in the Bull Run Watershed substantially minimize impacts of the water system on coho, but do not avoid all impacts on coho. Additional measures located in the Upper Sandy River, the lower Salmon River, and the Zigzag River are designed to improve habitat conditions for coho.

Photo courtesy of Char Corkran.

NMFS Willamette Lower Columbia Technical Recovery Team (WLCTRT) has classified the Sandy River winter steelhead run as a core population and stated that this run currently offers one of the most likely paths to recovery in the Lower Columbia Steelhead ESU (McElhany et al. 2003). HCP measures in the lower Bull Run River will greatly improve conditions for steelhead, but will not avoid all impacts associated with operating the water supply system. Additional HCP measures to benefit steelhead are located primarily in the upper Sandy River, the Salmon and Zigzag rivers, and smaller tributary streams that are favored by steelhead.

Providing favorable water temperatures for spring Chinook spawning emerged as an objective difficult, if not impossible, to achieve in the lower Bull Run River. Even natural (pre-dam and pre-water system) temperature conditions in the Bull Run River were too warm when spring Chinook are spawning in the late summer/early fall (ODEQ 2005). This limitation results from the east-west orientation of the watershed and the resulting exposure to summer sun. Warming that occurs in the reservoirs exacerbates this problem. The HCP includes measures in other Sandy River Basin locations (upper Sandy River near Salmon River confluence, lower Salmon River, and Zigzag River) targeted to benefit spring Chinook.

2.5.3 Solid Technical Foundation

The selection of Bull Run measures and offsite measures to include in the HCP was informed by a series of technical evaluations conducted jointly by the Partners and others between 1999 and 2006. Coordinated technical information at the basin scale provides a solid technical foundation for coordinated restoration throughout the habitat used by the Sandy River Basin fish populations.

The Partners' first step was to compile a habitat database for 120 stream reaches throughout the Sandy River Basin, including the Bull Run River. Data types (45 attributes) were selected based on EDT methodology. Most of these data already existed, but the data files were dispersed and had not been compiled into a comprehensive basin-wide analysis. The database is made up of recent stream survey data collected using standard methodology (Moore et al. 2002). Where data gaps existed, extrapolations were made by biologists familiar with the stream reaches in question. The Partners took the extra step of reconciling data from adjacent stream reaches for consistency and so whole tributaries could be evaluated. An EDT model, built on the habitat database, was used to assess the habitat factors limiting the productivity of fish populations. The Partners then used the limiting factors analysis results to identify 150 habitat conservation measures that could be implemented to strategically improve habitat conditions and fish population productivity.

The Partners, with others, also identified anchor habitats currently existing throughout the Sandy River Basin. Anchor habitats are defined as stream reaches that are currently providing the largest numbers of fish (productivity). The results of this analysis provided valuable information for development of the HCP, as well as for parallel work by other Partner organizations.

In addition, the Partners and affiliated organizations have developed a coordinated population monitoring program for adult and juvenile fish, and a conservation and restoration strategy based on project type and location. The habitat conservation and restoration strategy is a scientifically based approach to conserving streams currently in good condition and restoring impaired streams to improve fish habitat and salmonid populations in the Sandy River Basin. The strategy identifies priority locations and priority action types for the short-term (5-10 years) and a framework for long-term planning and implementation. The HCP is designed to be consistent with these basin-wide strategies.

2.5.4 A Partnership Approach

As noted above, the City has worked collaboratively with the Partners since 1999 to assess conditions and plan a strategic basin-wide approach for restoration in the Sandy River Basin. The Partners were also directly involved in identifying measures to include in the HCP. One of the HCP strategies was to use the City's investments in the HCP to complement and leverage the resources and capabilities of all the Partners.

Working relationships have been created and improved among the organizations and individuals involved in the Partners. These relationships provide an institutional framework to sustain a coordinated basin-wide recovery effort for the 50-year term of the HCP, if not longer. This framework helps increase the probability that the City's work implementing the HCP will proceed in the context of a coordinated effort by federal, state, and local agencies; nonprofit organizations; and a variety of private landowners and businesses. The ongoing participation of the Partners and the basin-wide restoration strategy developed by the Partners will help guide the direction of HCP implementation.

2.6 Effectiveness of the HCP

The HCP includes a diverse set of habitat conservation measures in multiple locations throughout the Sandy River Basin. Demonstrating the effectiveness of these measures in meeting ESA requirements is an important element of the HCP. To assist in the evaluation of effectiveness of the habitat conservation measures, the City has provided in the HCP a reference condition for each measure. These reference conditions are drawn from the technical foundation described above, and in the Bull Run River include a comparison to the conditions that existed in the Bull Run watershed prior to development of the City's water system in the late nineteenth century. The reference conditions are described in Chapter 8. In addition, the HCP draws on the capabilities of the EDT model to assess the overall effect of the HCP on the key parameters used to judge fish population performance, specifically the Viable Salmonid Population (VSP) metrics of productivity, diversity, abundance, and spatial structure (McElhany et al. 2003). The VSP analyses are also provided in Chapter 8. The City is confident that, when taken as a whole, the HCP conservation measures meet the requirements of the law and make a meaningful contribution to the basin-wide restoration effort described above.

2.7 Content of the HCP

This chapter has provided an introduction for the HCP, including background information on the Bull Run water system and the City's habitat conservation approach. Chapter 3 describes the species, lands, facilities, and activities for which the City seeks Section 10 coverage in an ITP. Chapter 4 provides contextual information about landscape conditions in the Sandy River Basin. Chapter 5 provides information about the current conditions for the covered species in the basin as well as the 18 other fish and wildlife species addressed in the HCP. Chapter 6 outlines the City's goals and objectives, and Chapter 7 defines the habitat conservation measures. Chapter 8 describes the outcomes expected for each of the species and is also referred to as the effects analysis. Chapter 9 describes the City's monitoring and adaptive management programs. Chapter 10 provides contingency plans for potential changed conditions during the term of the HCP. Chapter 11 describes the costs anticipated to implement the habitat conservation measures, as well as monitoring and adaptive management, and describes how those costs will be paid. Chapter 12 provides alternatives to implementing the HCP. A series of appendixes provide additional detail for some sections.