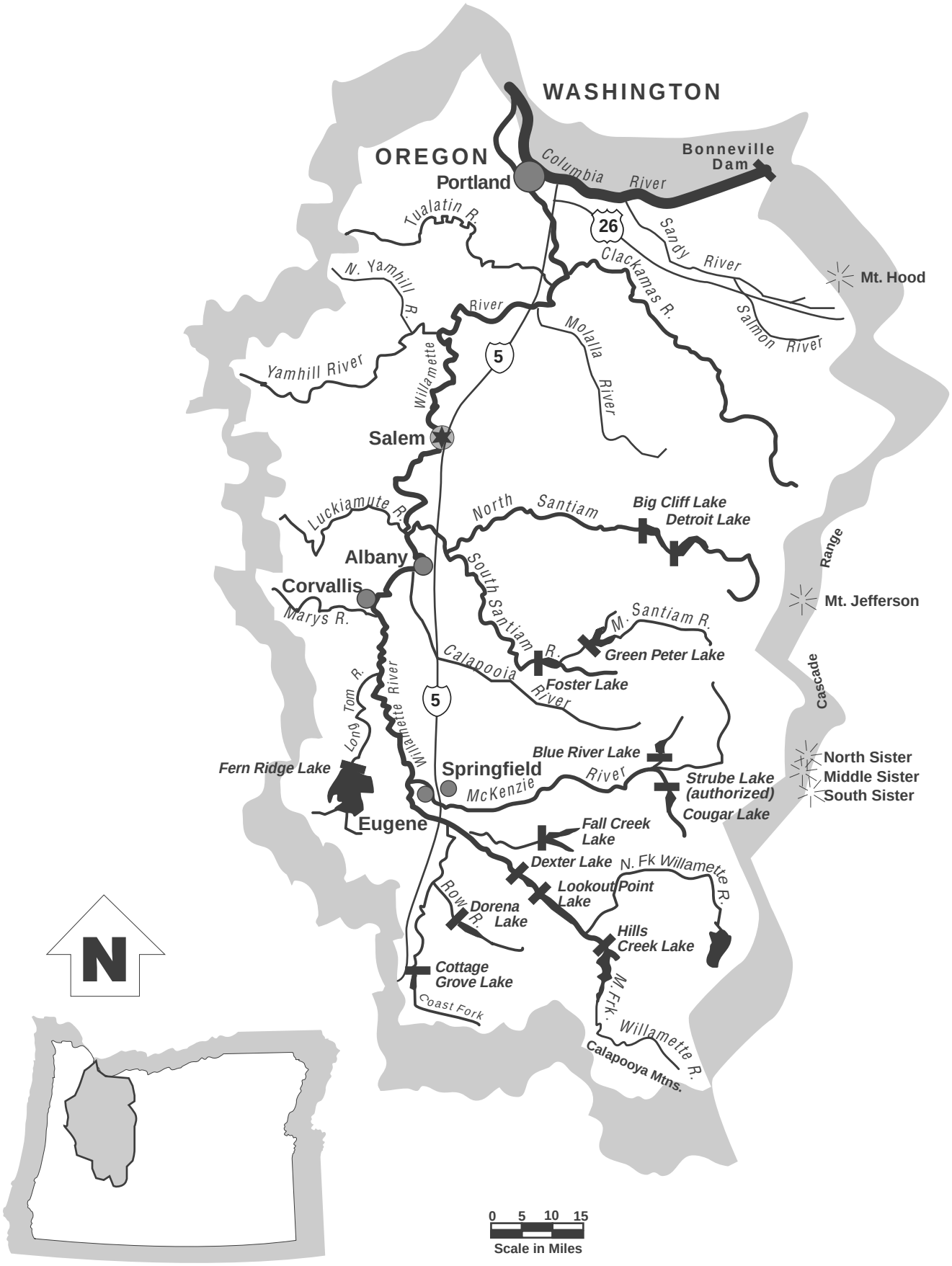
Willamette River Basin



Willamette River Basin

The Willamette River Basin lies between the Cascade and Coast mountain ranges in the northwestern part of Oregon. It is drained by the Willamette and Sandy rivers, which enter the lower Columbia River from the south. The basin is home to about two-thirds of Oregon's people, and includes the state's three largest cities — Portland, Eugene and Salem. The basin lies entirely in the Corps' Portland District.

The Willamette River Basin, an area of 11,200 square miles, is bounded on the east by the Cascade Range, on the south by the Calapooya Mountains, and on the west by the Coast Range. The Columbia River, from Bonneville Dam to St. Helens, forms its northern boundary. The basin is like a huge amphitheater, with the open end fronting on the Columbia. The Willamette Valley is an elongated lowland extending north-south, between the Cascade and Coast ranges. The Cascade Range has five peaks over 10,000 feet in elevation, and the Coast Range reaches to 4,000 feet. The general heights of these ranges, however, are about 5,000 and 2,000 feet. The Calapooya Mountains form a cross range that connects the two principal ranges. Elevations in the main valleys range from sea level along the Columbia to 450 feet in Eugene, near the head of the Willamette Valley, 120 miles to the south. The valley floor, as much as 30 miles wide and covering 3,500 square miles, is nearly level in many places, gently rolling in others, and broken by several groups of hills and scattered buttes.

The Willamette River forms at the confluence of its Coast and Middle forks, near Eugene. Its largest tributaries rise in the Cascade Range and enter from the east. Numerous smaller tributaries rise in the Coast Range and enter from the west. The Willamette River drains about 10,400 square miles, or about 93 percent of the basin. The Sandy River does not drain into the Willamette, but is culturally a part of the basin because it is close to Portland and important to the metropolitan area, especially for water supply and recreation. Annual runoff from the Willamette River Basin averages about 26 million acre feet, about 24 million carried by the Willamette River.

As the most populated area in Oregon, the Willamette River Basin is highly developed. Water supplies have been developed for municipal, industrial, domestic and agricultural use. The Willamette River is navigable for more than 100 miles upstream from its mouth. Numerous multipurpose dams have been constructed to control floods, generate power and provide water for navigation and irrigation. Resource problems of particular concern at present include flood damages, fish and wildlife conservation, water quality, municipal and industrial water supply and recreational opportunities.

Corps of Engineers development programs in the Willamette River Basin have been underway since the 1870s. Water resource development projects completed include 13 dams and many miles of levees and channels for flood protection. Flood plain information reports have been compiled for many areas in the basin.

Other multipurpose dam projects and flood control works have been authorized. Work on these projects is in various stages; some have not been started because funds have not been appropriated or other requirements have not been met.

Navigation work in the basin includes construction and maintenance of several waterways. The Willamette Falls Locks, originally built by private interests, were acquired by the U.S. Government in 1915 and have since been operated by the Corps. These navigation projects provide for both ocean-going and inland traffic. The lower Willamette River (Portland Harbor) provides adequate depths to serve ocean-going vessels. Further upstream, the Willamette carries shallow-draft river traffic. Multnomah Channel, near the mouth of the Willamette, also serves shallow-draft traffic.

Multipurpose Development

In 1938, the original congressional authorization for the basin's multipurpose projects provided for flood control, navigation, irrigation and power generation at projects where it could be economically installed. Navigation is improved by releasing water to increase depths in the navigable part of the Willamette River during late-summer low-flow periods. The dams are located far upstream from the navigable reach of the Willamette, and do not have navigation locks. Since 1950, additional projects have been authorized. It was recommended in the Willamette Basin Comprehensive Study, completed in 1971, that additional water resource needs — recreation, fish and wildlife enhancement, water quality control and municipal and industrial water supply — be served in addition to those purposes provided for in the original authorization.

Existing Projects

The Army Corps of Engineers has constructed 13 of the 17 construction projects originally authorized by Congress for the Willamette Basin: 10 multipurpose dam projects and three reregulating dams which smooth out discharges of water from hydroelectric power plants. Fern Ridge Dam and Lake, completed in 1941, was the first storage project, followed by Cottage Grove, Dorena, Detroit, Lookout Point, Hills Creek, Cougar, Green Peter, Fall Creek and Blue River. The three reregulating dams are Big Cliff, Foster and Dexter.

Four of the 17 authorized projects were never constructed. Cascadia, Gate Creek, and Holley Lakes were deauthorized by the Water Resources Development Act of 1986 (PL 99-662). The reregulating project for Strube Lake, located on the South Fork McKenzie River below Cougar Dam, included plans for construction of a dam, spillway, and power plant. The Strube Lake project will soon be eligible for deauthorization.

An example of the Corps' role in environmental protection and improvement in Oregon is the part Willamette River Basin multipurpose storage reservoirs have played in cleanup of the river. Badly polluted a number of years ago, the water quality of the Willamette River has been greatly improved over the last 25 years. Water stored in Corps reservoirs in the Willamette River Basin has played an important role in this improvement. Stored water released from reservoirs boosts streamflows far above natural levels during late summer months, when sluggish flows formerly contributed to high pollution levels near populated areas and to low oxygen levels in the lower reaches of the river, especially in Portland Harbor. This streamflow augmentation often raises flows to over twice what they would be under normal conditions. Improving water quality in the Willamette River Basin has improved fish habitat during the summer and fall season. Improvements to water quality has restored some fisheries and created new fisheries in the basin. However, the projects have caused some negative impacts primarily related to loss of fisheries habitat above the projects.

Improved fish passage facilities, higher late summer streamflows, and improved water quality have made it possible to establish a fall chinook run in the Willamette River. The program was established in 1967 and 2,692 fall chinook passed Willamette Falls in 1994.

Fern Ridge Lake

The Fern Ridge project, on the Long Tom River, is about 12 miles west of Eugene. The dam and reservoir have been in continuous operation since 1941. To provide for additional flood storage capacity, it was raised from 47 to 49 feet in 1965. The reservoir provides 110,000 acre-feet of usable flood control storage and controls runoff from a 275 square mile drainage area, including the Amazon Creek Basin.

The main dam consists of an earthfill embankment dam, a concrete gravity spillway near the left abutment with a non-overflow structure 46 feet long, containing outlet works, and an overflow structure, 248 feet long, controlled by six automatic gates. Two auxiliary dikes close off low areas along the northeast shore of the lake. The project also includes channel improvement on the Long Tom River downstream from the dam to the Willamette River. The authorized primary project purposes are flood control, navigation, and irrigation.

Since the project began operating in 1941, it has prevented an estimated $205 million in flood damages. Through September 1994, the total federal cost of the project was $26,851,400, which includes $8,685,600 for construction and $18,165,800 for operation and maintenance. The non-federal cost was $52,700. In 1994, a

maintenance contract was awarded and repairs were made in the discharge channel below the dam. Riprap was replaced on the adjacent bank.

At full pool, Fern Ridge Lake has 9,340 acres of water surface. It has become extremely popular with swimmers, boaters and other users, even though recreation was not originally an authorized primary project purpose. The multi-agency Willamette Basin Comprehensive Study, completed in 1971, included recommendations for modification of the project to permit fuller use of recreational potential without hindering irrigation and flood control uses. Fern Ridge is used heavily for picnicking, swimming, sailing, water skiing and fishing. The Corps operates Perkins Peninsula and Kirk parks. Richardson, Orchard Point, and Zumwalt parks are managed by the Lane County Parks Department under lease agreements. Fern Ridge Shores is a private park which provides day-use and camping facilities, and boot moorage. In 1994, about 862,000 recreation visits were made to Fern Ridge.

The Oregon Department of Fish and Wildlife manages 5,000 acres of land and water for migratory waterfowl under a lease agreement. A special continuing authority contained in Section 1135 of the Water Resources Development Act of 1986, as amended, allows modifications to structures and operations of constructed Corps projects to improve the quality of the environment. Fern Ridge, Long Tom River, and Fisher Butte waterfowl impoundments were initiated in July 1993. The three impoundments restored 115 acres of project lands on the east shore of Fern Ridge Lake to a more natural condition for waterfowl management. Construction included levees, ditches and overflow spillways, as well as installation of an irrigation water supply pump, a water supply pipeline, and drainage culverts with positive closure gates. The modification project was constructed under a cooperative agreement with the Bureau of Land Management and was completed on May 6, 1994. The non-federal sponsor is the Oregon Department of Fish and Wildlife. Total modification costs, including all planning, design, and construction was $210,664, of which $157,998 is federal and $52,666 is non-federal.

Cottage Grove Lake

The Cottage Grove project, completed in 1942, is about six miles south of the city of Cottage Grove. It controls runoff from a 104-square-mile area drained by the Coast Fork Willamette River. The earthfill and concrete dam, 95 feet high, impounds 33,000 acre-feet of water at full pool. The authorized primary project purpose is flood control, but other uses include irrigation, recreation, and improved navigation downstream.

Through September 1994, the total cost of the project was $17,216,000 — $4,013,100 for construction and $13,202,900 for operation and maintenance. Since the project began operating in 1942, it has prevented an estimated $530 million in flood damages.

The Cottage Grove Lake surface is 1,115 acres at full pool. The lake and its shoreline are used for boating, swimming, picnicking, camping, fishing and hunting. Visitors may camp at Pine Meadows Campground, a 92-unit campground on the west side of the lake, or at the Primitive Campground which has 18 campsites. Three day-use parks, Wilson Creek, Lakeside and Shortridge, provide for activities such as swimming, picnicking, fishing and water skiing. In 1994, more than 516,800 recreation visits were made to the Cottage Grove project.

Dorena Lake

Dorena Dam, on the Row River, is about six miles east of Cottage Grove. The project, completed in 1949, provides 77,600 acre-feet of storage at full pool level and controls runoff from 265 square miles of drainage area. The lake surface is 1,885 acres at full pool.

Dorena Dam controls the Row River and reduces flood stages downstream on the Willamette. Dorena Dam is a 145-foot-high earthfill and concrete structure with spillway and outlet works near the right abutment. Authorized primary project purposes are flood control, navigation improvement and irrigation.

Through September 1994, the total cost of the project was $23,090,500 — $14,568,300 for construction and $8,522,200 for operation and maintenance. Since the project began operating in 1949, it has prevented over $1.6 billion in flood damages.

Recreation areas have been developed by the Corps and Lane County at Dorena Lake. Water skiing, boating and swimming are popular activities. Harms and Baker Bay parks, operated by Lane County, have facilities for picnicking and boat launching, and Baker Bay has a camping area. Schwarz Park, operated by the Corps just downstream from the dam, is a minimally-developed campground with river access. Bake-Stewart and Vaughn day-use areas are operated by Lane County. In 1994, about 438,900 recreation visits were made to the Dorena project.

Lookout Point and Dexter Lakes

The Lookout Point-Dexter project, completed in 1955, is on the Middle Fork Willamette River about 22 miles southeast of Eugene. Both dams are embankments, with concrete spillways and powerhouses near the right abutments. The two-dam project controls runoff from about 1,000 square miles. Authorized primary project purposes are flood control, navigation improvement, irrigation and power generation.

Lookout Point Dam is one of the key projects in the Willamette Basin multipurpose-storage program because of its strategic location at the upper end of the Willamette Valley. In conjunction with Fall Creek and Hills Creek dams, it controls runoff of the Middle Fork Willamette River and contributes to flood-stage reduction downstream on the Willamette River. Lookout Point Dam is 258 feet high and impounds 456,000 acre-feet of water at full pool level. Just downstream of Lookout Point is Dexter Dam. Dexter Dam is 107 feet high and impounds a small reservoir, 27,500 acre-feet of water at full pool. It is used as a reregulating dam to smooth out water releases made from power generation at Lookout Point.

Lookout Point powerhouse has three generators with a total installed capacity of 120,000 kilowatts. Dexter powerhouse has a capacity of 15,000 kilowatts. The two dams generated 240,282,000 kilowatt-hours of power in 1994. Revenues of $3,319,300 from sales of electric power were deposited in the United States Treasury in fiscal year 1994. Through September 1994, the total cost of the project was $147,547,000 — $88,238,400 for construction and $59,308,600 for operation and maintenance. Since the project began operating in 1954, it has prevented almost $2.4 billion in flood damages.

As mitigation for project-caused loss of salmon spawning and rearing areas, the Corps of Engineers built Oakridge Hatchery and Dexter holding ponds. They are operated by the Oregon Department of Fish and Wildlife. Operating funds are provided by the federal government and the state of Oregon.

Most project recreation activity is at Dexter Lake, which is more accessible than Lookout Point Lake. At full pool, Dexter has 1,030 acres of water and Lookout Point has 4,250 acres. Water skiing and picnicking are especially popular at the project, with opportunities for swimming, boating, fishing and camping also available. Four recreation areas – Dexter Park and Lowell Park on Dexter Lake, and Landax Park and Ivan Oakes Park on Lookout Point Lake – are administered by Lane County. Near the Lookout Point Dam, the Corps operates the North Shore boat ramp.

Hampton and Black Canyon campgrounds, at the upper end of Lookout Point Lake, are managed by the U.S. Forest Service. In 1994, about 407,500 recreation visits were made to Lookout Point-Dexter project areas.

Hills Creek Lake

Hills Creek Dam, completed in 1961, is on the Middle Fork Willamette River about 45 miles southeast of Eugene. It is operated as a unit with Lookout Point Dam downstream, for the authorized primary purposes of flood control, power generation, irrigation and navigation improvement. The embankment dam is 338 feet high with a chute spillway in the right abutment. The regulating outlet and powerhouse penstock are connected to an intake tower near the dam. The reservoir controls runoff of a 390-square-mile drainage area. At full pool level, Hills Creek Lake has a surface of 2,850 acres, impounding 356,000 acre-feet.

The powerhouse has two 15,000 kilowatt generators. In 1994, power generated at the project and delivered to the Bonneville Power Administration was 76,701,000 kilowatt-hours.

Through September 1994, the total cost of the project was $57,753,100 — $45,700,600 for construction and $12,052,500 for operation and maintenance. Since the project began operating in 1961, it has prevented almost $1.5 billion in flood damages. Revenues of $858,700 from the sale of electric power were deposited in the U.S. Treasury in fiscal year 1994.

The Hills Creek Lake project lies within the Willamette National Forest. Recreation facilities at Hills Creek Lake are managed by the U.S. Forest Service. Visitors can enjoy picnicking and other recreational activities at Cline-Clark picnic ground, C.T. Beach picnic ground, Bingham boat ramp, Sand Prairie Campground and Packard Creek Campground. Sand Prairie and Packard Creek have RV camps without utilities, in addition to their regular campsites. The Packard Creek campsite hosts a swimming beach. In 1994, about 18,700 recreation visits were made to Hills Creek project areas operated by the Corps near the dam's abutments and downstream of the dam.

Fall Creek Lake

Fall Creek Dam is on Fall Creek, about 20 miles southeast of Eugene. Fall Creek is a tributary of the Middle Fork Willamette River and enters that stream several miles below Dexter Dam. Fall Creek Dam is operated in conjunction with Lookout Point and Hills Creek dams to control the Middle Fork Willamette River. Construction of the project was completed in 1966.

Fall Creek Lake provides 115,100 acre-feet of storage and controls runoff from 184 square miles of drainage area. The lake's surface area is 1,760 acres at full pool.

The dam is a 193-foot-high embankment, with the spillway in the left abutment and outlet works near the right abutment. Fish collection facilities are provided. Chinook salmon collected at Fall Creek are transported to state hatcheries. Steelhead migrating upstream are collected and transported past the dam in tank trucks. Fall Creek Lake is used as a rearing pool for chinook salmon. Fingerlings migrate downstream through a collection system and bypass conduit at the dam. Authorized primary project purposes for Fall Creek are flood control, navigation improvement and irrigation.

An interim feasibility study for adding power generation to Fall Creek was approved by the Board of Engineers for Rivers and Harbors and forwarded to the Office, Chief of Engineers in July 1984. The recommended plan is for construction of two turbine/generating units, with installed capacity of 9.8 megawatts. The hydropower plan is awaiting a non-federal sponsor. Existing operations of Fall Creek would not change.

Through September 1994, the total cost of the project was $29,883,500 — $22,118,300 for construction and $7,765,200 for operation and maintenance. Since operations began in 1965, an estimated $1.18 billion in flood damages have been prevented.

Day-use recreation facilities for boating, water skiing, fishing, swimming, and picnicking are provided at two sites managed by the Lane County Parks Department – Winberry Creek Park and North Shore Park. Swimming, boating, and

camping are available at Cascara Campground and Fisherman's Point Campground, operated by the Corps. SKY Camp, an outdoor youth education and recreation facility dedicated in 1978, was developed in cooperation with the Bethel School District and the Springfield Kiwanis Club. About 240,900 recreation visits were made to Fall Creek project areas in 1994.

Cougar Lake

Cougar Dam, on the South Fork McKenzie River about 42 miles east of Eugene, began providing flood control in 1963, and downstream navigation improvement and power generation in 1964. Primary project purposes are flood control, navigation, irrigation and power generation. Below Cougar Lake, construction is authorized for a reregulating dam, Strube Lake, which would permit Cougar to operate as a peaking powerplant.

Cougar Lake has a storage capacity of 219,000 acre-feet and controls runoff from an area of 208 square miles. The lake's surface area is 1,235 acres at full pool. The dam rises 445 feet above the streambed.

The Cougar powerplant has a 25,000 kilowatt generating capacity. In 1994, 113,469,000 kilowatt hours of power were generated and delivered to the Bonneville Power Administration. Through September 1994, total cost of the project was $75,885,900 — $58,636,400 for construction and $17,249,500 for operation and maintenance. Since beginning operation in 1963, the project has prevented an estimated $217 million in flood damages. Revenues of $1,025,900 from electrical power sales were deposited in the U.S. Treasury in fiscal year 1994.

McKenzie Hatchery was built near Leaburg on the McKenzie River as mitigation for loss of salmon and steelhead spawning grounds caused by construction of Cougar and Blue River dams. In a joint effort, the Corps of Engineers is financing the cost of restoring the fish runs to their former size and the Oregon Department of Fish and Wildlife pays for facilities to boost runs above natural numbers.

The project's recreation facilities, all within the Willamette National Forest, are managed by the U.S. Forest Service. Slide Creek and West Bridge campgrounds offer picnicking, boat launching and camping. Echo Park has picnic and boat launch facilities. Delta Campground, two miles downstream of the dam, and French Pete Campground, two miles above the upper end of Cougar Lake, are other nearby Forest Service campgrounds.

About 84,900 recreation visits were made in 1994 to Corps-operated Cougar project areas downstream of the dam and on both abutments.

Blue River Lake

Blue River Dam is on Blue River, a tributary of the McKenzie River, about 40 miles east of Eugene. Construction was completed in 1969. Flood control operation started during the winter of 1968-69. The dam is a 320-foot-high embankment with spillway and outlets in the left abutment. A 70-foot embankment dam (Saddle Dam) about four miles from the main dam closes off a low saddle between the Blue River and McKenzie River watersheds. Authorized primary project purposes are flood control, irrigation and downstream navigation improvements. The reservoir provides 85,000 acre-feet of storage and controls runoff from an 88-square-mile drainage area. At full pool, the lake's surface area is 940 acres.

A final feasibility report for adding power to Blue River Dam was approved by the Board of Engineers for Rivers and Harbors in 1982 and forwarded to the Secretary of the Army in August 1983 by the Chief of Engineers. The recommended plan, which was authorized by PL 99-662, is for construction of two turbine/generator units with installed capacity of 29 megawatts. Eugene Water and Electric Board (EWEB) was granted a FERC license in November 1989 to install two small hydropower units at Blue River Lake project. EWEB has delayed their plans for hydropower units pending the conclusion of a Corps proposal to add water temperature control to the regulating outlet tower. An Environmental Impact Statement (EIS) has been completed and is out for review.

Through September 1994, the total cost of the project was $35,562,900 — $32,038,200 for construction and $3,524,700 for operation and maintenance. Since the project began operation in 1968, it has prevented over $124 million in flood damages.

Blue River Lake is operated in conjunction with Cougar Lake to control the McKenzie River and the Willamette River downstream.

Blue River Lake is in the Willamette National Forest and recreation areas at the lake are managed by the U.S. Forest Service. Overnight camping is available at Mona Campground and boat launching facilities are provided at Lookout Creek ramp. Fishing, swimming and water skiing also are available at the two recreation areas, both near the upper end of the lake. In 1994, about 53,000 recreation visits were made to Blue River project areas operated by the Corps.

Detroit and Big Cliff Lakes

The project consists of Detroit Dam, the principal facility, and Big Cliff Dam, a smaller reregulating dam about three miles downstream from Detroit. These reservoirs store waters of the North Santiam River, controlling runoff from about 438 square miles of drainage area. The project is located about 45 miles southeast of Salem. The authorized primary project purposes are flood control, irrigation, downstream navigation improvement and power generation Detroit Lake provides 455,000 acre-feet of storage capacity. Big Cliff, a reregulating dam and small reservoir, is used to smooth out the power generation water releases at Detroit. The reregulating operation controls downstream river level fluctuations.

The North Santiam canyon is rocky, narrow and steep at the dam sites. That is why Detroit and Big Cliff are concrete dams, rather than earth and rockfill embankments like most Corps dams in the Willamette Basin. Detroit Dam rises 454 feet above streambed and has a 100,000-kilowatt powerhouse. Big Cliff is 191 feet high and has an 18,000-kilowatt powerhouse.

The two generators at Detroit were put in service in 1953, the Big Cliff unit the following year. During 1994, power generated at the two dams and delivered to the Bonneville Power Administration was 343,829,000 kilowatt-hours.

To mitigate for loss of salmon-spawning areas upstream from the project, the Marion Forks Hatchery and Minto Holding Pond were built by the Corps in 1950. Both facilities are operated by the Oregon Department of Fish and Wildlife.

Through September 1994, total cost of the project was $100,030,000 — $62,729,700 for construction, $36,937,200 for operation and maintenance, and $363,100 for rehabilitation. Since the project began operating in 1953, it has prevented an estimated $345 million in flood damages. Revenues of $2,338,300 from the sale of electricity were deposited in the U.S. Treasury in fiscal year 1994.

Detroit Lake is a popular recreation area. At full pool, 3,600 acres of reservoir are available for water skiing, swimming and fishing. The Oregon State Parks Department operates two parks which include picnicking, swimming and boat launching facilities. Mongold is a day-use area, whereas the Detroit Lake State Park has campsites and RV camps. The U.S. Forest Service runs three campgrounds: Piety Boat Camp, Hoover campground and South Shore campground. Private moorage facilities are available in the town of Detroit. In 1994, about 33,300 people visited the Detroit powerhouse and other Corps-operated projects.

Green Peter and Foster Lakes

This project consists of Green Peter and Foster dams. Green Peter Dam, a concrete structure, is on the Middle Santiam River. Foster Dam, an embankment, is at the confluence of the South Santiam and Middle Santiam rivers. Authorized primary project purposes are flood control, downstream navigation improvement, irrigation and power generation.

Green Peter Dam is 385 feet high and provides 428,100 acre-feet of usable storage. The project controls runoff from 227 square miles of drainage area.

Foster Dam is 146 feet high and provides 61,000 acre-feet of storage. In addition, it reregulates water releases made from Green Peter for power generation.

The power generators at the two dams are operated differently. At Green Peter, the 80,000-kilowatt plant is run during periods of peak power demand. With that operation, large water-level fluctuations occur in a short stretch of the Middle Santiam River. Foster Lake absorbs those fluctuations, then the water is released evenly through the Foster powerplant. The 20,000–kilowatt powerplant at Foster is run about 80 percent of the time, thereby adding to the base (continuous) power supply. Green Peter powerplant operates about 40 percent of the time, providing valuable peaking capacity. During 1994, 256,892,000 kilowatt-hours of power were generated and delivered to the Bonneville Power Administration.

Provisions for fisheries at the two projects include facilities to pass migrating salmon and steelhead fish upstream and downstream, and stocking lakes with resident fish. When the project was completed in 1968, the Oregon Department of Fish and Wildlife's South Santiam Hatchery was relocated and expanded to provide mitigation for loss of spawning grounds. Capacity of the Leaburg Hatchery was increased to provide additional resident fish required for stocking.

Through September 1994, the total cost of the two-dam project was $120,298,300 — $84,005,800 for construction and $36,292,500 for operation and maintenance. Since the project began operating in 1966, it has prevented an estimated $218 million in flood damages. Revenues of $3,033,000 for sale of electricity were deposited in the U.S. Treasury in fiscal year 1994.

Recreation areas at Green Peter Lake include Whitcomb Creek Park and Thistle Creek boat ramp, administered by Linn County Parks and Recreation Commission. Public recreation areas at Foster Lake include Sunnyside Park, Lewis Creek Park and Gedney Creek boat ramp, administered by the county parks commission; and Andrew S. Wiley Park and Shea Point, operated by the Corps. Facilities for camping, picnicking and boating have been built at both lakes.

The two lakes provide more than 4,800 acres of water surface, three-fourths of it at Green Peter. Opportunities for fishing, boating, water skiing, camping and picnicking are available. The old Quartzville mining district above Green Peter Lake is a nearby attraction. In 1994, about 1,113,100 recreation visits were made to the Green Peter-Foster project areas.

Authorized Project

Of the 14 projects presently authorized by Congress in the Willamette Basin, one has not been constructed. This project is Strube Lake, located on the South Fork McKenzie River below Cougar Dam.

Strube Lake

Strube Dam remains authorized for construction on the South Fork McKenzie River, about two miles downstream from Cougar Dam. The dam would be an 80-foot-high embankment with a gate-controlled, concrete-chute spillway and a 4,600-kilowatt powerplant. Strube Lake would smooth out water discharged from the Cougar powerhouse. This would permit Cougar to be operated as a peaking plant with 35,000 kilowatts of new capacity in addition to its present 25,000 kilowatts. Estimated cost of the Strube project is $114 million (1994). Benefits of this new development would be from additional electricity produced. Preconstruction engineering and design have been completed; but no funds have been expended on this project for many years and there are no plans to do so. The project will soon be eligible for deauthorization.

Current and Recent Studies

Willamette River Basin Review

A reconnaissance report completed in June 1991 investigated a number of water resources problems and opportunities for the Willamette River Basin. Water uses, needs, and public expectations have changed since the reservoir system was originally authorized over 40 years ago. Because the Willamette Valley is heavily populated and one of the fastest growing regions in the state, the demands placed on Corps reservoirs for municipal and industrial water supply, irrigation, and recreation will increase in the future. State and public concerns and management objectives for the projects are diverse and sometimes conflicting. A major finding of the reconnaissance report was that modifications to the operation and storage allocation of the existing Corps reservoirs to reflect changed conditions in the basin could result in a net economic benefit to the nation.

Willamette River Temperature Control

For many years, state and federal resource agencies including the Northwest Power Planning Council have been seeking modification of water temperatures downstream from two reservoirs, Blue River and Cougar lakes.

Replicating preproject temperatures could achieve more beneficial conditions for anadromous fish. Current work leading to a feasibility report and Environmental Impact Statement (EIS) for modifying the Corps' projects in the McKenzie subbasin for temperature control improvements is underway.

South Santiam Fishery Restoration

A reconnaissance study is in progress to determine if there is federal interest in reestablishing anadromous fish runs on the South Santiam River above the Corps' Foster and Green Peter projects. The study is evaluating alternatives for both adult and juvenile winter steelhead and Willamette spring chinook salmon passage. Reestablishing wild runs of these species is a high priority of the state of Oregon. These species were historically present in the South Santiam River before federal projects were constructed in the late 1960s.

Flood Control Development

Four single-purpose flood control projects have been authorized for construction by the Corps of Engineers in the Willamette River Basin. Work has been done on three projects. The fourth, Johnson Creek, is in inactive status pending local cooperation.

Existing Projects

Willamette River Basin Bank Protection

The Willamette River Basin Bank Protection program protects agricultural lands as well as urban and suburban areas from erosion damage. Bank erosion results in the loss of farmland and threatens roads, bridges, utility lines and other improvements. Erosion also opens overflow channels. These new channels threaten property and isolate developed areas from their normal access routes, requiring

construction of new roads and bridges. Authorized by the Flood Control Acts of 1936, 1938, and 1950, the Willamette River Basin Bank Protection program assists with erosion problems in the region. It covers bank protection and channel clearing works along the Willamette River from New Era upstream to the dams and along major tributaries which include the Clackamas River, Tualatin River, Mollala River, Santiam River, Marys River, Muddy Creek, and the McKenzie River in Oregon.

Investigations are initiated at the request of a non-federal sponsor who is willing and able to cost share 25 percent of the project implementation costs. Total federal cost of the project is estimated to be $30,700,000 (1994). As of September 1994, the project was 96 percent complete with 489,795 linear feet of protection in place at 230 locations. The project includes riverbank revetments, pile and timber bulkheads, drift barriers, minor channel improvements, and maintenance of existing works for control of floods and prevention of riverbank erosion at various locations. Costs through September 1994 were $24,853,300 for construction and $4,041,900 for maintenance. An additional $93,733 has been expended for new construction by local governments. Through September 1994, bank protection works had prevented over $62 million in flood damages.

Willamette Basin Channel Improvements

Channel improvements for flood control and major drainage improvements on 16 tributaries of the Willamette River were authorized by the Flood Control Act of 1950. In several areas, local interests have accomplished improvements essentially in accordance with the preliminary plans made by the Corps. That work was done with assistance of the Production and Marketing Administration (now the Commodity Stabilization Service), U.S. Department of Agriculture. Those improvements have stimulated installation of tile drainage.

One project has been classified inactive at Beaver Creek. Five others — Turner Prairie, Bear Creek, Calapooia River, Shelton Ditch and Ferguson Creek — have been deauthorized.

Amazon Creek Channel Improvements

The project provides about 5.4 miles of channel improvements through the city of Eugene including a 1.1-mile-long concrete-lined channel, a 2.5-mile-long improved channel from Eugene to a diversion structure and a 3.8-mile-long canal from the diversion structure to Fern Ridge Lake. The project reduces flood damages in and near Eugene.

The project was authorized by the Flood Control Act of 1946 and modified by the acts of 1950 and 1954. Construction began in 1951 and was completed in 1959. Total federal cost of the project was $1,214,300. The city of Eugene contributed $89,000. In addition, the city of Eugene paid $66,000 for construction work outside the scope of the authorized project, including extension of the concrete channel about 700 feet upstream from the end of the federal project. The total project cost was $1,369,300, not including

the cost of rights-of-way and utility relocations. Since completion of the project in 1959, it has prevented an estimated $7.5 million in flood damages.

Authorized Project

Johnson Creek in and near Portland

Flooding during heavy rains is a frequent problem along Johnson Creek. Flood control improvements in Gresham, southeast Portland, Milwaukie and other parts of Multnomah County were authorized by the Flood Control Act of 1950. The authorization provides for channel improvements and bank protection at various locations between the creek's mouth in Milwaukie and the vicinity of Southeast Park Drive in Gresham.

Advanced engineering and design for the reach from the mouth to 158th Avenue was completed in 1958, but construction was not started due to lack of local sponsorship. The project was reclassified as inactive in 1966. In 1971, the Metropolitan Service District (MSD) agreed to sponsor the project and furnish preliminary assurances of local cooperation.

Since completion of the 1958 design memorandum, significant changes had occurred in the Johnson Creek basin. A restudy was undertaken. Results of the restudy showed channel improvements from the mouth of Johnson Creek to 158th Avenue were economically justified, but no project could be justified in the Gresham area.

In November 1979, MSD initiated the formation of a Local Improvement District (LID) to provide funds for non-federal costs of the Johnson Creek project. Advanced engineering and design studies began in 1980. In July 1980, MSD postponed action on the assessment ordinance for the project pending resolution of problems associated with LID boundaries. Economic and hydrology studies are complete.

MSD was unable to develop a cooperation agreement with the municipalities involved in the 1980 Johnson Creek studies, and consequently the project was never completed.

In 1988, the city of Portland became the sponsor of the project and a study was initiated to determine the feasibility of solving the flooding problems on Johnson Creek. The sponsor withdrew support and the study was terminated. This project has been recommended for deauthorization.

Continuing Authorities for Flood Control

Work has been accomplished at many locations in the Willamette River Basin under various special authorities for projects of limited scope. The special authorities are described in detail in the introductory chapter.

Sandy River at Troutdale

The continuing authority contained in Section 14 of the 1946 Flood Control Act, as amended, allows construction of emergency bank protection to prevent flood damage to public works. The authorized project is located within the Troutdale city limits on the left bank of the Sandy River between the Interstate Highway 84 bridge and the Union Pacific Railroad bridge, about 11 miles east of Portland, Oregon. The project consists of construction of 600 feet of embankment fill and revetment stone to stabilize the bank to protect both the Interstate Highway 84 bridge abutment and the City of Troutdale sewage treatment ponds.

Construction was completed in October 1993. Total project cost was $431,230, of which $323,422 is federal and $107,808 is non-federal. The non-federal sponsor, the city of Troutdale, participated financially in accordance with the cost sharing requirements of the Water Resources Development Act of 1986, Public Law 99-662 through a cash contribution of $98,313 and by providing lands, easements and rights of way, relocations and disposal areas valued at $9,495.

Current Study

Amazon Creek

A reconnaissance study for project modification for improvement of the environment, conducted under Section 1135 of the Water Resources Development Act of 1986, explores the potential for restoring about 500 acres of wetlands that were significantly altered by flood damage reduction projects along Amazon Creek. Restoring wetlands to Willamette Valley wet prairie conditions would improve fish and wildlife habitat and other wetland functions and values.

Navigation Development

Navigation developments authorized or constructed within the Willamette River Basin include Willamette Falls Locks, the Willamette River channel upstream from Portland, the deep-draft channel in Portland Harbor and Multnomah Channel. The last two projects are discussed in the Lower Columbia River Basin chapter due to their close relationship to navigation works in that basin.

Existing Projects

Willamette River above Portland and Yamhill River

The project, authorized in 1896 and later modified, provides for navigation in the Willamette River from Portland (river mile 14) to Eugene (river mile 185), and in the Yamhill River. At present, dredging of the channel in the Willamette River is only required in the vicinity of the mouth of the Clackamas River below Oregon City. Authorized snagging and clearing in the Willamette River between Harrisburg and Eugene were determined to be not economically justified and no work has been done. On the Yamhill River, a dam and lock at Lafayette, built in 1898-1900, provided the 18-mile channel to McMinnville. Operation of the lock was discontinued in 1954 because commercial traffic was lacking. The lock and adjacent property were turned over to Yamhill County in 1959 for a park. At West Linn (river mile 27), the Willamette Falls Locks provide passage around the falls.

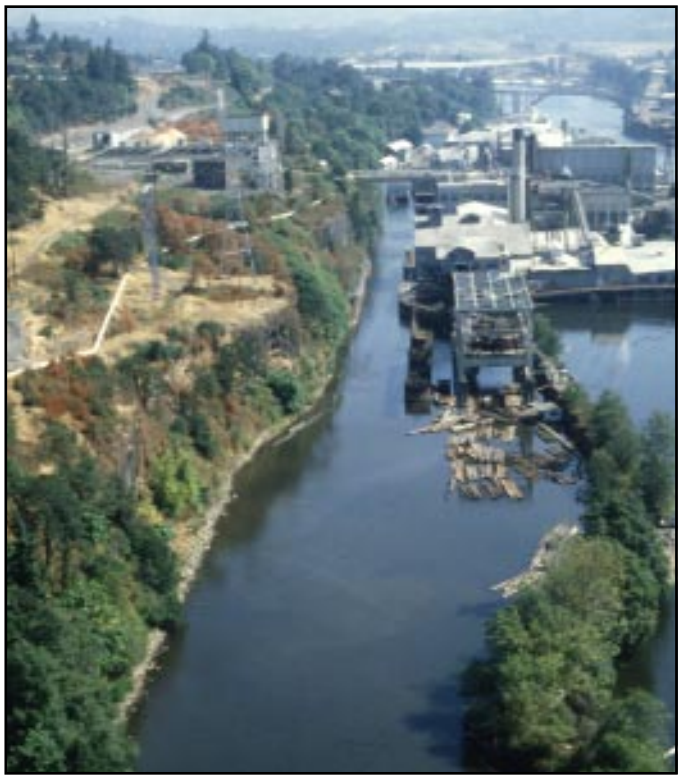
Local interests constructed a channel 20 feet deep and 200 feet wide to Lake Oswego (river mile 21) in 1962. A channel with a depth of eight feet and width of 200 feet is

maintained from Lake Oswego to Cedar Island (river mile 23), and a 150-foot width from there to Oregon City. Commercial gravel operations have provided most of the channel maintenance from Portland to Oregon City. From Oregon City to Corvallis, the project provides for a channel to be maintained at 2.5 to 3.5 feet deep and 100 or more feet wide. Additional depth is provided by stream flow augmentation. Due to minimal commercial navigation, regular dredging activities were terminated in the reach above Newberg (river mile 50) in 1973. Only periodic removal of snags has been accomplished since then.

Total cost of the project through September 1994 was $18,763,200 (excluding $485,000 from flood control funds for bank protection). Of that, $862,900 was for construction and $17,900,300 for operation and maintenance. Waterborne traffic in 1994 was 1,481,000 tons. The average annual traffic for the 5-year period 1990-1994 was 1,620,600 tons.

Willamette River at Willamette Falls

The locks and dam at Willamette Falls, a rocky reef in the Willamette River at Oregon City, Oregon, were completed in 1873 by private interests. The locks were purchased by the U.S. government in 1915 for $375,000. The dam along the crest of the falls remains the property of private interests. The locks completed 100 years of successful operation in 1973. Their historical value has been recognized by the National Park Service, which placed them in its Register of Historic Places in 1974. The project was established as an Oregon Civil Engineering Landmark in 1991.



The project includes four locks, a canal basin, and an extra guard lock used to prevent flooding when river levels are high. The system acts as a fluid staircase between the upper and lower reaches of the Willamette River. Each of the four locks is 175 feet long and 37 feet wide. Total lift is 50 feet. The total length of the canal and locks is 3,500 feet. Controlling depth over the sills is six feet.

Until the 1940s, the gates were opened manually. Now, the gates are operated by hydraulic pumps controlled by switches in two control stations with the aid of closed-circuit television and radio communication. All the gates have been replaced under minor rehabilitation funds. Existing locks and grounds are in good condition and in continuous operation. Through September 1994, the total federal costs were $520,000 for construction, $234,800 for rehabilitation, and $20,287,200 for operation and maintenance. In addition, $300,000 was contributed by non-federal interests.

There are more than 9,000 lockages in an average year. Major volume cargoes are sand and gravel, used as construction materials; and pulp and paper materials.