

reservoirs is predominantly comprised of younger Eocene to older Oligocene volcanic lava flows, Oligocene volcanoclastic rocks, and Quaternary volcanoclastic deposits. Alpine glacial deposits overlay older bedrock but underlay the younger Quaternary volcanoclastic deposits. The volcanic rocks have undergone regional compressional deformation; rock strata are folded by a major southeast plunging anticline and a southeast plunging syncline.

Soils in the basin are predominantly well drained and medium-textured, and were derived from volcanic ash or were formed in sediments derived from mixed volcanic rocks and ash. Slopes, which are variable from gentle to steep, range from flat to more than 70 percent. Soil erosion hazard is dependent on slope and vegetation cover; the erosion hazard increases with increasing slope and extent of bare soil.

The climate in the North Fork Lewis River basin is influenced by the Pacific Ocean to the west and the Cascade Range to the east. The Pacific Ocean provides a moderating influence on temperatures in the basin. Storms from the Pacific encounter the Cascade Range, forcing the air masses to rise, cool, and drop large volumes of precipitation. Levels of precipitation increase with elevation in this area. Average annual precipitation varies from 45 inches near Woodland, to over 140 inches on Mount Adams. The majority of the precipitation occurs during the rainy fall and winter months, with snow falling at higher elevations of the basin. Summers (July through mid-October) are generally drier.

The majority of the North Fork Lewis River basin is forested; a condition typical of the Southern Washington Cascades Province. However, an area of approximately 30 square miles within the upper basin was denuded by the May 18, 1980 eruption of Mount St. Helens. Most of the basin is within the western hemlock vegetation zone (Franklin and Dyrness 1988).

Basin lands provide winter range for deer and elk; mink and beaver are common in wetlands. Large numbers of amphibians have been observed in the basin, primarily in wetland and riparian/riverine habitats. Over 100 species of birds have also been observed, including waterfowl, raptors, and numerous species of passerines.

A large portion of the North Fork Lewis River basin is managed as commercial forest, and as such is undeveloped except for logging roads. In recent years, these lands have experienced increased recreation use and demand for residential

development. Other land uses include farming in the lower elevation areas, hydropower, parks, and the Mount St. Helens National Volcanic Monument (Monument). Population densities are low. The small communities of Cougar, Chelatchie, and Amboy lie in the upper basin, along with scattered private homes and recreational properties. The largest town near the project is Woodland.

#### *The Lewis River Hydroelectric Facilities*

The following description covers all four hydroelectric projects in the North Fork Lewis River basin. The projects begin approximately 10 miles east of the small town of Woodland, Washington. The upstream sequence of the projects from the confluence of the Lewis and Columbia rivers is as follows: Merwin, Yale, Swift No. 2, and Swift No.1. The Merwin, Yale, and Swift No.1 projects represent a linked reservoir/powerhouse system covering over 30 miles of the Lewis River. The Swift No. 2 project does not include a dam and reservoir. It utilizes water directly from the tailrace of Swift No.1, which flows into a 3.2 mile-long canal that discharges through the Swift No. 2 powerhouse into Yale Reservoir.

The three-reservoir system is operated in a coordinated fashion to achieve optimum benefits for power production, flood control, and to provide for natural resources in the basin such as fish, wildlife and recreation. The four projects utilize the water resources within the North Fork Lewis River basin from elevation 50 ft msl (Merwin Project tailwater) to 1,000 ft msl (Swift No. 1 normal pool). The total usable storage in the reservoirs is 814,000 acre-ft. The total installed capacity for the four projects is 580 MW.

#### *Merwin Dam and Reservoir*

The Merwin Hydroelectric Project is a 136 MW plant owned and operated by PacifiCorp. The project is the furthestmost downstream project of the four projects on the North Fork Lewis River, and is located approximately 35 miles northeast of Portland. Construction of the Merwin Project began in 1929 and was completed with a single unit in 1931. Two additional units were added to the project in 1949 and 1958.

Merwin Dam is located on the North Fork Lewis River 21 miles upstream from the confluence with the Columbia River. Merwin Dam is a concrete arch structure with a total crest length of 1,300 feet and a maximum height above its lowest foundation of 314 feet. The dam consists of an arch section 752 feet in crest length, a 75-foot-long gravity

thrust block, a 206-foot-long spillway section, a non-overflow gravity section 242 feet long, followed by a concrete core wall section 20 feet high and extending 25 feet into the bank. The spillway is equipped with four taintor gates 39 feet wide and 30 feet high, and one taintor gate 10 feet wide and 30 feet high. The taintor gates have been extended to an elevation of 240 ft above msl by the addition of 5-foot flashboards.

The reservoir formed by Merwin Dam is about 14.5 miles long with a surface area of approximately 4,000 acres at elevation 239.6 feet above msl (full pool). At full pool, the reservoir has a gross storage capacity of approximately 422,800 acre-ft. Of this amount, 182,600 acre-ft are available between elevation 190 and 239.6 ft msl, and an additional 81,100 acre-ft are available if the reservoir is lowered to its allowable minimum level of 165 ft msl.

#### *Yale Dam and Reservoir*

The Yale Hydroelectric Project is a 134 MW plant owned and operated by PacifiCorp. The project lies directly upstream of the Merwin Project on the North Fork Lewis River, approximately 40 miles northeast of Portland. Construction of the Yale Project began in 1951 and was complete by 1953. The project consists of a main embankment dam, saddle dam, reservoir, penstocks, powerhouse, and transmission line. The project is operated in coordination with the other three hydroelectric facilities on the North Fork Lewis River.

Yale Dam is located on the North Fork Lewis River approximately 30 miles upstream from the confluence with the Columbia River. Yale Dam is a rolled earthen fill embankment type dam with a crest length of 1,305 feet and a height of 323 feet above its lowest foundation point. Its crest elevation is 503-ft msl. The saddle dam is located  $\frac{1}{4}$  mile west of the main dam and it is approximately 1,600 feet long and 40 feet high with a crest elevation of 503 feet msl. The main dam has a chute type spillway, located in the right abutment, with a capacity of 120,000 cfs by utilizing five 30 foot by 39 foot taintor gates with the reservoir at elevation 490 ft msl.

The reservoir formed by Yale Dam is approximately 10.5 miles long with a surface area of approximately 3,800 acres at elevation 490-ft msl (full pool). At full pool, the reservoir has a gross storage capacity of approximately 401,000 acre-ft. At the minimum pool elevation of 430-ft msl, the reservoir has a capacity of approximately 190,000 acre-ft.