

# Columbia Basin PROJECT



U.S. DEPARTMENT OF THE INTERIOR

Stewart L. Udall, Secretary

BUREAU OF RECLAMATION, Floyd E. Dominy, Commissioner

[1961]



# THE COLUMBIA BASIN *Project*

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## IRRIGATION OF LANDS

THE PROJECT AREA contains approximately 1,029,000 irrigable acres embraced in the Big Bend of the Columbia River. It begins some 60 miles south of Grand Coulee Dam and is about 100 miles long, north and south, and 60 miles wide, with an excellent network of State and county highways serving the area.

Major features of the project include Roosevelt Lake behind the dam and Banks Lake, the 27-mile-long equalizing reservoir. The latter is formed between two earth and rock dams across the Grand Coulee, a water course cut through the lava plateau by the Columbia River when an ice-age glacier temporarily diverted it southward.

A total of 12 pumps, each operated by a 65,000-horsepower motor driven by the dam's powerplant, will eventually be installed behind the dam at its west end. Six of the pumps are already installed. These pumps, each with a capacity of 720,000 gallons per minute, lift water from behind the dam uphill some 280 feet through steel pipes into a feeder canal flowing into Banks Lake.

From the equalizing reservoir, irrigation water flows through the project area by gravity, with some supplemental pumping, through a system of canals now being completed. The Potholes Reservoir south of Moses Lake, near the center of the project,

conserves runoff water from irrigated lands in the north for reuse on lands to the south.

Although the first irrigation on the project began in 1948 by pumping from the Columbia River near Pasco, initial irrigation with water from behind Grand Coulee Dam was not started until 1952. Construction of facilities is continuing as part of the orderly development to bring irrigation to the entire million-acre project.

Seventy percent of the land in the Columbia Basin project is privately owned. Under Federal law, land under one ownership receiving project water is limited to family-size farms. All irrigable excess land eligible to be served by the irrigation system is being sold at the appraised price by the owners (individuals or the Government) to settlers. Farm units generally are laid out on a basis of land quality and contour, rather than existing property lines. The sale of all project land eligible to receive water is subject to anti-speculation laws. The land has been surveyed, examined, classified, and appraised on a basis of dry-land values.

The Columbia Basin project is a self-liquidating development. Three irrigation districts, organized under Washington State laws, contract with the Federal Government for repayment of assigned charges and handle collection of irrigation water charges from the users. Power revenues from Grand Coulee Dam will assist in paying water charges as well as all costs attributable to power development. Thus the entire cost of the project, estimated at \$960,496,000, will be repaid to the United States Treasury except those costs allocated to flood control, downriver navigation, and other minor items.

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Studies are under way to modify the dam outlets and increase its value in flood control. In conjunction with other proposed upstream storage, substantial additional flood-control benefits and power will eventually be obtainable.

## THE COLUMBIA RIVER

THE COLUMBIA RIVER, one of the great rivers of the world, drains an area of 259,000 square miles. The drainage area above Grand Coulee Dam totals 74,100 square miles, including 39,700 square miles in British Columbia. About 60 percent of the water that passes Grand Coulee Dam comes out of river basins in Canada.

Columbia Lake, lying between the Cana-

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Because of its great volume and its fall of 1,290 feet between Grand Coulee Dam and tidewater below Bonneville Dam, the Columbia River is a source of tremendous wealth in waterpower.

## RECREATIONAL AREA

IN ADDITION TO its primary purposes, opportunities abound for development of recreation on the Columbia Basin project. These include boating, fishing, camping, hunting, swimming and many other recreational activities, which are being developed and administered by Federal, State and local organizations. Franklin D. Roosevelt Lake is a principal recreation area in the National Park Service system.

The West Canal, carrying irrigation water to the western portion of the project farmlands.





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## GRAND COULEE DAM

GRAND COULEE DAM rests on massive granite, which is a remnant of the foothills of the Okanogan Highlands, buried in the Columbia lava plateau millions of years ago and exposed when summer torrents from the Cordilleran ice cap cut the 1,600-foot canyon in which the Columbia River now flows. It is a "gravity" dam, depending on its weight alone to prevent water pressure on its upstream face from tipping it over or causing it to slide on its base.

The main structure of the dam was completed in 1941. It is 4,173 feet long, stands about 370 feet above the surface of the river below it, and weighs about 22 million tons. Its height from bedrock is 550 feet; therefore, nearly half its mass is below the river surface.

During spring and summer, the river is fed by melting ice and snow. During the peak flow, usually between May and September, the 11 drum gates at the crest of the 1,650-foot-wide central spillway are gradually opened and thousands of tons of surplus water pour over the dam, creating a waterfall half as wide and twice as high

as Niagara Falls. During most of the remainder of the year, the entire flow passes through turbines in powerhouses at each end of the spillway. In late fall and winter, the flow is supplemented by storage water from the reservoir as well as other reservoirs upstream.

Within the dam are 8½ miles of inspection galleries and 2½ miles of shafts. Buried in the concrete are 1,700 miles of thin-wall steel tubing, through which cold water was circulated during construction to cool the concrete to the local mean annual temperature and prevent the prolonged future shrinking and cracking that would result from slow, natural cooling.

The 30-foot highway crossing the dam is open for passenger vehicular traffic during daylight hours only. A highway bridge for general use is located downstream from the dam.

Among its multiple purposes, Grand Coulee Dam provides water for the irrigation system, stores water for use in power generation in the low-water season of winter, and concentrates in one place the formerly wasted energy accumulated during

the flow from the Canadian boundary. It has made possible a firm supply of hydroelectric power for pumping irrigation water and for industrial and domestic uses in the Pacific Northwest.

## THE POWERPLANT

THE POWERPLANT at Grand Coulee Dam was completed in 1951, 10 years after the first power was produced. It consists of an 800-foot powerhouse at each end of the spillway and has 18 generators, each rated at 108,000 kilowatts but capable of yielding more than 120,000 kilowatts, and 3 station service units of 10,000 kilowatts capacity each. On September 9, 1953, the plant set the astounding 1-hour production record of 2,324,000 kilowatts.

Power for each main generator is derived from a 16-foot turbine waterwheel, which in turn receives its power from reservoir water carried diagonally down through the dam in an 18-foot penstock, a steel pipe imbedded in the concrete. A generator weighs about 1,000 tons, and a turbine half as much. Neither was ever completely assembled until

it was installed in the powerhouse. About 40 carloads of parts are required for one generator, and about 20 carloads for a turbine. Some single pieces weigh as much as 72 tons. All generators and turbines are under the remote control of operators in a control room.

Outside the powerhouse, opposite each of the generators inside, is a group of 3 transformers, which take energy from the generator at 13,800 volts and deliver it to outgoing lines, most of which are 230,000 volts. Through oil circuit breakers in the switchyard, operated from the control room in the powerhouse, connections are made with the long-distance transmission lines of the Bonneville Power Administration, which distributes and sells the power output from Grand Coulee along with that of most other Federal dams on the river system.

## ROOSEVELT LAKE

FORMED BY GRAND COULEE DAM, Franklin D. Roosevelt Lake extends 151 miles to the Canadian boundary. The height of the dam and maximum level of the reservoir were

determined by the elevation of the Columbia River at the Canadian border. The water level in the lake is not allowed to rise more than 1,290 feet above sea level, to avoid backing water into Canada.

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Columbia Lake, lying between the Cana-

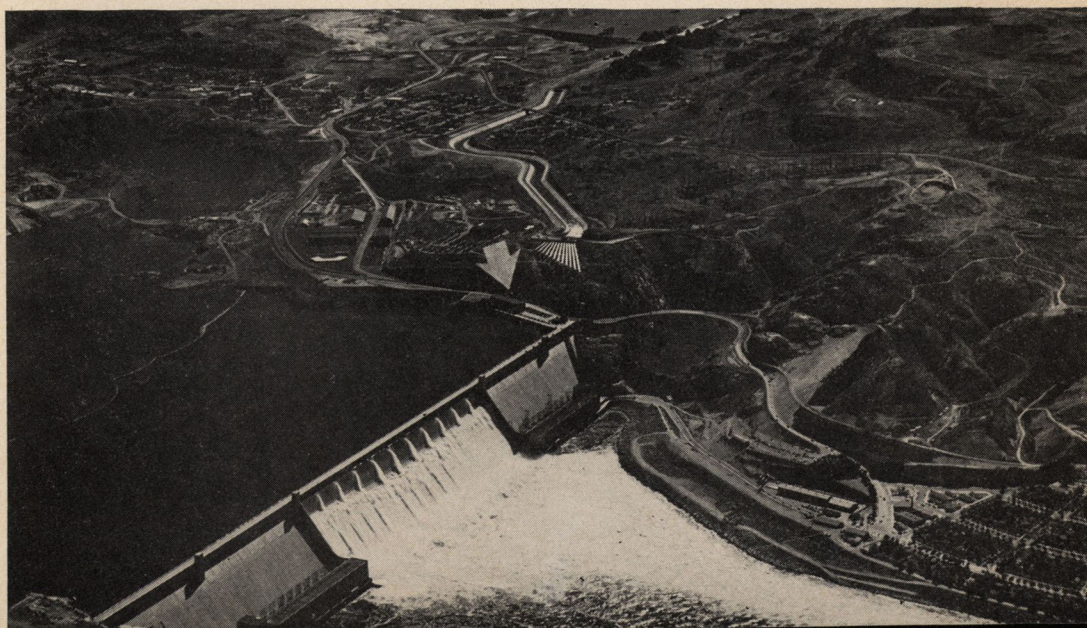
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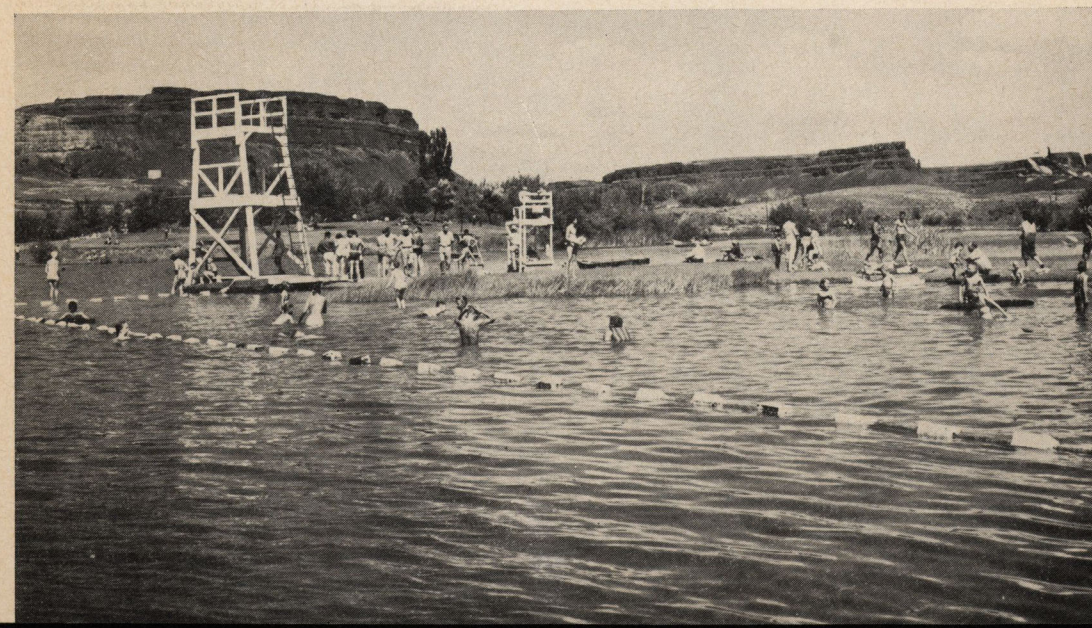
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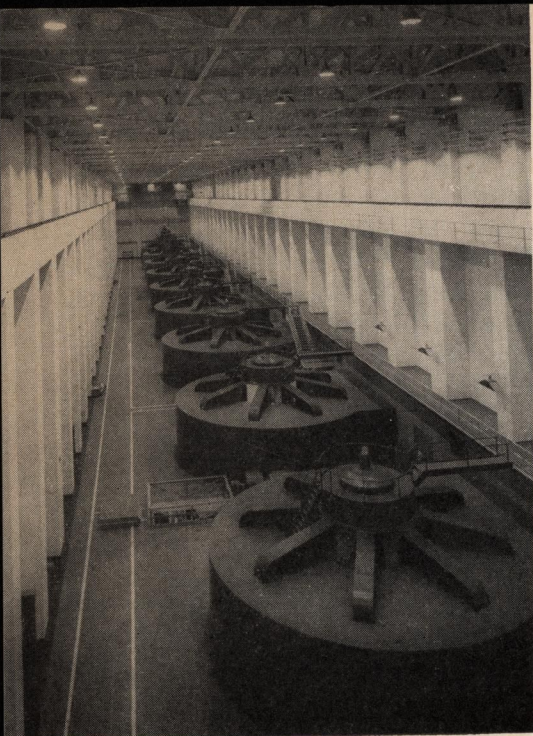
Grand Coulee Dam, keystone of the Columbia Basin project. Arrow indicates pumping plant.



Swimming is only one of the many recreational opportunities found in the project area.







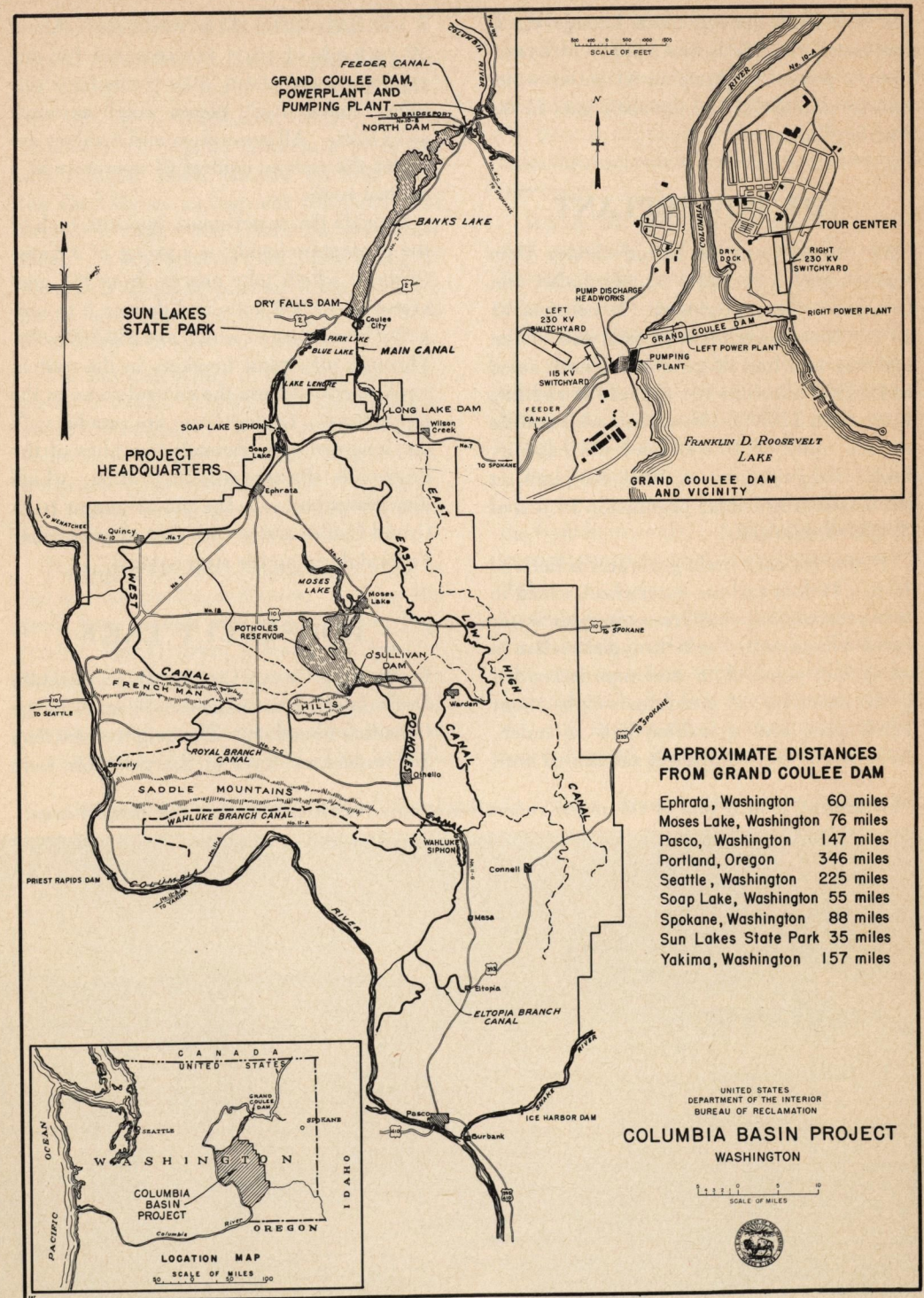
The nine 108,000-kilowatt generators of the left powerhouse.

This sprinkler irrigation system makes early potatoes bloom.



A harvest of onions from irrigated land on the project.

Cultivating beans—Typical scene during the growing season.





FROM \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Stamp

TO \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## VISITORS WELCOME

VISITORS TO GRAND COULEE DAM are encouraged to visit the tour center and to take the free, self-guided tour. Hours during which various buildings will be open to visitors are posted in the tour center. The tour center is open from Memorial Day through Labor Day from 6 a.m. to 11 p.m., and from Labor Day to May 29 (except Christmas Day) from 7 a.m. to 6 p.m.

The colored floodlights which illuminate the spillway with a night-time panorama of color are turned on at the time water begins flowing over the spillway, about May 15, and operate from darkness to midnight with a complete cycle of colors every 30 minutes, until about September 15 or later when water conditions permit.

## INFORMATION SOURCES

INFORMATION ABOUT the general activities of the Bureau of Reclamation is obtainable from the Commissioner, Bureau of Reclamation, Washington 25, D.C. Data concerning Bureau operations in the Pacific Northwest can be obtained from the Regional Director, Bureau of Reclamation, Boise, Idaho.

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## STATISTICAL DATA

### THE DAM

Length of crest..... 4, 173 feet  
Height above lowest bedrock..... 550 feet

Spillway width..... 1, 650 feet  
Concrete content..... 10,230,776 cubic yards

### POWERPLANT

Turbines..... { 18 of 160,000 horsepower each  
                          3 of 14,000 horsepower each  
Generators..... { 18 of 108,000 kilowatts each  
                          3 of 10,000 kilowatts each  
Total nameplate capacity..... 1,974,000 kilowatts  
Record hourly output (in  
1953)..... 2,324,000 kilowatts

### PUMPING PLANT

Pumps (12 total,  
6 installed)..... 65,000 horsepower each  
Capacity  
(each pump)..... 1,600 cubic feet per second

### FRANKLIN D. ROOSEVELT LAKE

Area..... 85, 000 acres  
Length..... 151 miles  
Length of shore line..... 600 miles

### COLUMBIA RIVER BASIN

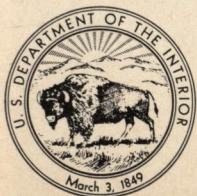
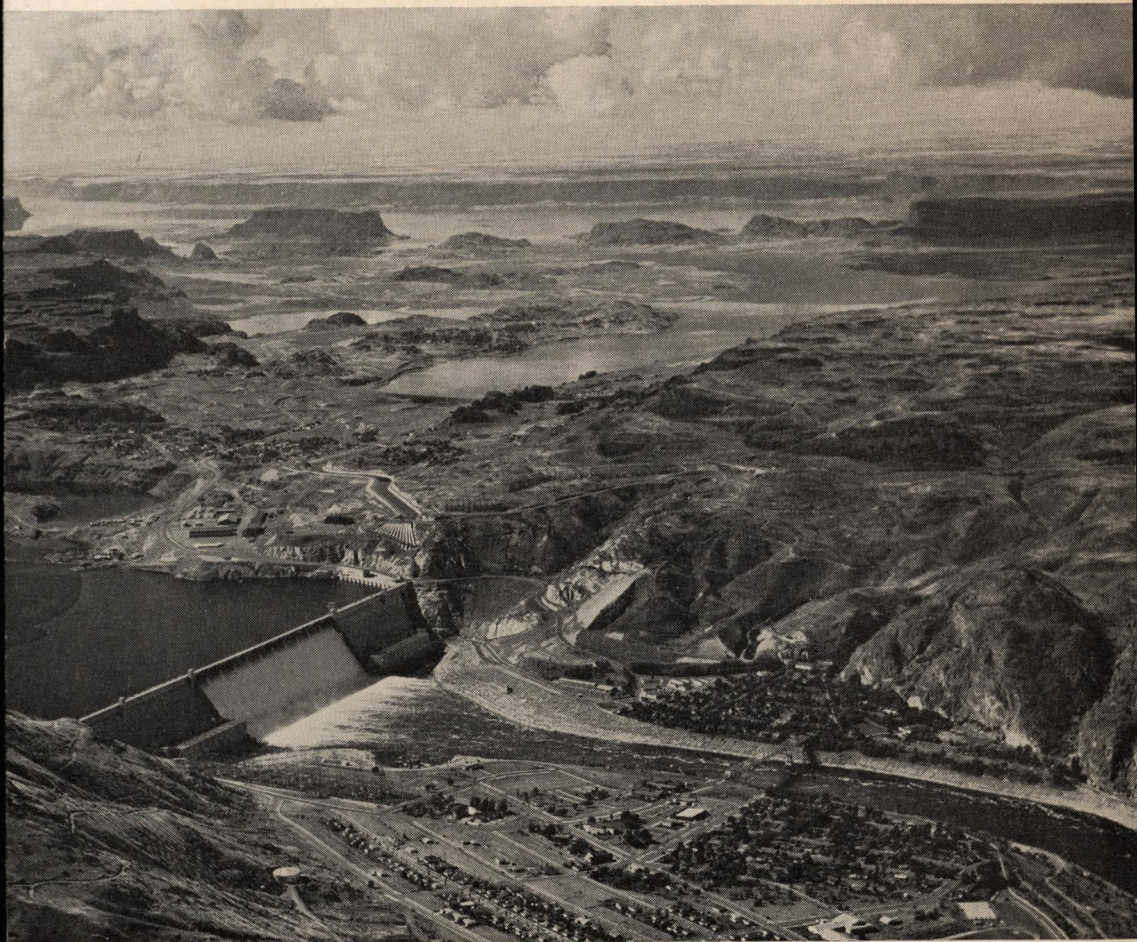
Area..... 259, 000 square miles  
Area above Coulee Dam.... 74, 100 square miles  
Area in Canada..... 39, 700 square miles  
Mean annual runoff above  
the dam..... 77, 200, 000 acre-feet  
Maximum required for  
irrigation..... 4, 000, 000 acre-feet

### DISTRIBUTION SYSTEM COMPLETED

Mileage, main canals..... 288  
Mileage, laterals..... 1, 623  
Mileage, drains..... 735



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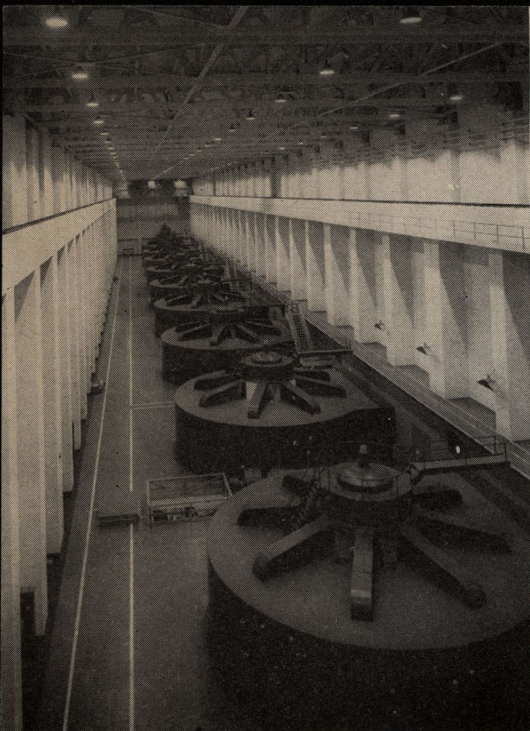
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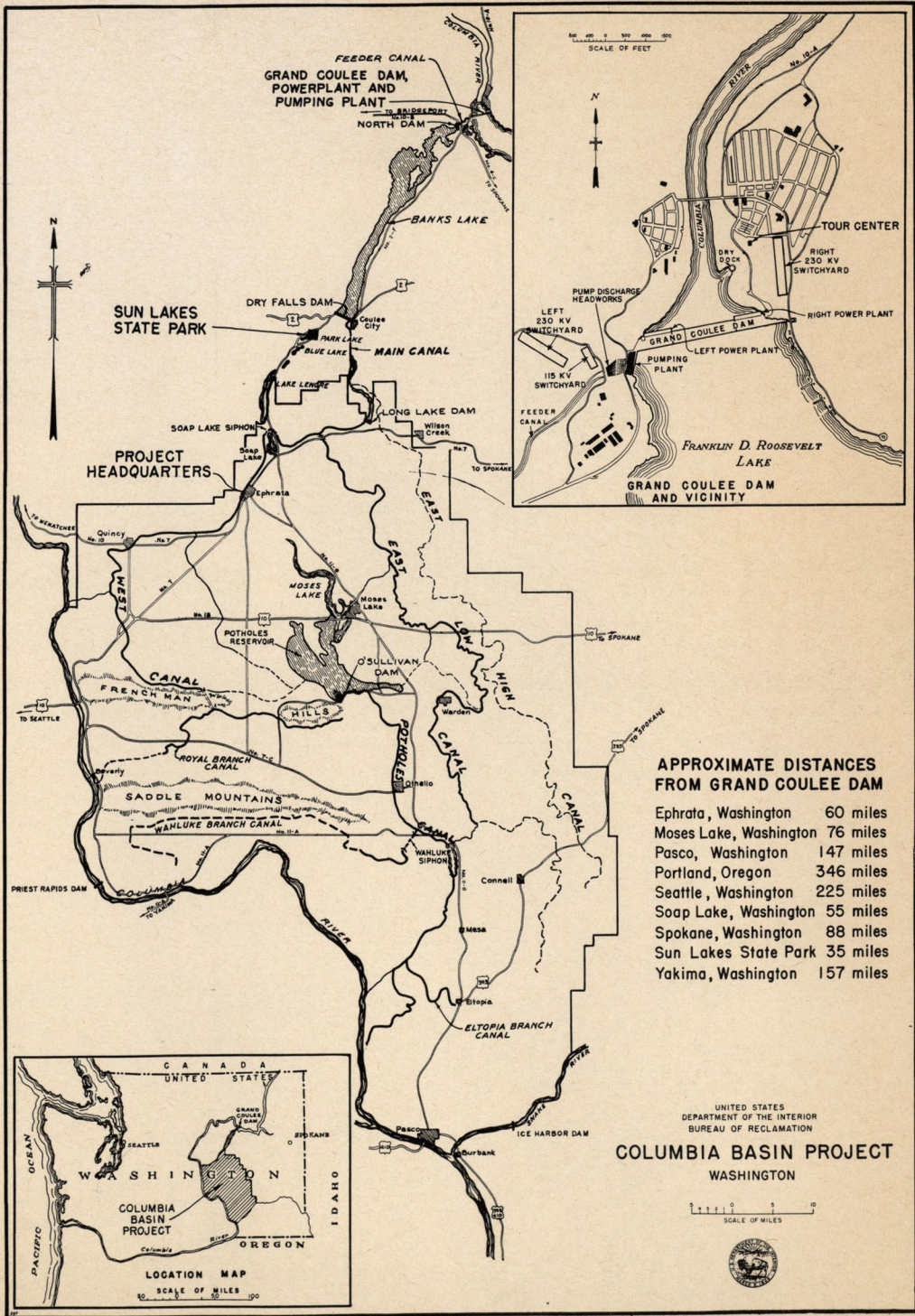
The nine 108,000-kilowatt generators of the left powerhouse.

This sprinkler irrigation system makes early potatoes bloom.



A harvest of onions from irrigated land on the project.

Cultivating beans—Typical scene during the growing season.



APPROXIMATE DISTANCES FROM GRAND COULEE DAM

Ephrata, Washington	60 miles
Moses Lake, Washington	76 miles
Pasco, Washington	147 miles
Portland, Oregon	346 miles
Seattle, Washington	225 miles
Soap Lake, Washington	55 miles
Spokane, Washington	88 miles
Sun Lakes State Park	35 miles
Yakima, Washington	157 miles

VISITORS WELCOME

VISITORS TO GRAND COULEE DAM are encouraged to visit the Tour Center—first stop on the free, self-guided tour. The Center is open from 6 a.m. to 11 p.m. in the summer and from 7 a.m. to 6 p.m. the rest of the year.

The other self-guided tour facilities, right powerhouse, gallery in dam, top of dam, pumping plant and exhibit room are open daily from 6 a.m. to 11 p.m. The exhibit room has an animated relief map of the project.

Colored floodlights, which illuminate the dam, are turned on during the summer months when water is flowing over the spillway and operate from darkness to 11 p.m.

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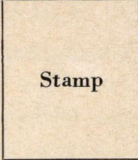
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FROM \_\_\_\_\_

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POWERPLANT

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Generators.....	{18 of 108,000 kilowatts each 3 of 10,000 kilowatts each
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Length of shore line.....	600 miles

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Area in Canada.....	39,700 square miles
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Maximum required for irrigation.....	4,000,000 acre-feet

DISTRIBUTION SYSTEM COMPLETED

Mileage, main canals.....	288
Mileage, laterals.....	1,623
Mileage, drains.....	735