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PROFILE SURVEYS IN 1915

IN

SKAGIT RIVER BASIN, WASHINGTON

PREPARED UNDER THE DIRECTION OF
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Prepared in cooperation with
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CONTENTS.

ILLUSTRATIONS.

PROFILE SURVEYS IN SKAGIT RIVER BASIN, WASHINGTON.

Prepared under the direction of W. H. HERRON, Acting Chief Geographer.

INTRODUCTION.

In order to determine the location of undeveloped water powers, the United States Geological Survey has from time to time, alone and in cooperation with State organizations, made surveys and profiles of some of the rivers of the United States that are adapted to the development of power by low or medium heads of 20 to 100 feet.

The surveys are made by means of plane table and stadia. Elevations are based on heights derived from primary or precise levels of the United States Geological Survey. The maps are made in the field and show not only the outlines of the river banks, the islands, the positions of rapids, falls, shoals, and existing dams, and the crossings of all ferries and roads, but the contours of banks to an elevation high enough to indicate the possibility of using the stream. The elevations of the bench marks left are noted on the field sheets in their proper positions. The figures given with the gaging stations shown on the maps indicate the elevation of the zero of the gage.

GENERAL FEATURES OF SKAGIT RIVER BASIN.

Skagit River, the largest stream tributary to Puget Sound, rises in Beaver Lake, British Columbia, 20 miles north of the Canadian line, and flows southwestward 125 miles to its mouth near Mount Vernon, Skagit County, Wash. Below Mount Vernon it passes, by several channels, through its delta into Skagit Bay, an arm of the Sound.

Its basin comprises 3,100 square miles on the western slope of the Cascade Mountains, touching the crest for 130 miles, measured along the divide, or 90 miles in a straight line, extending from Indian Pass northward along the eastern boundaries of Snohomish, Skagit, and Whatcom counties to the Canadian line, thence northward 20 miles into British Columbia, where it reaches Fraser River basin.

Altitudes within this area range from sea level to about 7,000 feet on the Cascade divide and to more than 11,000 feet at the summit of Mount Baker—the highest peak in this basin. Other mountains whose slopes are drained by the Skagit are Glacier Peak and Mount

Shuksan. Roughly speaking, the greater part of this area that is above an altitude of 1,000 feet—approximately 2,500 square miles—is in the Washington and Snoqualmie national forests. Above the timber line and within the zone of perpetual snow much of the surface is barren rock. On Mount Baker and Glacier Peak there are many glaciers which furnish the most permanent water supply of the river. Below an elevation of about 4,000 feet the area is, in general, timbered with Douglas fir and hemlock, which are smaller and less abundant with increase in altitude. Some of the heaviest stands of Douglas fir are found on the lower stretches of this area. Cedar also is abundant.

The prevailing soil on the higher elevations is coarse glacial gravel, but there are many pockets of loam in the valleys, and the deposits of limestone and clay at the mouth of Baker River are notable, as they furnish materials for the Portland cement factories there. Underbrush and litter are thick on the lower levels and along the stream courses, become thinner up the slopes, and die out before they reach the timber line.

The greater part of this area is snow covered to a depth of 2 to 10 feet in winter and to much greater depths on the higher slopes and peaks. As on all streams in the Puget Sound region, the minimum stages of the streams are reached in September and October, when freezing nights cut off the snow water from the higher slopes and the drought still prevails in the valleys and low areas. A second low stage comes in February, when the streams in the higher courses are ice locked and when all precipitation is held back in the form of snow.

The possibilities of power development on the upper Skagit and its tributaries are extensive, but few of the sites have been utilized.

Navigation on the lower Skagit, from its mouth to Rockport, about 50 miles, has been investigated and reported on by the United States Army Engineers.

The two largest tributaries of Skagit River are Sauk and Baker rivers. Thunder Creek, Ruby Creek, and Cascade River are also large, as they head in the high Cascades and furnish the water for the largest power plant now in operation.

Sauk River, the largest of the tributaries, drains 731 square miles, mostly in the northeastern part of Snohomish County. Sauk River proper is formed by the union of the Upper Sauk and Suiattle rivers near the southern boundary of Skagit County, 10 miles above the mouth of the Sauk and the town of Sauk, Wash. Sauk River above the Suiattle is formed by the confluence of its north and south forks, Whitechuck River and Clear Creek, and it enters the Skagit approximately at the head of navigation near the town of Rockport. From its mouth to its most distant source at Indian Pass the river is about 50 miles long. It receives its principal tributaries at distances

from its mouth as follows: Suiattle River, 10 miles; Clear Creek, 22 miles; the Whitechuck, 28 miles; and the confluence of North and South forks of Sauk, 35 miles. The Suiattle is composed of four streams of almost equal size—Canyon, Sulphur, Downey, and Buck creeks—which enter it at distances above its mouth of 30, 24, 22, and 16 miles, respectively. The tributaries head in the glaciers of the Cascade divide and carry all the water yielded by the ice fields of Glacier Peak. Altitudes within the basin exceed 6,000 feet in many places, including the Cascade divide and the many lesser divides. Glacier Peak, 10,436 feet above sea level, is the highest peak in this area. A large part of the basin is above the timber line and much of it is in the zone of perpetual ice and snow. The greater part of the area drained by the Sauk above the mouth of the Suiattle is in the Snoqualmie and Washington national forests.

Baker River, the tributary second in importance, heads at Hannegan Pass, on the eastern slope of Mount Shuksan, and flows southward about 25 miles, passing through Baker Lake, on the southeastern slope of Mount Baker, to its junction with the Skagit, 40 miles above the mouth of that river, at Concrete, Wash. The basin of this stream comprises 295 square miles, is very mountainous and rugged, and is chiefly in Whatcom County, within the Washington National Forest. Like the Sauk, this river drains much surface within the zone of perpetual ice and snow, and is fed by the glacial fields of Mounts Baker and Shuksan.

Baker River offers possibly the most feasible power site in the whole Skagit basin, as is indicated by the fact that it has already been developed. The Portland cement plants at Concrete have been operated by steam since the dam built on Baker River washed out in the fall of 1906.

Little can be added concerning Cascade River, which constitutes the third most important tributary of the Skagit. This river and the adjacent creeks, already named, are very desirable power streams. They are to be utilized by plants now under construction at Marblemount, Wash.

The results of surveys of Skagit River and certain of its tributaries above Concrete, Wash., are presented in Plates I–XII.

GAGING STATIONS.

The Geological Survey has maintained in the basin of Skagit River the gaging stations indicated by the following list. The stations are arranged in downstream order, the position of tributaries being indicated by indention. A dash after date indicates that the station was being maintained June 30, 1916. A period after the date indicates discontinuance.

Skagit River at Reflector Bar, near Marblemount, Wash., 1914.
Skagit River near Marblemount, Wash., 1908–1914.
Skagit River near Sedro Woolley, Wash., 1908–
Stetattle Creek near Marblemount, Wash., 1914–1916.
Cascade River near Marblemount, Wash., 1909–1913.
Sauk River above Whitechuck River near Darrington, Wash., 1910.
Sauk River above Clear Creek near Darrington, Wash., 1910–1913.
Sauk River at Darrington, Wash., 1914–
Sauk River at Suiattle Crossing, near Sauk, Wash., 1910–1912.
Whitechuck River near Darrington, Wash., 1910.
Clear Creek near Darrington, Wash., 1910–1912.
Baker Lake (on Baker River) near Concrete, Wash., 1910–1915.
Baker River below Anderson Creek, near Concrete, Wash., 1910–
Baker River at Concrete, Wash., 1910–1915.

PUBLICATIONS.

Water-Supply Papers 252, 272, 292, 312, 332–A, 362–A, and 392 of the Geological Survey contain the results of investigations of stream flow at the stations indicated in the preceding list.

Water-supply papers and other publications of the United States Geological Survey containing data in regard to the water resources of the United States may be obtained or consulted as indicated below.

1. Copies may be obtained free of charge by applying to the Director of the Geological Survey, Washington, D. C. The edition printed for free distribution is, however, small and is soon exhausted.

2. Copies may be purchased at nominal cost from the Superintendent of Documents, Government Printing Office, Washington, D. C., who will on application furnish lists giving prices.

3. Sets of the reports may be consulted in the libraries of the principal cities in the United States.

4. Complete sets are available for consultation in the local offices of the water-resources branch of the Geological Survey, as follows:

Boston, Mass., Customhouse.
Albany, N. Y., Room 18, Federal Building.
Atlanta, Ga., Post Office Building.
Madison, Wis., care of Railroad Commission of Wisconsin.
St. Paul, Minn., Old Capitol Building.
Austin, Tex., Old Post Office Building.
Helena, Mont., Montana National Bank Building.
Denver, Colo., 302 Chamber of Commerce Building.
Phoenix, Ariz., 417 Fleming Building.
Salt Lake City, Utah, 421 Federal Building.
Boise, Idaho, 615 Idaho Building.
Tacoma, Wash., 406 Federal Building.
Portland, Oreg., 416 Couch Building.
San Francisco, Cal., 328 Customhouse.
Los Angeles, Cal., 619 Federal Building.
Honolulu, Hawaii, Kapiolani Building.

A list of the Survey's publications may be obtained from the Director of the United States Geological Survey, Washington, D. C.

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