JOB COMPLETION REPORT

INVESTIGATIONS PROJECTS

State of Montana

Project No. F-7-R-2 Work Plan No. II Job No. II-A

Title of Job: Inventory of the Project Area's Waters from the Standpoint of Physical and Chemical Characteristics.

Objective:

The purpose of the project is to determine the physical and chemical characteristics of the various waters in the project area and to catalogue these waters.

Techniques Used:

Survey of the waters of the project area was confined chiefly to the Kootenai River drainage above Pipe Creek. An airplane was used to determine the location of barriers, beaver dams, whether the stream was dry and in some cases types of bottom material. A small number of streams and lakes outside the Kootenai River drainage were surveyed due to urgent requests.

Stream lengths were measured from the largest maps available, usually the one-half inch to a mile Forest Service maps. A few streams had roads full length and these were measured by automobile odometer. Areas of lakes were measured from county surveyor plat books, Forest Service maps and aerial photographs.

Volumes of streams were taken from United States Geological Survey run-off records and from actual measurements taken in the field. Lake fluctuations were noted from direct observations.

Gross chemical analysis were taken in the field. This included dissolved oxygen, free carbon dioxide, phenolphthalein alkalinity, methyl orange alkalinity and hydrogen ion concentration (pH).

Characteristics of the drainage, shoreline and bottom types were noted by direct observations. The suitability of the streams for natural reproduction was made by walking a portion of the stream and noting types of bottom material. Temperatures at various depths of lakes were taken by a thermophone.

Findings:

Kootenai River is one of the largest rivers in Montana but goes through only a corner of the state. In all maps examined, this river is referred to as the "Kootenai" in the United States, and as the "Kootenay" in Canada. The river starts in the Canadian Rockies, flows due south for many miles before entering Montana, and then makes a partial loop and leaves the state in a north-westerly direction (Figure 1). It then flows through the northern part of Idaho and after some more winding in a westerly direction, enters the Columbia River in British Columbia. The length of the river in Montana is approximately 95 miles. The river water is unique for the state in that it has a milky-blue color when other large streams of the state have cleared. The color is attributed to glacial flour brought down by water from the melting glaciers. The status of the controversial

water development project planned by the U. S. Corps of Army Engineers is unknown at this time. The dam-site is near Libby and no work besides the initials surveys has been done.

A list was made of all the waters in the Kootenai River drainage in Montana. A total of 366 streams and 98 lakes was recorded. However, not all of these are in the portion of the drainage to be affected by construction of the dam. The proposed dam-site is approximately 5 miles upstream from the mouth of Pipe Creek. In the drainage above Pipe Creek, lengths were obtained for 28 streams from maps by map measurer, and for 1 stream by car odometer. Volumes and velocities were obtained on 29 streams while 13 streams were found dry at least at their mouths. According to available records, the maximum discharge of the Kootenai River in the vicinity of Rexford was 87,300 second-feet on June 18, 1933, and the minimum, 1,100 second-feet on February 7, 1936. The average flow taken from 1928 through 1938 for the months of August through March, is approximately 7,200 second-feet. The discharge from the streams surveyed were all less than two second-feet except for one which was about five second-feet. An example of a stream drying up at the lower extremity is Cripple Horse Creek that was dry for approximately the lower 2 miles, but above this a good flow of water was found with a good fish population. The time required to walk the streams and inaccessibility by truck, prevented observations on other dry streams during the fall of the year. The area studied is mountainous, heavily timbered, and rocky. The elevation of the Kootenai River at Libby is about 2080 feet above mean sea level and at the international boundary is approximately 2150 feet. Many of the mountain tops are over 7000 feet above mean sea level.

A list was also made of all the lakes and streams in the Flathead River drainage. A total of 242 lakes and 652 streams are listed for this watershed.

Chemical analysis was made on 29 streams of the Kootenai River drainage. Survey of these streams was made cheifly during the months of September and October. The pH of these streams ranged from 6.4 to 8.4. Twenty-three of the streams were found to be alkaline and 6 were found to be acid. Dissolved oxygen ranged from 9.1 to 12.8 ppm (parts per million). Phenolphthalein alkalinity was zero in all streams tested while methyl orange alkalinity ranged from zero to 219 ppm in the streams. Free carbon dioxide was tested but results were so erratic in some cases that no conclusions can be drawn from the readings obtained. Temperatures ranged from 34 to 55 degrees F. with most of the readings around 41 degrees F.

Chemical analysis was made on four lakes of the Kootenai River drainage. The pH was alkaline in all cases and dissolved oxygen at the surface was 9.3 ppm in two lakes and 9.4 ppm in the other two lakes. Surface temperatures ranged from 58 to 78 degrees F. Depths of the lakes ranged from 33 to 70 feet with a temperature difference from surface to bottom of the various lakes ranged from 1.5 to 29.5 degrees F.

One stream and three lakes were surveyed outside the Kootenai River drainage, but still within the project area. These waters are some distance from each other and no generalizations can be given.

Analysis and Recommendations:

The survey of this area has indicated many streams with low temperatures and that many go dry each year, especially near their mouths. The lakes have a high surface temperature but production of game fish is limited by inadequate spawning facilities, especially for the native game species. Three of the lakes did not have inlet or

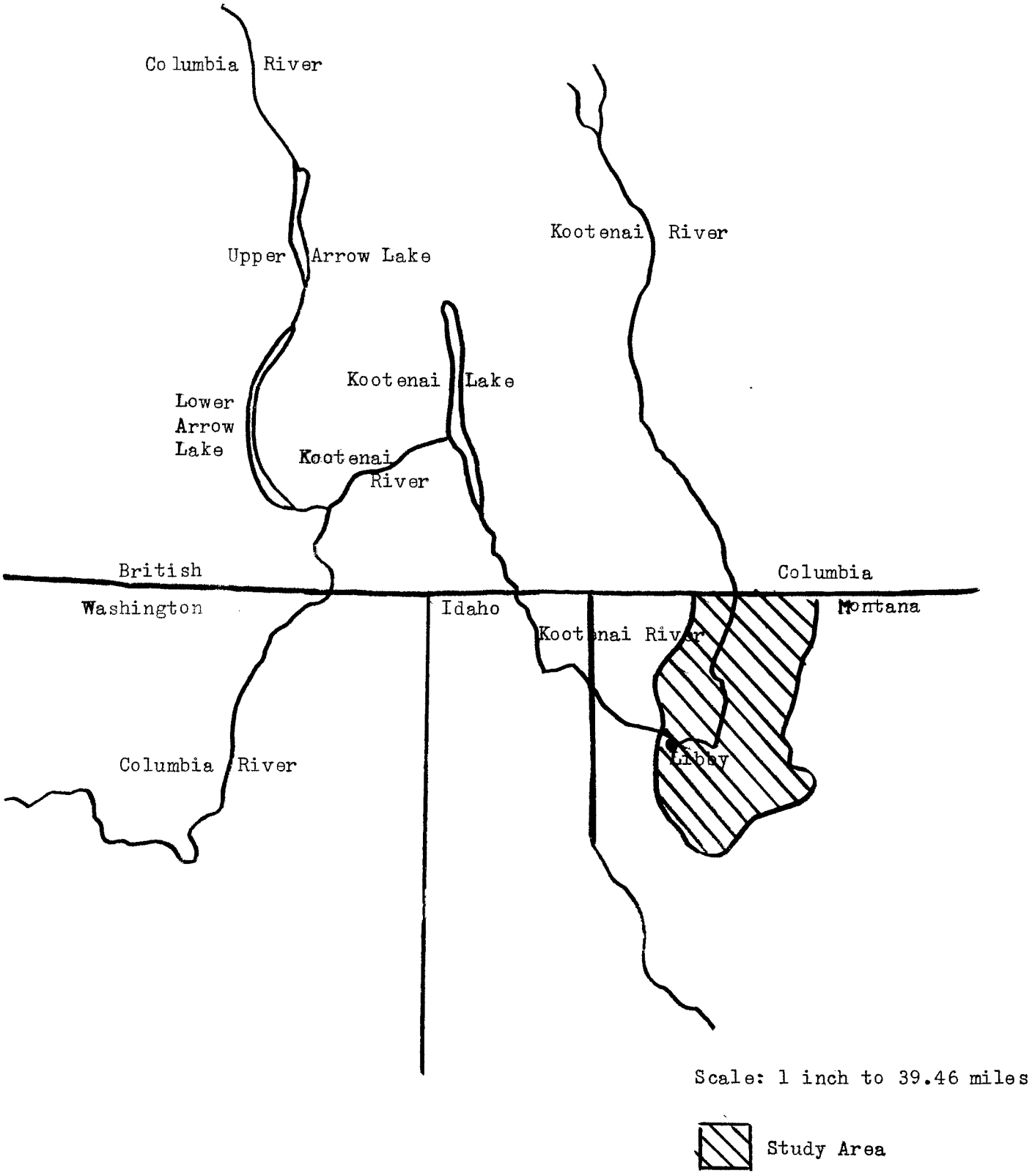

Figure 1. Study area of the Kootenai River Drainage.

outlet streams.

This type of survey will give the department some idea of the fish habitat in the area studied. Fishing may be improved by annual introduction of trout into isolated lakes observed during the course of the survey.

It is recommended that this study be continued on the Kootenai River Drainage until all waters are surveyed from Pipe Creek to the Canadian line.

Summary:

A list was made of all the waters in the Kootenai River drainage and of the Flathead River drainage. A total of 366 streams and 98 lakes were recorded for the Kootenai River drainage and a total of 652 streams and 242 lakes were listed for the Flathead River drainage. Forty-two streams and four lakes were surveyed for gross chemical and physical characteristics in the Kootenai River drainage. One stream and three lakes were surveyed in the Flathead River drainage.

Data and Reports:

The original data are filed on special card forms with the project leader at Kalispell, Montana and duplicate copies are filed at the head office in Helena, Montana.

Prepared by Frank A. Stefanich Approved by _____

Date May 1, 1953