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1950

### Biological Station Summer Session, 1950

Montana State University (Missoula, Mont.)

Flathead Lake Biological Station

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NUMBER 427  
DECEMBER, 1949

# University of Montana Bulletin



1950 SESSION

*Montana State University*  
BIOLOGICAL STATION

FLATHEAD LAKE

BIGFORK, MONTANA

**June 17 to August 12**

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DR. ROYAL BRUCE BRUNSON

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Cover Photo Courtesy of Royal Bruce Brunson  
Invertebrate Class in Mission Mountains

## UNIVERSITY OF MONTANA BULLETIN

Montana State University Series No. 427

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MISSOULIAN



# THE BIOLOGICAL STATION OF MONTANA STATE UNIVERSITY

## Summer Session

June 17 to August 12, 1950

The Biological Station, a unit of the Summer Session of Montana State University, is a field station for teaching and research in Botany and Zoology. The first session was held in the summer of 1899 and regular classes were offered every summer through the year 1920. Formal classwork was suspended from 1920 until the summer of 1947, when rehabilitation of the Station was begun.

The Station grounds proper comprise approximately 70 acres of land at Yellow Bay on the east shore of Flathead Lake. In addition to this area, the Station controls three small bird islands and 40 acres of Idylwild Island. Permission has been granted to the Station personnel to make biological studies on Wildhorse Island, an area of approximately 2,000 acres. At the south end of Flathead Lake the Station controls a 40-acre plot. This area is excellent for the study and collection of insects and birds.

Sixteen miles north of the Station is Bigfork, Montana, situated at the north end of Flathead Lake. Polson, Montana, lies at the south end of Flathead Lake, 17 miles from Yellow Bay. The Mission Mountains rise abruptly from the Station grounds to the east and south. The Swan Range lies within easy driving distance east and north of Yellow Bay, and Glacier National Park can be reached by car in one and one-half hours.

Flathead Lake is an oligotrophic lake with a definite thermocline during the summer months. It is approximately 35 miles long with an average width of 7 miles. The maximum depth is approximately 300 feet. The shore line of the lake varies considerably from precipitous, rocky shores on the east side to a sloping, sandy bottom at the south end of the lake. The Swan and Flathead Rivers empty into the lake at the north end, and the latter river drains the lake at the south. There are many islands in the lake in addition to those already mentioned.

Within easy driving distance are mountain streams, temporary and permanent ponds, several smaller lakes and many mountain lakes in the passes of the Mission and Swan Ranges. Flathead Lake and the Station grounds are at an elevation of approximately 3000 feet. The Mission and Swan Ranges reach an altitude of about 10,300 feet, and the ranges of Glacier National Park attain an altitude of 12,000 feet.

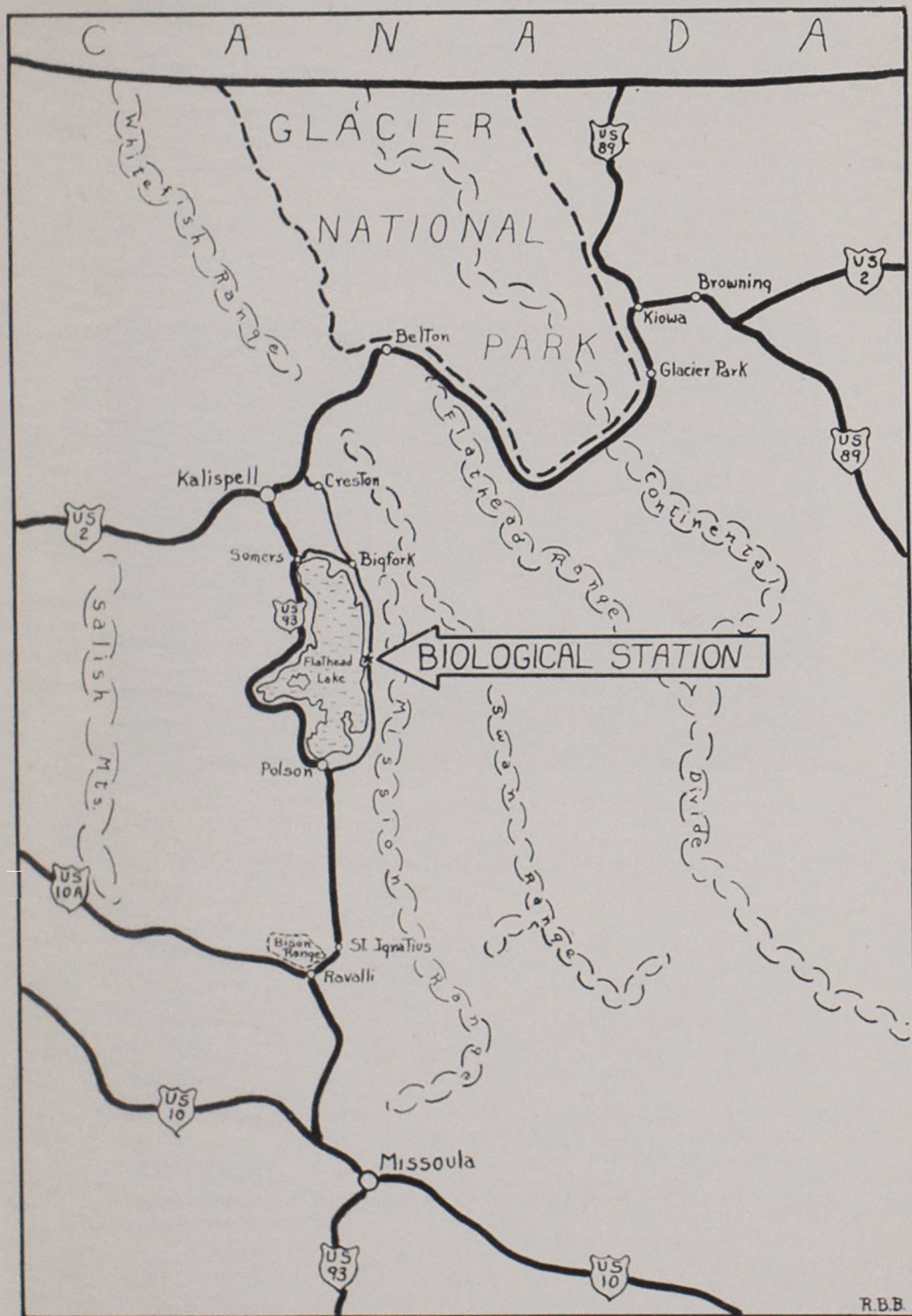
## OPPORTUNITIES FOR STUDY AND RESEARCH

The variety of habitats and range of altitude offers unlimited possibilities for research in Botany in three major drainage systems. The greater part of the region lies in the Columbia River drainage. The Mississippian and Hudsonian drainage systems have their headwaters in Glacier National Park and are accessible for study. The predominant vegetation types are those of the montane and sub-alpine forests. Also present are many fine representations of the coast forest, sage brush, grass land and tundra formations. Botanical research in this region to date has been almost entirely of the preliminary survey type. Thus, the possibilities for research in both the higher and lower plant groups are almost unlimited.

The possibilities for research in Zoology are equally as good. All of western Montana is practically unknown territory, particularly for taxonomists and ecologists. There are 75 species of mammals found in the area. Big game animals are common over the western part of Montana. Among these are the elk, moose, white-tailed deer, mule deer, mountain goat, Rocky Mountain big-horn sheep and grizzly and black bear. The National Bison Range, 40 miles from the Biological Station, supports herds of bison, elk, sheep and deer. Mammals peculiar to mountain ranges, such as the pika and hoary marmot, can conveniently be studied near the Station. Nearly 200 species of breeding birds are to be found in western Montana. Common nesting birds in the vicinity of the Station include the western tanager, Macgillivray's warbler, and the little-known Townsend's warbler. In Glacier Park, the rosy finch and the American pipit are common at high elevations and the white-tailed ptarmigan may be seen. At Nine-Pipe and Pablo Federal Migratory Bird Refuges, an hour's drive south of the Station, many species of water birds nest, of which the avocet and the western grebe are striking examples. A few species of amphibians and reptiles are known from western Montana. An unknown number of species of fish inhabit the waters of the region. Three species of trout, the land-locked salmon, Rocky Mountain whitefish, and many introduced species of fish are among those found in Flathead Lake. No estimate can be made as to the number of species (or genera) of invertebrates found in the region. There are many aquatic and terrestrial gastropods and an abundance of Sphaeriids. Fresh water sponges occur in several of the waters. Macro-crustaceans are rare, but at least two species of phyllo-pods are known to be present. The insect fauna is rich both in numbers of species and in numbers of individuals.



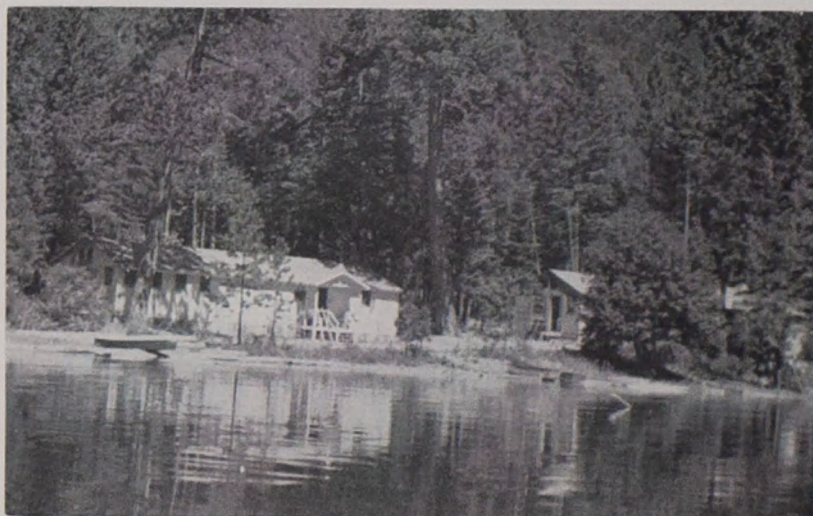
# FLATHEAD LAKE AND SURROUNDING AREA



## FACILITIES FOR INSTRUCTION AND RESEARCH

The physical plant of the Biological Station includes a two-story brick laboratory building, a four-room laboratory and three other wooden laboratories. Equipment includes boats, a launch, compound and dissecting microscopes and accessories, and other items needed in laboratory work.

In the zoological collections are skins and skulls of mammals; bird skins; a small collection of preserved reptiles, amphibians, and fishes; and a collection of invertebrates. The botanical material includes a good representative Bryophyte herbarium and a small phanerogamic collection.



—PHOTO COURTESY FRED RASMUSSEN

Research and Mammalogy Laboratories

## GENERAL LIVING CONDITIONS

### **Board and Lodging**

Board is provided at the Station commissary. All people living at the Station are required to board at the commissary.

Students and faculty live in cabins. Each cabin is provided with beds, mattresses, pillows, chairs, table and minor items of equipment. Blankets, towels and linen must be provided by the occupants. Cabins are supplied with electric lights and electric (AC) outlets. One family or four students will occupy one cabin. Because of limited space, accommodations cannot be supplied to families of undergraduates. Groups of cabins are set apart in various areas of the Station grounds for men, single women, married students and faculty.

A combination bath house and latrine, centrally located, has hot showers in addition to regular wash stands. Washing machines and stationary laundry tubs are available for use in both men's and women's sections of the bathhouse. A small ironing room is also available. No irons are supplied by the Station.



## Health

A trained nurse will be on hand at all times for treatment of minor illnesses. Several doctors in the vicinity of the Station are available for emergencies. Modern hospitals are located at Polson and Kalispell.

The drinking water comes from artesian springs and is piped to various parts of the Station grounds. The sanitary system includes both cesspools and septic tanks.

## Recreation

Opportunities for recreation are many. Mountain climbing, hiking, swimming, boating and fishing offer the best means of relaxation. Some of the best fishing in western United States is to be found within a few hours' drive of the Station. Fine catches of rainbow, cut-throat and Dolly Varden trout and landlocked red salmon are made the year round in Flathead Lake. Ideal trout fishing may be had in most of the streams and rivers in the community. There are excellent Forest Service and Indian Service trails in the Mission and Swan Mountains. There are also many fine trails with overnight accommodations at chalets in Glacier National Park. Community recreation will be planned for those in attendance at the Station.

## Field Trips

Transportation will be provided for class trips at a rate of one cent per mile. All field trips are under the supervision of an instructor. Transportation for Station excursions to areas of interest will be supplied by the Station. Many of the field trips will be completed within one day, although at least one overnight trip in each course may be expected. Meals on such trips are supplied by the commissary. The Station cannot as yet offer transportation for independent research workers; however, space on scheduled field trips will be available at the same rate as that provided for students. The cost for the summer's transportation will approximate \$10.00 to \$15.00.

## Pack Trip

The study of the taxonomy, distribution and ecology of the flora and fauna of the Mission Range is an extended research project of the Biological Station staff and investigators. To collect data for this program, a pack trip will be taken into primitive areas of the Mission Mountains during the week of August 13-19th. Interested students, who have demonstrated marked ability in their course work, and investigators are permitted to participate in this program. Students and investigators who may desire to take this pack trip are urged to notify the Director of their interest when enrolling so that cost estimates can be made.

**Scholarships**—The Western Montana Fish and Game Association Scholarship for the study of fish and related problems in Flathead Lake—This Scholarship provides \$350.00 a year to a graduate student working for his Master of Arts degree at Montana State University. Application should be made to the director, Biological Station, not later than May 1, 1950. An application for admission to the Graduate School should also be filed with Dr. W. P. Clark, Dean of Graduate School, Montana State University.

## FEEES AND EXPENSES

A student fee of \$50.00 is charged for both resident and non-resident students. This includes a cabin fee of \$10.50.

Resident and non-resident investigators, for whom research space





Mission Pack Trip

—PHOTO COURTESY R. B. BRUNSON



and general laboratory materials will be supplied, are charged a fee of \$50.00, which includes the \$10.50 cabin fee.

Dependents of students and investigators must pay a \$10.50 cabin fee. However, there is no charge for children below three years of age.

Board at the commissary is \$98 for the regular session. This must be paid at the time of enrolling.

Inasmuch as the Biological Station is a part of Montana State University, government educational benefits to veterans under Public Laws 16 and 346 apply at the Station in the same manner as they do on the University campus. Veterans should indicate on the application blank the congressional act under which they will enroll.

Full subsistence will be paid by the Veterans Administration if enrolled for nine or more credit hours.

## ADMISSION AND REGISTRATION

Students who have reached the junior level in college and who have satisfactorily completed necessary course prerequisites are eligible for admission. Students of sophomore standing with the required prerequisites may petition the Executive Committee for entrance. Applications for admission to courses should be made before May 1, using the blank provided in the catalog. Additional blanks will be provided on request. Applications will be reviewed on May 1 and notifications of acceptance will be mailed soon after. Applications made after May 1 will be considered in the order in which they are received.

Students who have not previously been enrolled at the Station must submit a complete official transcript together with recommendations from two instructors. Graduate students must first enroll in the Graduate School of Montana State University. Application blanks may be secured from the Dean of the Graduate School, Montana State University, Missoula, Montana.

A \$10.00 deposit must be included with the application for admission to the Biological Station. This will be refunded if the applicant withdraws his application before June 1. At the time of registration, this deposit will be credited to the cabin fee. Official registration will be held at the Station on Saturday, June 17. Classwork begins Monday, June 19, and extends through the full session of 8 weeks.

## CREDITS

Credits earned at the Biological Station are transferable to other colleges and universities the same as credits earned in the Botany and Zoology Departments on the University campus. Graduate credit can be received in all courses given at the Station. Undergraduates may take only those courses numbered below 200.

## ADVANCED DEGREES

Qualified students who are officially enrolled in the Graduate School may take course work and do research at the Station toward a master's degree. Master's degrees are offered in both Botany and Zoology by the respective departments. Students interested in earning a master's degree through successive summers at the Biological Station should refer to the catalog of the University. Since exact requirements



vary with the preparation of each student, each case will be considered by the department concerned and recommendations will be given to the individual student.

### **Zoology**

To receive a Master of Arts degree in Zoology for work done in part at the Biological Station, a student must fulfill the requirements for the Department of Zoology at Montana State University. These requirements are as follows:

1. Complete all work or the equivalent required for a major in the Department.
2. A minimum of one year each of collegiate botany, chemistry and physics.
3. Take the graduate record examination and, in addition, a 30-minute oral examination with each member of the staff in the Department of Zoology. These oral examinations may be waived at the discretion of the Department.
4. All work done in absentia must be approved unanimously by all members of the Department and the Graduate Committee. Twelve credits secured in an accredited college or university may be counted toward a master's degree with Departmental approval.
5. The following specific requirements must be met:
  - a. A minimum of 10 credit hours in an acceptable cognate.
  - b. An acceptable problem must be investigated and a thesis prepared on the results of the investigation.
  - c. An oral final examination in the field of Zoology must be passed.
  - d. The residence requirement of one quarter on the Missoula campus must be fulfilled.

### **Botany**

Students seeking the degree of Master of Arts in Botany for work done in part at the Biological Station must fulfill the general requirements of the Graduate School as well as the following specific requirements of the Department of Botany:

1. Pass an oral and/or written qualifying examination in Botany. A waiver of this requirement may be made in certain cases on the basis of the candidate's previous record.
2. Have Departmental approval of all work done in absentia which is to be offered as part of the total credit hours for the degree.
3. Complete all courses or their equivalents required for an undergraduate major in the Department.
4. The final draft of the thesis must be approved by the Departmental staff before it is accepted.
5. It is advisable that every graduate student in Botany complete at least one summer's work at a biological station or have equivalent field experience with a governmental or private agency.
6. Each candidate's program will be individually worked out and approved.

## DESCRIPTION OF COURSES

Students may elect only those formal courses announced in the bulletin, but certain qualified students may elect work under 199 and 200. Credit is given in quarter hours. The recommended load for students is nine hours. Maximum load for any student is twelve and the minimum load is six hours. Only exceptional students will be granted permission to carry courses in excess of nine hours. A three-hour course meets one full day a week and a six-hour course meets two full days a week. Courses are so planned that additional work, such as preparation of reports, assigned readings, study, and conferences, occupies time outside of regular class days.

### BOTANY

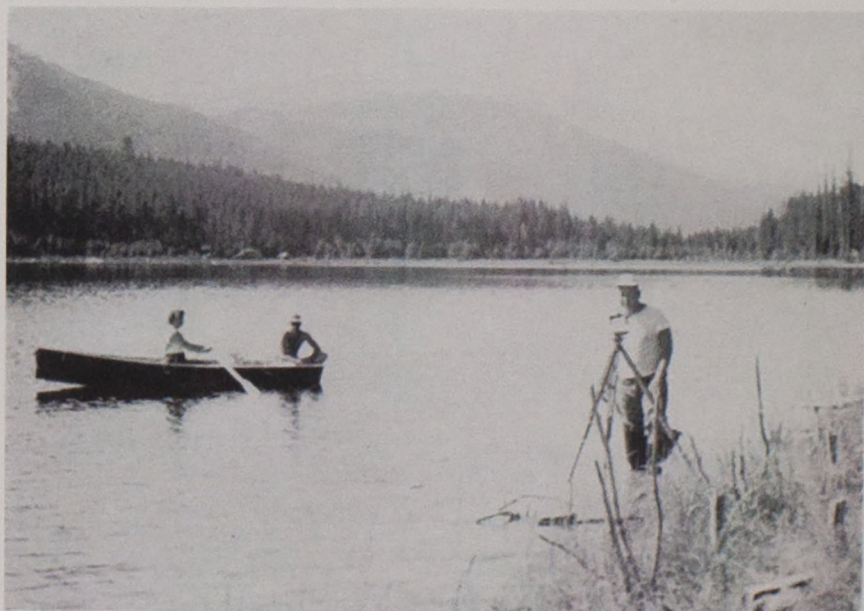
- S160. **Systematic Botany.** 6 credits. **Prerequisite:** One year's collegiate laboratory course in botany or equivalent. Identification and classification of vascular plants and their ecological distribution. Principles of nomenclature, methods of collecting, mounting and preserving plants.  
Three two-day trips are taken into alpine habitats as well as one day trips to aquatic habitats, typical palouse prairie, western white cedar-western white pine and yellow pine-Douglas fir forests and several mixed habitats. Approximately 120 species in forty families are studied.  
Botany Laboratory. Monday, Tuesday, Saturday. Harvey.
- S163. **Aquatic Flowering Plants.** 3 credits. **Prerequisite:** One collegiate laboratory or field course in systematic botany. Identification, classification and ecology of higher aquatic plants.  
The Flathead Lake area is particularly rich in aquatic flowering plants. Geographically, it is a meeting ground for aquatic plants characteristic of the lakes and streams of the Pacific Coast and the Rocky Mountains, some of the Pacific Coast species being probably relics of the ancient redwood forest flora which inhabited the region about twenty-five million years ago in Miocene time. Furthermore, most of the wide-ranging northern aquatic species characteristic of the Great Lakes region reached their western limit in Northwestern Montana. Since the Mission Valley was glaciated in Pleistocene times, numerous small lakes and ponds occur among the glacial debris, and these provide varying local habitats suitable to a wide range of species.  
Botany Laboratory. Thursday, Friday. Benson.
- S164. **Agrostology.** 3 credits. **Prerequisite:** One collegiate laboratory or field course in systematic botany. Identification, classification and ecology of grasses, sedges and rushes.  
Two two-day field trips are taken to alpine habitats and one to the mixed prairie east of Glacier National Park. One day trips are taken to typical palouse prairie and various marshy areas where sedges and rushes are numerous. Approximately 50 species of grasses, 10 rushes and 20 sedges are studied.  
Botany Laboratory. Wednesday, Thursday. Harvey.
- S174. **Fresh Water Algae.** 3 credits. **Prerequisite:** One year's collegiate laboratory course in botany or equivalent. Identification, classification, distribution, life histories and limnological relationships of the algae of the Northern Rocky Mountains.  
Botany Laboratory. (Omitted in 1950.)
- S176. **Bryophytes.** 3 credits. **Prerequisite:** One year's collegiate laboratory course in botany or equivalent. Taxonomy, ecology and morphology of the mosses and liverworts of the Northern Rocky Mountains.  
Botany Laboratory. (Omitted in 1950.)
- S199. **Special Problems in Botany.** 3 to 9 credits. **Prerequisite:** Consent of the professor. Students whose needs are not satisfied by the formally announced courses may secure advanced work in the several fields represented by the members of the teaching staff. Open to undergraduates and graduates. Staff.  
Opportunities are available for problems in the taxonomy and





—PHOTO COURTESY R. B. BRUNSON

Overnight Camp—Limnology and Invertebrates Classes



—PHOTO COURTESY R. B. BRUNSON

Limnology Class in Cabinet Mountains

the altitudinal or ecological distribution of higher plants in areas studied in all habitats mentioned under S160, S163 and S164 above.

- S200. **Advanced Botanical Problems.** 3 to 9 credits. **Prerequisite: Consent of the professor in charge of the work.** Directed research in any of the fields covered by the staff. Written report required. This may be converted to a form for publication if the results of the problem so warrant. Students wishing to enroll for this course should consult or correspond with the staff member under whom they wish to do their work as soon as they have been notified of their acceptance. If the problem requires special equipment, the Director should be notified by May 15 so that it may be arranged for. Staff.

## ZOOLOGY

- S108. **Ornithology.** 3 credits. **Prerequisite: One laboratory course in vertebrate zoology.** Life history, habits, identification and distribution of birds.  
Weekly field trips are taken to a variety of habitats extending from the marshlands of the Flathead Valley, the islands of Flathead Lake to the alpine region of Glacier National Park.  
Mammalogy Laboratory. Wednesday, Thursday, Farner.
- S109. **Mammalogy.** 6 credits. **Prerequisite: Comparative vertebrate anatomy.** The life history, habits, identification and distribution of mammals, with particular reference to those of the Rocky Mountain region.  
Four two- or three-day collecting trips are taken into representative mammal habitats. One of these trips will be taken to the National Bison Range and two to Glacier National Park. The small mammals of a plot on the Station grounds are censused annually by the live trap method.  
Mammalogy Laboratory. Monday, Tuesday, Saturday, Wright.
- S110. **Ichthyology.** 3 credits. **Prerequisite: Comparative Vertebrate Anatomy.** The classification, natural history and distribution of fishes, with special reference to those of the region.  
Fishery Laboratory. (Omitted in 1950.)
- S161. **Limnology.** 6 credits. **Prerequisite: Elementary Zoology and one collegiate course in Chemistry.** Ecology of lakes, streams and ponds, with emphasis on the physical, chemical and biotic factors which determine their biological productivity. Stress is placed on Flathead Lake but studies are conducted on reservoirs, high altitude lakes and glacial waters of Glacier National Park.  
Although most of the work is done on Flathead Lake, a three-day trip is taken to some mountain lake and a complete limnological survey is made of that body of water. The last field trip is one to a glacier in Glacier National Park where students observe the history of the water through a succession of lower lakes to the valley floor.  
Limnology Laboratory. Monday, Tuesday, Wednesday, Brunson.
- S164. **Natural History of Invertebrates.** 3 credits. **Prerequisite: Invertebrate Zoology.** The ecology, taxonomy and distribution of the invertebrates of the Rocky Mountain area. Although all invertebrates other than insects and helminths are studied, emphasis is placed upon the molluscs of the region.  
At least three overnight trips are taken. The Mission, Whitefish and Cabinet Mountains and Glacier National Park are visited to secure representative invertebrate types. About 30 species of molluscs, 5 species of sponges and the red Hydra are included in the forms studied.  
Invertebrate Laboratory. Friday, Saturday, Brunson.
- S165. **Entomology.** 6 credits. **Prerequisite: Two laboratory courses in Zoology, including invertebrate zoology.** Introduction to the morphology, physiology, taxonomy and ecology of the Insecta.  
Research Laboratory. (Omitted in 1950.)
- S166. **Aquatic Insects.** 3 credits. **Prerequisite: Zoology 14ab (Elementary Invertebrates) or equivalent and consent of the professor.** A study of the insect fauna, both immature and adult, of aquatic habitats of Western Montana.  
Invertebrate Laboratory. Thursday and Friday, Castle.



- S199. **Special Problems in Zoology.** 2 to 6 credits. **Prerequisite: Adequate background courses in the subject and consent of the professor.** Opportunity is available for students to pursue work under the guidance of the professor in the field of interest. Staff.

**Mammalogy**—Opportunities are available for study of distributional, taxonomic and life history problems of mammals. Live traps are available for problems involving censusing of small mammals. There are sizeable populations of flying squirrels, chipmunks, red-backed mice and shrews on the Station grounds or in the immediate vicinity. Arrangements may be made to carry out special problems either with small mammals or the big game species in Glacier National Park. Wright.

**Ornithology**—The Station area offers opportunity for the study of life histories, local distribution and ecology of resident species. Live traps are available for banding studies. Problems of broader scope may be pursued in adjacent areas. Farner.

**Entomology**—Western Montana offers almost unlimited opportunities for taxonomic, ecologic and life history studies of insects. The immature stages of many aquatic forms which occur in the area are practically unknown. With a wide variety of habitats available, ecological studies of many groups are possible. Castle.

**Fisheries**—There are excellent opportunities for studies of distribution, migration, feeding habits and age and growth of the fish of Flathead Lake and surrounding lakes. Gill nets, seines and boats are available for use. Brunson.

**Invertebrates**—Possibilities are unlimited for ecological, life history and taxonomic studies of all the invertebrates. These studies may be made independently or in conjunction with the Invertebrate class. Brunson.

- S200. **Advanced Zoological Problems.** Credit variable. **Prerequisite: Consent of professor.** Opportunity is given graduate students with sufficient preparation and ability to pursue original investigations. Staff.

- S261. **Limnological Methods.** 3 credits. **Prerequisite: Graduate standing, limnology, and at least one year of collegiate chemistry.** A course which provides field and laboratory practice in standard procedures employed in limnological investigations. Brunson. (Omitted in 1950.)





Yellow Bay

—PHOTO COURTESY R. B. BRUNSON



# INFORMATION FOR 1950 SESSION

## Enrolling

The size of each class will be limited so as to make the most efficient use of materials and equipment on hand. **Therefore, when applying for admission, each student should show a first and second choice of schedule of courses or problems.** Although a six-hour course normally meets two days a week and a three-hour course meets one day a week, all classes are scheduled an extra day each week to reserve time for two-day trips. Enrolling permits, showing whether first or second choice is granted, will be mailed as soon as action has been taken by the Executive Committee.

## Equipment Needed

The student is responsible for supplying his own bedding, linens, toilet articles and proper clothing. As a rule, summer rains will come the last week of June and the first week of July. However, local showers occur in high altitudes, so that rain equipment that is light to carry is desirable. Nights are cool, and temperatures are low at high altitudes. Therefore the student should be supplied with warm clothing, preferably wool. Since many of the classes will do mountain climbing during the course of the summer, students are strongly advised to have adequate foot wear. Regular mountain boots are advisable for climbing. For those intending to do aquatic work, tennis shoes or hip boots will probably be the best type of foot wear. Recreational equipment should be supplied by individual students.

Inasmuch as many overnight trips will be taken, back-packs and sleeping bags (such as the inner bag of the arctic type) are recommended.

Books and class supplies can be obtained from student book store supplies.

Since the Station area is a game reserve, dogs and other pets are not allowed. Firearms may not be brought on the premises without advance, written permission from the Director. All guns will be kept in the gun room.

## Remunerative Work

Opportunities for work are not many. Graduate assistantships are available in most of the courses. To be eligible for one of these assistantships, a student should have had the course or its equivalent in some other institution. There will be opportunity to work by the day and by the hour at janitor work, day labor on the Station grounds, and driving trucks. Applications for work should be sent to the Director.



Cabin in Manville

—PHOTO COURTESY ARTHUR MERRICK

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## APPLICATION FOR ADMISSION

MONTANA STATE UNIVERSITY  
BIOLOGICAL STATION

Missoula, Montana

SUMMER SESSION, 1950

Name ..... Age.....  
Last First Middle

Mailing Address .....

Graduate..... Undergraduate..... Year..... Major Field.....

Institutions previously attended (with year of graduation):

College or University.....

Degrees with Dates.....

Veteran.....; PL 16....., PL 346.....

(Continued on next page)





Chow Time

—PHOTO COURTESY R. B. BRUNSON

If a member of some instructional staff, give status: .....

Schedule of courses desired:

First Choice: .....

Second choice: .....

If Research Work: (a) Independent....., (b) Under Supervision.....

If under supervision, with whom or in what field?.....

Cabin requirement:

Roommate preferences .....

If married, will wife or family accompany you?.....

If so, give number and ages of children.....

(Instructions for arrival and other pertinent information will be mailed to applicants.)

(Additional bulletins may be obtained by writing to the Director.)

## NOTES





The Mission Range

—PHOTO COURTESY R. B. BRUNSON