1956

Biological Station Summer Session, 1956

Montana State University (Missoula, Mont.)

Flathead Lake Biological Station

MONTANA STATE UNIVERSITY

BULLETIN

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Collecting trip at St. Mary's Lake in Glacier National Park

1956 Session of the University

BIOLOGICAL STATION

Flathead Lake

June 16 to August 11
and July 16 to August 18

Bigfork, Montana

The Montana State University
BIOLOGICAL STATION

Staff

GORDON B. CASTLE, Ph.D.
Professor of Zoology and Director of the Biological Station, Montana State University

PAUL BALDWIN, Ph.D.
Visiting Assistant Professor of Zoology, Colorado A&M College, Fort Collins, Colorado

ROYAL BRUCE BRUNSON, Ph.D.
Associate Professor of Zoology, Montana State University

JAMES S. GEBHART, M.S.
Assistant Professor of Education, Montana State University

LEROY H. HARVEY, Ph.D.
Assistant Professor of Botany, Montana State University

GERALD W. PRESCOTT, Ph.D.
Visiting Professor of Botany, Michigan State University, East Lansing, Michigan

JOSEPH W. SEVERY, Ph.D.
Professor of Botany, Montana State University

PHILIP L. WRIGHT, Ph.D.
Professor of Zoology, Montana State University

Photos by Ralph S. Palmer and Royal Bruce Brunson. Cover photo by Brunson.

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The Summer Session
June 16 to August 11
and
July 17 to August 18

The Biological Station is a unit of the Summer College of Montana State University. All courses offered at the Station except Field Zoology, Field Botany, and Introduction to Systematic Botany are designed at the upper division and graduate levels. Students who have reached the junior level in college and who have satisfactorily completed necessary course prerequisites are eligible for admission. Other students may petition the Director for entrance. Biology teachers are invited to take advantage of those courses designed particularly to fit their teaching needs. Investigators in all fields of natural history and biological research are encouraged to utilize the facilities of the station.

GEOGRAPHIC LOCATION

The main station grounds are located on the east shore of Flathead Lake where the north end of the Mission Mountains rises abruptly from the lake shore. The station also owns several acres of land on various islands and along Polson Bay at the south end of the lake. Although the more formal course work is given in the seven well-equipped laboratories, all courses emphasize field work. Trips from one to four days' duration are taken to various ecological areas of Western Montana.

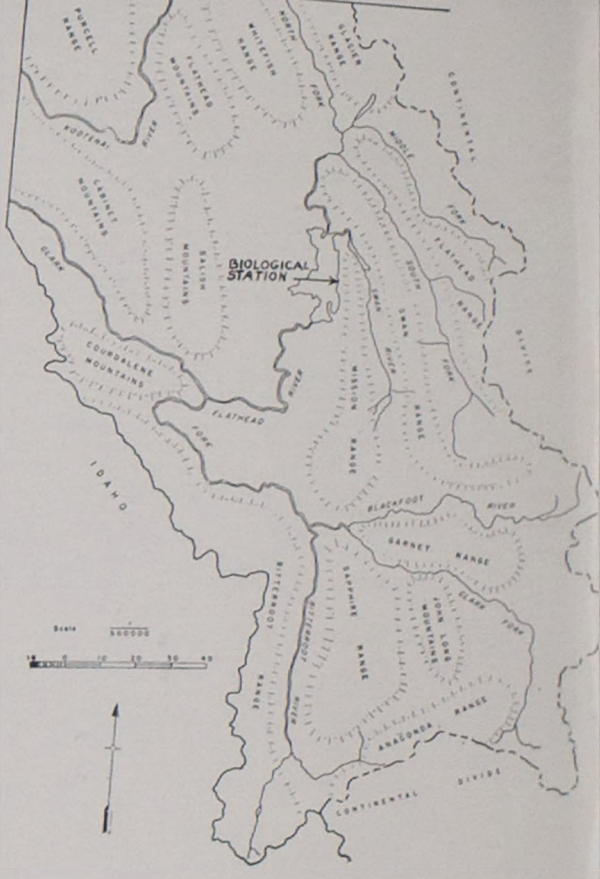
Flathead Lake lies in the Flathead valley at the southern end of the Flathead and Purcell Trenches of the Rocky Mountains. The valley is bordered by mountain ranges showing marked differences in geological structure and lies about 40 airline miles west of the Continental divide, just south of the Canadian border. The entire valley and the adjacent slopes of the surrounding mountains form one of the upper reaches of the Columbia River Drainage. In Glacier National Park the headwaters of the Hudsonian and Mississippian drainage systems are also accessible for study.

Limnology and Entomology Laboratory on Yellow Bay

OPPORTUNITIES FOR STUDY AND RESEARCH

Flathead Lake and the Station grounds are at an elevation of approximately 3000 feet. The Mission and Swan Ranges reach an altitude of 10,000 feet and several peaks in the Livingston and Lewis Ranges of Glacier National Park Exceed 10,000 feet. The variety of habitats found in this range of altitude offers unlimited possibilities for research in botany, zoology and ecology.

Although the predominant vegetation types are those of the montane and sub-alpine forests, there are also present many representations of the coast forest, sage brush, grassland and tundra formations. Botanical research in this region to date has been almost entirely of the preliminary survey type. Research possibilities are unlimited in both higher and lower plant groups on taxonomic, ecological, distributional, and comparative aspects within the three drainage systems.



The possibilities for research in Zoology are equally as good. All of western Montana is practically unknown territory, particularly for taxonomists and ecologists. Seventy-five species of mammals occur 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 four species of phyllopods are known to be present. The insect fauna is rich both in numbers of species and in numbers of individuals.

The fields of limnological and fisheries research are also "wide open." Flathead Lake, with its 200 square miles of surface area and maximum depth of 107 meters has yielded such a bare minimum of information that it will supply data for years to come. The same holds true for the hundreds of lakes at all elevations in the many mountain ranges. Very little is known about the distribution, migrations, life histories and natural history of either the native or introduced species of fish now found in western Montana.

COOPERATING AGENCIES

The facilities and active cooperation of many state and federal agencies are available to the staff and research workers of the Biological Station. Research projects are conducted independently and in cooperation with biologists and naturalists in Glacier National Park, at the Rocky Mountain Laboratory in Hamilton, at the National Bison Range at Moiese, with the Fish and Wildlife Service Wildlife Research Unit at the Missoula campus, and with the State Fish and Game Department in various sectors of the state. Both long-range and short-term research projects are feasible under these arrangements.

Lake McDonald and Peaks of the Lewis and Livingston Ranges

Collecting along the shore of Bowman Lake in Glacier National Park.

Citellus columbianus
—Palmer

Field Zoology class at a remote wilderness lake

Description of Courses

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

Credit is given in quarter hours. The recommended load for students is nine hours for the eight-week session. 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. 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.

A student electing work in either Botany or Zoology S199 and S200 must secure the consent of the instructor in charge before action can be taken on his application by the executive committee.

Five-week Session

A special session of five weeks' duration is offered for the summer of 1956. This session runs from July 16 to August 18 and is dove-tailed into the regular eight-week course. It is designed particularly for teachers who wish to take course work in Field Zoology and/or Field Botany. Anyone interested in this shorter session should write to Director, Biological Station, Montana State University, Missoula, Montana, and ask for complete details.

Conservation Education Workshop

The Conservation Education Workshop stresses those problems and principles of conservation which are particularly characteristic of the Northwest. Proper management of natural resources is the keynote of the workshop, and field trips are designed primarily to emphasize management practices. Extending over the five-week period from July 16 to August 18, the workshop can be taken in combination with certain other courses of either the regular session or the five-week session. Credit is variable from 3 to 9 hours. The workshop is under the direction of Professors Gebhart and Severy, assisted by professional men in the conservation field. Anyone interested in this program should write the Director, Biological Station, for more detailed information.

Regular Session

Weekly Course Schedule:

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Bot. S61	Bot. S61	Bot. S160	Bot. S174	Bot. S160	Bot. S163
Zoo. S109	Bot. S160	Bot. S174	Zoo. S108	Bot. S163	Zoo. S15
Zoo. S161	Zoo. S109	Zoo. S108		Zoo. S15	Zoo. S109
Zoo. S165	Zoo. S161	Zoo. S161			
	Zoo. S165	Zoo. S165			

BOTANY

S15. **Field Botany.** 3 credits. No prerequisite. A field course in the collection, preservation and identification of plants and consideration of where they grow.

S61. **Introduction to Systematic Botany.** 3 credits. A course in field botany which deals with the summer flora of North-western Montana. Training in the use of a manual for identifying plants is emphasized. Plants of the prairie, forests, and high mountain areas are studied. Botany Laboratory. Monday, Tuesday. Harvey.

Limnology class making a reconnaissance of Lake McDonald

Beargrass
—Palmer

Class in Laboratory

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. Tuesday, Wednesday, Friday. Harvey.

S163. **Aquatic Flowering Plants.** 3 credits **Prerequisite: One collegiate laboratory or field course in systematic botany.** Identification, classification, ecology of higher aquatic plants.
The Flathead Lake area is particularly rich in aquatic flowering plants. The small lakes and ponds among the glacial debris of the valley floor provide varying local habitats suitable to a wide range of species.
Botany Laboratory. Friday, Saturday. Prescott.

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 studies.
Botany Laboratory. Days to be arranged. 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. Wednesday, Thursday. Prescott.

S176. **Bryophytes.** 3 credits.
(Omitted in 1956.)

S199. **Special Problems in Botany.** 3 to 9 credits. **Prerequisite: Advance written consent of the instructor.** 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 the altitudinal or ecological distribution of plants in areas studied in all habitats mentioned under S160, S163, S164 and S174 above.

S200. **Advanced Botanical Problems.** 3 to 9 credits. **Prerequisite: Advance written consent of the instructor 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 arrangements can be made. Staff.

ZOOLOGY

S15. **Field Zoology.** 3 credits. A field and laboratory course in the collection, identification, and preservation of animals. Students not only collect and study animals in the field, but also learn to associate the individual species with certain habitat characteristics. Field work is followed up by identification in the laboratory with the use of taxonomic keys.
Invertebrate Laboratory. Friday, Saturday. Brunson.

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. Baldwin.

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- and 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.
(Omitted in 1956.)

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. Days to be arranged. 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.
Invertebrate Laboratory. Monday, Tuesday, Wednesday. Castle.

S166. **Aquatic Insects.*** 3 credits. **Prerequisite: Zoology 14ab (Elementary Invertebrates) or equivalent and consent of instructor.** A study of the insect fauna, both immature and adult, of aquatic habitats of Western Montana.
Invertebrate Laboratory. Days to be arranged. Castle.

S199. **Special Problems in Zoology.** 2 to 6 credits. **Prerequisite: Adequate background courses in the subject and advance written consent of the instructor.** Opportunity is available for students to pursue work under the guidance of the instructor 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. Baldwin.

Entomology—Western Montana offers almost unlimited opportunities for taxonomic, ecological 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 oportunities for studies of distribution, migration, feeding habits and age and growth of the fish of Flathead Lake and surrounding lakes. Gill nets, seines, trap nets 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: Advance written consent of instructor.** Opportunity is given graduate students with sufficient preparation and ability to pursue original investigations. Staff.

S261. **Limnological Methods.** 3 credits.
(Omitted in 1956.)

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*Enrollment demands will determine which of these two courses (S165 and S166) will be offered in 1956.

General Information

FEES

A student fee of $53.50 (maximum) 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 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 $15 per week*. 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 894 and 550 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.

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.

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.

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 Botany, Zoology, and Wildlife. Students interested in earning a master's degree through successive summers at the Biological Station should write to the chairman of the department of either Botany or Zoology for additional information.

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, 1956. An application for admission to the Graduate School should also be filed with the Dean of the Graduate School, Montana State University.

FIELD TRIPS

Transportation will be provided for all regular class trips. All field trips are under the supervision of an instructor. 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 made available to them.

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*Subject to the approval of the State Board of Education.

REMUNERATIVE WORK

Opportunities for work are not numerous. Graduate assistantships are available in most 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.

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 found within a few hours' drive of the Station. Fine catches of rainbow, cutthroat 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. Weekly climbs into the Missions and community recreation will be planned for those in attendance at the Station.

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 arctic type) are recommended.

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

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.

ENROLLING

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 notification 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 16. Classwork begins Monday, June 18 and extends through the full session of 8 weeks.

Lunch stop on field trip to plains east of the Continental Divide

Application for Admission

MONTANA STATE UNIVERSITY
BIOLOGICAL STATION
Missoula, Montana
SUMMER SESSION, 1956

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 894 _____; PL 550 _____

Regular session _____ Five-week session _____

(Continued on next page)

Men's quarters along shore of open lake—Mission foothills in background

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? .....

Are you interested in taking post-session trip? .....

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.)

Bibliography of Recent Papers

—based on work done in part at the Biological Station of Montana State University—

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