

**A PROGRESS REPORT ON THE  
SAGEHEN CREEK EXPERIMENTAL  
WILDLIFE AND FISHERIES PROJECT, 1951**

by

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In 1951, the University of California started construction of an experimental wildlife and fisheries station known as the Sagehen Creek Project under the Fisheries Section of the Zoology Department. The station is located in the Tahoe National Forest, 15 miles north of Truckee in Nevada County, California, at an elevation of 6,600 feet. Field research is made possible by a Cooperative Agreement drawn up between the Regents of the University of California and the US Forest Service. About 112 acres of land bordering the stream have been set aside by the Forest Service under a Special Use Permit to the University for such studies as are proposed here and for an indefinite period. Research on wildlife problems will be directed by Dr. A. Starker Leopold of the Museum of Vertebrate Zoology while the fisheries program and general administration of the project will be a responsibility of the writer.

Selection of Sagehen Creek came only after an extensive reconnaissance of a large part of the eastern drainages of the State in 1950. The necessary prerequisites of a fairly small, controllable stream in a region of normal public use and vulnerability to severe winter conditions were found there. Furthermore, the Sagehen Creek basin is in excellent shape with respect to soils, timber and general ecological conditions and offers exceptionally favorable opportunities for research on wildlife and fishery problems.

#### Fisheries Research Program

The broad, over-all program in fisheries is to be directed toward solution of basic problems concerned with survival and migrations of trout on a year-round basis. Sagehen Creek is small and for this reason total fish populations can be utilized in the areas proposed for study. Freshwater streams are rigorous habitats where ecological extremes of flood and droughts, heat and cold affect their inhabitants. In this respect Sagehen Creek offers no major obstacles to measuring such ecological factors under carefully controlled conditions.

Winter conditions in freshwater streams are poorly understood. The formation and dispersal of frazil, anchor, and surface ice hinges around fractions of a degree below and above 0°C. The concomitant effects on fish and their foods are most marked. Fisheries literature is barren of significant winter biological observations. The work planned will be paralleled with studies made during other seasons of the year and both will be focused on the central problems of survival and migrations.

#### Methods

Survival Studies. Sections of Sagehen Creek of varying lengths have been set aside as experimental areas. Sampling of wild populations of fish is accomplished by diversion of the stream into side channels and pumping the pools dry with a portable

pump. All fishes taken are weighed and measured alive and after marking, returned to the stream alive. Periodic sampling of the same areas at specified intervals of time, combined with the operation of two-way traps, will provide the basic population statistics. Complete weather data, water temperatures and flow data will be recorded on a daily or weekly basis. Water analysis for pH, oxygen, CO<sub>2</sub>, and alkalinities will provide a background for seasonal changes in the character of the water.

Winter water temperatures in the region around 32°F will be taken with a resistance thermometer sensitive to 0.1°F and provided with three terminal bulb-stations. The conductor wires from these will run into the field & laboratory where protection from the elements will be had for the recording instruments. That the Sagehen Creek Project is located in an area subject to climatic extremes is evidenced by the fact that on January 3, 1952, air temperatures of 41°F below zero were reported at Boca, California, some seven miles from the Sagehen Creek Station. Maximum yearly ranges of over 140°F have been recorded there. The snow pack approximated eight feet at the station on February 15, 1952.

Migration Studies. The extent and time of fish migrations will involve the use of two-way fish traps, mentioned above, as "traffic control" points in order to account for decreases or increases in numbers of fish moving into, or out of, given sections of stream. Four, two-way fish traps will be installed at points selected for their strategic value in relation to spawning areas, beaver dams, and other items that aid or impede movement of fish either up or downstream. These will be regularly attended and a complete record maintained.

A fish-marking program is being developed in order that an accurate record may be kept of the movements and survival of fish handled both through the traps and in the stream areas sampled periodically by pumping and draining.

#### Fishery Work of 1951

While construction work of necessity limited the amount of fisheries work undertaken in 1952, nevertheless a satisfactory start was made. The first season's biological work was largely in the nature of a preliminary survey to determine the species of fish present and their distribution in the Sagehen Creek Basin, as well as a study of the physical and biological characteristics of the basin. This approach was necessary in order to ascertain exactly the type & nature of the research opportunities afforded by the aquatic environment there. With the preliminary survey work completed, it is now possible to plan the long-range fishery program outlined above.

From preliminary sampling of the fish populations in 1951, it was determined that a total of at least nine species inhabit the basin in addition to one hybrid. These are eastern brook, brown, and rainbow trout, sculpins, Rocky Mountain whitefish, speckled dace, red-sided shiners, and two kinds of suckers. Curiously enough, only trout and sculpins occur in Sagehen Creek above Highway 89, while about two miles downstream, in addition to these forms, whitefish, dace, shiners, and suckers suddenly enter the picture and are fairly abundant. Little is known regarding the ecological factors governing distribution of these so-called "trash" fishes that are enormously abundant in most drainage basins east of the main escarpment of the Sierra Nevada Range.

#### Allied Fish and Game Problems

As noted above, the Sagehen basin offers a rich array of field problems where modern ecological concepts dealing with intra and inter-specific relationships of fish and game animals in relation to their environments may be studied in great detail. With respect to fishes of the basin, much basic life history work remains to be accomplished and, of course, can parallel the population studies proposed. The emphasis will be on long-range studies covering at least ten years on the larger problems with lesser amounts of time being allotted to smaller, peripheral but closely related problems that might be undertaken by graduate students. A description of five such problems follows herewith.

1. Beaver-Trout Relationships: There are three areas on Sagehen Crook that contain a series of beaver dams. Trapping operations just above one of these groups produced only six trout while another trap installed well above the blocking effect of the dams, produced 72 eastern brook and brown trout over the spawning-period of those fish in the fall of 1951. While these data are not conclusive, it is evident that beaver dams in this instance at least, were a major factor in preventing upstream movement. A graduate, wildlife student is planning to investigate this problem and his work will be closely coordinated with the general over-all problems of survival and migrations. Aside from playing a major role in blocking movements of fish, beaver dam flood stream-side land areas and cause drastic changes in aquatic habitats. For these reasons, research on the problems presented under typical California conditions, should open up new management methods for the benefit of our resources in beaver and trout.

2. Production of Naturally Spawned Trout to Angler's Creels: Sagehen Creek presents a fine opportunity for operation or a creel census to determine productivity of trout to anglers' creels without the stocking of hatchery fish. This work should be of particular interest to fishery managers, for the data obtained might indicate more clearly than is evident now, the amount of fish provided by natural reproduction to anglers and permit a more critical examination of the whole fish planting problem. Natural propagation of eastern brook, rainbow and brown trout is heavy in stream and a complete creel census would tell precisely how many, what kinds, sizes and numbers of fish are taken by anglers. The stream is fairly heavily fished and good catches are made over the open season but even so, the sampling data taken in 1951 indicated a high survival of the larger breeders to assure future angling crops.

3. Predator-Competitor Relationships between Cottids and Trout: Mr. Eli Dietsch will finish his M.A. thesis by June, 1952, on a study of the predator-competitor relationships between sculpin and trout in Sagehen Creek. Sculpin are abundant in Sagehen Creek, over 500 being collected from less than 150 feet of stream in one instance.

4. Distribution of Fishes in the Sagehen Creek Basin: Mr. Glen Flittner, another graduate student, has started a study of fish distribution in relation to water temperatures, elevations, and other factors; a study which will be continued through 1952. The results of studies on such sub-problems as these named here, will form the fabric of the overall results to be published in suitable form when sufficient materials have accumulated.

5. Study of Cyclic Population Changes in Sooty Grouse and Related Forms: Today a great fund of knowledge has accumulated on population cycles in grouse, lemmings, ptarmigan, rabbits, and other animals. To date no one has solved the question of why and how these synchronous cycles occur. Diseases, parasites, sun spot cycles and

weather have all been considered as major factors. The fact that there may be fluctuations in the basic nutritional values of foods eaten by cyclic species has been offered but never followed up. The problem of cycles will be attacked from the standpoint of qualitative nutrition with special emphasis on chemical analyses of the principal food plants, particularly in late winter when the lowest protein levels are reached. These observations will be correlated with ecological field studies relating to fluctuations in numbers of selected species, reproductive success, food habits, movements, parasites and other factors. Mr., Robert S. Hoffman, Teaching Assistant in Zoology, has already started work on this project.

6. Management Study of the Little Truckee System: Sagehen Creek, with Webber Creek and Independence Creek, form the three main tributaries of the Little Truckee system. The water of all of them drains into Boca Reservoir and finally into the main Truckee River. It is a productive and heavily fished basin. Over thirty miles of stream and approximately ten lakes including Independence, Webber, and Lake-of-the-Woods comprise the general aquatic picture. Eventually, if and when funds permit, the work under the Sagehen Creek Project might well be expanded to include all waters in the basin. To date no such detailed study of a large basin has been attempted. The present program might well be expanded in future years to include such a study if the initial efforts are as productive of results as is anticipated. Progress in any field of endeavor today is dependent upon observation and experiment. In the field of wildlife and fisheries, progress in the past has been largely measured by the numbers of gamebirds and fish planted, not on the end result in the bag or creel. Wishful thinking as opposed to facts have dictated past fish and game policies. The combined efforts of state, federal and university fishery researchers, properly organized, equipped, and directed on such a broad program might over a period of years, contribute much fundamental knowledge to a more rational solution of pressing fish and game problems than is practiced today.

For further purposes of illustration, listed herewith are a few other lines of research that might well be done at the Sagehen Project:

1. Life history work on each species of fish in the basin.
2. Limnology of Independence and Webber Lakes and Boca Reservoir.
3. Causes of decline of the Lahontan cutthroat trout which was formerly the dominant species of fish in the basin.
4. Ecological studies on density-dependent and density-independent factors in relation to the abundance of each species present.
5. Development of stream improvements to aid natural propagation and survival of gamefishes.
6. Studies on the productivity of Sagehen Creek in aquatic foods with special emphasis on determining means of increasing the abundance of foods in natural waters.
7. Utilization and culture of aquatic organisms as a means of supplementing and improving diets fed in fish hatcheries.

#### Construction Program in 1951

Initial construction was undertaken on June 15, 1951 and at first was devoted primarily to the facilities needed to provide suitable living conditions for personnel. Two, 14' x 16' wall-tent floors were erected and installation of two outbuildings quickly followed. Benches and tables were constructed along with the necessary shelves for storage of various items. These tents were provided with wood stoves, steel cots and

mattresses. Summer housing for ten persons and over-winter accommodations for two have been completed. As the summer season progressed, a 14' x 16' equipment storage cabin was erected, as well as a completely winterized 14' x 20' cabin. The latter structure will serve as the project headquarters for personnel engaged in winter studies, and for this reason was provided with complete rock-wool insulation, oil heat, bathroom with shower and kitchen supplied with a propane gas range, refrigerator, and hot-water heater.

A temporary water system was provided by placing a small, surplus army pump on the creek bank and pumping water into two 55-gallon, steel drums placed up on the hill above the camp. This provided a gravity supply to the headquarters cabin, laboratory tent, and outside shower. The latter is for the use of staff members conducting research in the area during the summer. Other major items completed were a septic tank and drain field for the main cabin, a sump for the outside shower and laundry trays, and an outside wood boiler for heating water.

During the month of August a pair of portable two-way fish traps were constructed. These were designed for a preliminary survey of the pre- and post-spawning movements of the trout population in Sagehen Creek. The structures were installed during the first week of October, and remained in operation until the project was closed for the winter in early November.

A Bristol 2-pen thermograph recorder was installed on July 27, and remained in operation until November 11, 1951. Air and water temperatures for this period were recorded on standard weekly charts. Maintenance of a complete year-long record will be kept, once year-round operations are started.

Another task completed during the months of July and August, 1951, was the laying out and mapping of the land and water, areas that are covered by the Forest Service Special Use Permit to the University. Boundaries were established, and a segment of stream bottom approximating 1.25 miles in length was included in the project area. A spring which maintains a flow of approximately 30 gallons per minute, and which is situated within the northwest corner of the project area, is expected to provide a gravity water supply for the camp and for a small experimental hatchery to be built later.

#### Costs

The sum of approximately \$11,000.00 was spent in 1951 on the above items, including the fisheries research program and it will be necessary to spend a similar amount in 1952 in order to adequately meet the requirements of the work program outlined above. All funds used to date have come from the Fisheries budget under the Department of Zoology. Approval to proceed with the Sagehen Project was granted in the spring of 1951 by University authorities.

#### Personnel

The following graduate students formed the back-bone of the work-crew that helped get the Sagehen Project underway: Mr. Warren Freihofer, Mr. Tom Beland, Mr. Tom Haratani,, Mr. Eli Dietsch, and Mr. Glenn Flittner. These men are all majoring in fisheries work.

## Construction Program – 1952

Funds will, of necessity, limit the contemplated construction program. Assuming that sufficient funds are available after July 1, 1952, the following projects will be undertaken: (1) construction and installation of two more 2-way fish traps; (2) fencing of camp headquarters area; (3) construction of a suitable laboratory building for year-round use; (4) installation of a 500 gallon tank in water system; (5) construction of a small experimental fish hatchery to house 12, 6 foot troughs; and (6) insulation of the water supply system to permit over-winter operation.

### Equipment

The station is fairly well equipped now with small items of equipment such as nets, seines, fish-shocking motor, pumps, and thermometers plus the usual laboratory equipment used in field investigations. Eventually it will prove desirable to install a gravity water system by piping the 44°F spring water referred to above down the 0.4 mile to the station headquarters and funds for this will be requested in the future budget.

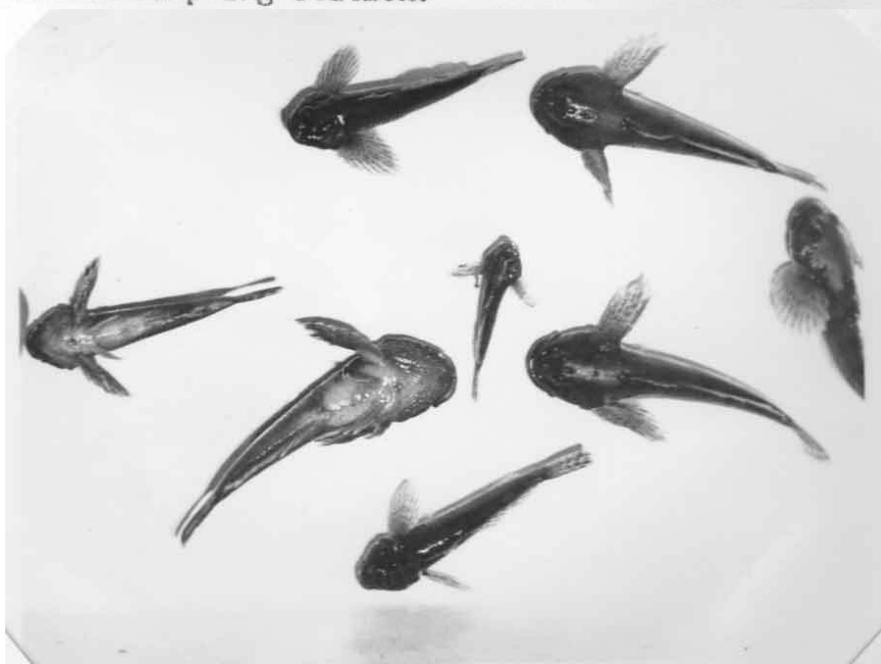
### Cooperation

Excellent cooperation has been given the project both by staff members in the Department of Zoology and by members of other University departments. The late Dr. Harold Kirby, Chairman of the Zoology Department, was especially helpful, as were staff members of the Museum of Vertebrate Zoology. Dr. E. Gorton Linsley, Chairman, and Dr. R. L. Usinger of the Division of Entomology and Parasitology of the College of Agriculture have both expressed an interest in the possibilities of study of aquatic insects offered by Sagehen Creek and Dr. Usinger started work on the aquatic faunas there last summer. This work will greatly aid the fisheries investigations by making known the forms present and their importance as fish foods. Some fifteen graduate students and twelve Faculty Members from the Berkeley and Davis campuses visited the project in 1951 and all displayed keen interest in the ecological possibilities of the areas both from the point of teaching and research in Zoology.

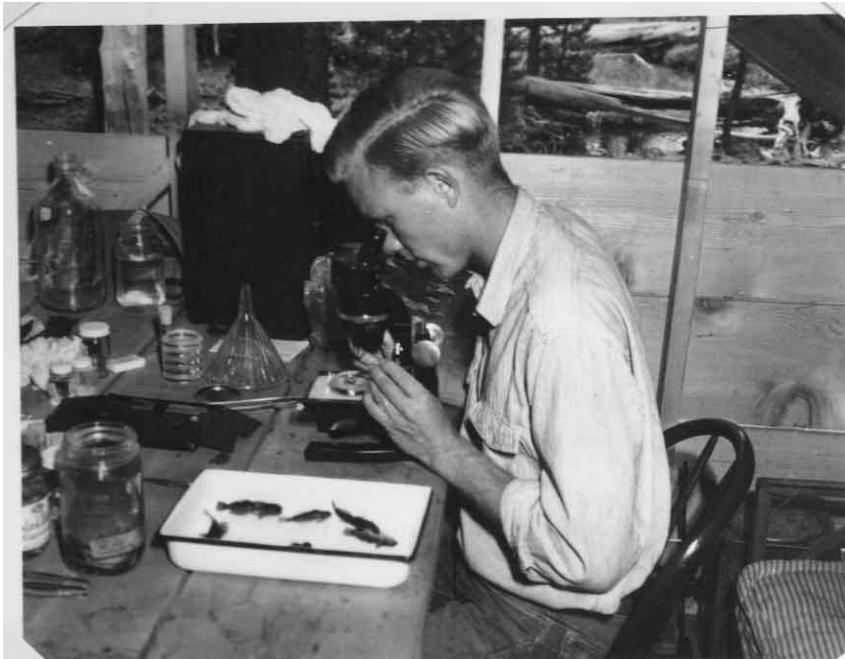
The California Department of Fish and Game has agreed to provide all fish required in the experimental program and to assist the work in every way possible. Mr. Jack Fraser, District Biologist in fisheries, visited the project twice while Mr. Alan Taft, Chief, Bureau of Fish Conservation, and Mr. Seth Gordon, Director, California Department of Fish and Game, inspected the station in early July, 1951. The U.S. Forest Service through Mr. Fred Cronemiller, Chief, Division of Wildlife Management, and Mr. Guerdon Ellis, Supervisor of the Tahoe National Forest, gave much aid to the Sagehen Creek program. Mr. Boehm, District Ranger, at Truckee, California, gave much day to day help that was of immense value in getting the work underway. Not the least of this in 1953 was the grading and improvement of the dirt road leading into the Project 1.5 miles from State Highway 89. Arrangements have been made with the Forest Service for loan of an International T.D.9 tractor for getting in and out of the project headquarters in -winter and for doing light bulldozing work, road clearance and other miscellaneous tasks.



Field workers recording data at a stream  
bottom sampling station.



Sculpins (Cottus beldingi) collected from  
Sagehen Creek



Glenn Flittner working over samples of sculpins taken in Sagehen Creek.



Sagehen Creek in vicinity of the Station Headquarters camp.