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Michigan's Hunt Creek Fisheries Experiment Station[1]

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As early as 1935, staff members of Michigan's Institute for Fisheries Research[2] felt the need for a field experiment station where trout problems could be investigated continuously and more intensively than was possible by field trips from a central laboratory in the southern part of the state. A major purpose of the creation of such a station was to provide comfortable living quarters and good facilities for investigations of trout throughout the year, but especially during the winter months which may be the "bottleneck" in trout production.

In 1938, approval was given and funds made available by the Michigan Conservation Commission for the establishment of a field laboratory and experimental area to be devoted principally to the investigation of trout stream problems. After carefully examining various streams in different parts of the state, Institute staff members agreed on a section of the headwaters of Hunt Creek, a tributary of the Thunder Bay River, in the northeastern part of Michigan's lower peninsula. With the exception of two small private

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[1] Contribution from the Michigan Institute for Fisheries Research

[2] Technical branch of the Fish Division, Michigan Department of Conservation

holdings on minor tributaries, all the stream frontage was already state-owned; the stream system itself seemed fairly typical of the many smaller trout streams of this part of the state; its size was such that it could be worked by a relatively small number of men with ordinary equipment; it was known to be but little affected by ice formation; and the area, while off the main roads, would be relatively accessible the year around.

The experimental area embraces about three miles of Hunt Creek, as well as six of its tributaries of varying importance which range in length from about one-sixth of a mile to 2-1/4 miles. There are also four small lakes (more properly called ponds), two of which contain brook trout all on tributaries of Hunt Creek. The water supply of the system is derived almost wholly from springs. The country is hilly, with swamps of tag alder, cedar, balsam and tamarack along some portions of the stream system. The uplands formerly supported good stands of red and white pine but are now mainly forested with second growth aspen, white birch, maple and oak. The soil is largely of sand and gravel which absorbs rainfall and minimizes floods.

At the lower end of the experimental area the average flow is about 22 cubic feet per second. The slope of the stream bed is considerable; through most of its course the surface velocity is between 1 and 2.5 feet per second. Through the upper reaches of the stream, dense cover is provided by white cedar swamp. Then the course enters a relatively open, marshy area, the scene of former beaver activity, where clumps of alder provide varying amounts of shade, and cover is largely restricted to the slightly undercut banks. Below the

marsh, the stream flows between high banks supporting a mixed growth of aspen, balm-of-Gilead and oak, with occasional clumps of white cedar, spruce and balsam along the water's edge. After more than half a mile the character of the streamside gradually reverts to swamp conditions, with dense growths of white cedar and tamarack. Here, however, the swamp forest seldom extends to the shoreline, and the stream receives considerable sun. The stream flows through swamp for about 1,800 feet, then enters a broad, open, marshy meadow which continues for a little over half a mile to the lower end of the experimental area.

Through the upper marsh area the stream bottom is composed largely of silt, fibrous peat and sand. In the high-bank and cedar-tamarack swamp sections the bottom is predominantly gravel. The lower marshy section is very sandy. Thus, the experimental area provides examples of the major types of bottom material and bank-cover characterising many of the trout streams of the state.

Construction of the physical plant began in the late summer of 1939. Present facilities include a frame building housing the office and laboratory, quarters for transient investigators, and an apartment for the resident biologist. The basement provides space for a small workshop, garage, darkroom, tanks and troughs in addition to the heating plant. The building is provided with central heating, running hot and cold water, and "high-line" electricity. A 3-room and a 1-room cabin at other points on the area provide accommodations for permanent and part-time assistants. A series of three stream-channel diversions totalling about 600 feet in length was constructed in 1940, where screen-holding bulkheads permit experiments with known

fish populations under fairly natural conditions. Counting weirs have been installed on five tributaries entering Hunt Creek in the experimental area. A water-level control dam and two-way fish trap have been built at the outlet of East Fish Lake, largest of the trout ponds, and a fish trap placed on the inlet.

At present, the station staff is composed of the resident biologist, in charge; one trained permanent assistant; and 3 temporary assistants employed for the duration of the trout season. Necessary laborers and construction workers are engaged locally, on a temporary basis. Various members of the Ann Arbor staff of the Institute spend considerable time at the station working on special projects.

The broad goal of the station's research program is the development of practical methods for accurately determining the carrying and productive capacities of trout streams and lakes, and for increasing these capacities so far as may be economically feasible. Specific investigations now under way include:

1. An intensive creel census, which will start its ninth consecutive season in 1947, from which are obtained complete yield records for the various parts of the experimental area, and incidental information on catch per hour, types of lures used, and fluctuations in quality of angling. Scale samples and weight-length data are taken to provide information on age and growth rate. Stomachs are secured at intervals for food analyses.

2. A study of fish movements throughout the experimental area by means of counting weirs installed in each of the major tributaries. Results from weir operations are throwing light on the much-mooted question of the desirability of closing tributaries as "nursery streams," as well as on brook trout migrations generally.

3. A general study of brook trout spawning and the results from natural reproduction. This has involved redd counts in the experimental area each fall since 1944, also the confinement of known numbers of males and females in one of the blocked-off diversions until they have completed spawning, their subsequent removal, and the counting of the surviving progeny late the following summer. In another phase of this work, a single female and one or more males are confined in another diversion and allowed to spawn, after which the adults are removed. Observations are made as to the number of redds fanned by the single female, and the nests dug open later to determine how many redds actually were utilized for egg deposition.

During the fall just past (1946), the brook trout resident in East Fish Lake were observed to spawn within the confines of the lake for the first time. In order to determine whether or not their reproductive efforts were successful, wooden frames 2 by 2 by 2 feet covered on five sides with screen wire, have been constructed and driven into the bottom enclosing egg pockets at two different sites. Use of frames should facilitate determination of the success or failure of the spawning attempts in this unusual site.

4. Population studies of trout streams and the techniques used in making such studies. This general field is regarded as one of the most important in present-day trout stream research and methods which will result in accurate counts will aid in answering many questions which now baffle the investigator and the trout stream manager. The most efficient tool found thus far for this work is the electric "shocker," originally described by Haskell (1939) but modified somewhat, in the light of experience, both in the hook-up and in the type of electrode used.

Studies on the area to date indicate a wide variation in the population of different stream sections at the same time, and also a wide variation in the same section at different seasons of the year. Shetter and Leonard (1943) reported on a population study of a short section of Hunt Creek in September, 1940, in which a population of approximately 94 pounds per acre of brook trout was found. Studies conducted over the identical water between September, 1942 and September, 1943, yielded data which indicated a population of brook trout which varied between a low of 44 pounds per acre in January of 1943 and a high of 86 pounds per acre in September of 1942, despite the fact that this small portion of the stream was closed to fishing after the first study.

5. A study of the interrelated effects of increasing a known fish population which is existing on a known food supply. During November, 1946, the wild fish population of one of the open diversions was removed by use of the shocker after blocking off the diversion with 1/4-inch mesh screens and all fish measured, weighed and marked. While the native fish were held in tanks, bottom food samples were taken from the 4 types of bottom present in the diversion to determine the food supply. The original population was doubled by obtaining additional fish from the stream below the experimental area to bring the total up to twice the original number of fish present. The introduced fish were weighed and measured and given a different mark than that used on the native population. All fish in the experiment will be weighed and measured from time to time to determine changes in average growth and condition, and the bottom food supply will be examined every two months. A detailed map of the diversion has been prepared as an aid in checking physical changes and to make possible

more accurate estimation of total bottom found present at any given time.

6. A study of the effect of lowering the legal size limit on brook trout in Hunt Creek from 7 inches (total length) to 6 inches. Under special regulations promulgated by the Conservation Commission, anglers are permitted to retain 6-to 7-inch brook trout from four designated sections of Hunt Creek. The effect of this removal of an additional size group of brook trout, starting with the 1946 trout season, will be followed carefully by means of the intensive creel census. In addition to the usual information on the anglers' catch, measurements and weights of the 6-to 7-inch brook trout will be obtained for the records. The effect of the removal of this smaller size group of fish should be apparent in the catch during the next two years.

7. The maintenance of general ecological records on the area to provide a basis for the appreciation of gradual changes in the environment. As a foundation of this phase of the program, a detailed map of the stream and its tributaries was prepared on a scale of 1 inch = 20 feet. Fixed stations were established for repeated photography of certain sites at regular intervals.

In addition to those described above, numerous experiments of short duration are conducted. These include actual field tests of new designs for experimental apparatus, tests of various chemical agents reputed to control noxious aquatic insects with minimal damage to fish, and similar short-term investigations.

Two research projects which have been completed since the description of the Station and its activities by Hazzard (1940) are those concerning the efficiency of planting fingerling brook trout in streams, and an analysis of the value of stream improvement devices

in producing better fishing. The experiment with brook trout fingerlings from a nearby rearing station involved the fin-clipping of approximately 53,000 fish for release in 1939 and 1940. Returns on the marked fish were obtained by intensive creel census, random creel census, and voluntary report. The results demonstrate that, in the Hunt Creek drainage, where there is more than adequate natural reproduction, plantings of hatchery-reared brook trout fingerlings are superfluous. It appears very unlikely that any more than 3 percent of the fingerlings released will survive to reach legal size and further that such survival is at the expense of naturally produced fish.

An 8-year study of the value of stream improvement devices in a portion of the experimental waters of Hunt Creek indicates that pool-forming deflectors bettered the angling quality (as judged by the number of pounds of fish caught per hour) an average of 46 percent, based on average data obtained for a 3-year period before improvement compared with those for a 5-year period after installation of the devices (Shetter, Clark and Hazzard, Trans. Am. Fish. Soc., in press). Since this study has been completed, two other stream sections with different environmental characteristics have been improved. A different type of deflector construction has been tried out in an effort to make a structure which can be put in with a minimum of labor and equipment, and which will have the least possible maintenance cost. Again the creel census data population analyses and food studies on these sections will provide the final answer as to the true value of the work that has been done.

Leonard (1942) has published observations concerning the relation between natural food present in the stream in midwinter and the food

found in trout stomachs at that time. He noted that the percentage occurrence of food items in the stream bottom samples differed noticeably from the percentage occurrence of food items found in the trout stomachs. For example, volumetrically, larvae and pupae of midges and black-flies made up 84.7 percent of the diet but only 56.9 percent of the bottom fauna; mayfly nymphs formed only 7.5 percent of the diet but were 24.8 percent of the bottom fauna. It was further observed that the digestive rate of the brook trout fingerlings collected during the midwinter was extremely slow. Three hours after removal of trout from the stream, midge and blackfly larvae, and aquatic annelids found in the stomachs were still vigorous enough to crawl around the watchglasses.

The onset of World War II interferred to a large degree with portions of the research and construction program planned at the Station, and also with the writing up of several phases of investigation which had been completed. In the latter category are analyses of the results of various population studies, results of the monthly seinings for marked fish, an analysis of the brook trout scale sample collection (which amounts to several thousand fish of all sizes), observations on the relative growth and mortality of hatchery-reared and wild brook trout fingerlings and the comparative feeding habits when held in the same natural raceway, and an analysis of a 5-year study involving the yearly release of a known number of hatchery fingerlings into a natural raceway containing a known population of wild brook trout. It is the ambition of all connected with the work at the Hunt Creek Fisheries Experiment Station to publish eventually all unreported data worthy of printing.

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Two-way fish weir with self-cleaning rotary screen[1] installed in Fuller Creek, principal tributary of Hunt Creek

[1] We gratefully acknowledge the assistance of Mr. Milo C. Bell, Chief Engineer, Washington State Department of Fisheries, who supplied us with blueprints covering the basic design of this structure.

Seining in connection with trout population

study in Section A of the Hunt Creek

Experimental Area

Electric shocker in use. Portable generator on stream bank.

Close-up of electrode used with electric shocker

Electric shocker in use. In foreground and background may be seen the seines backed with chicken wire used to block off the section under investigation.

Electric shocker in use in a stream section where natural obstructions make conventional seining almost impossible.