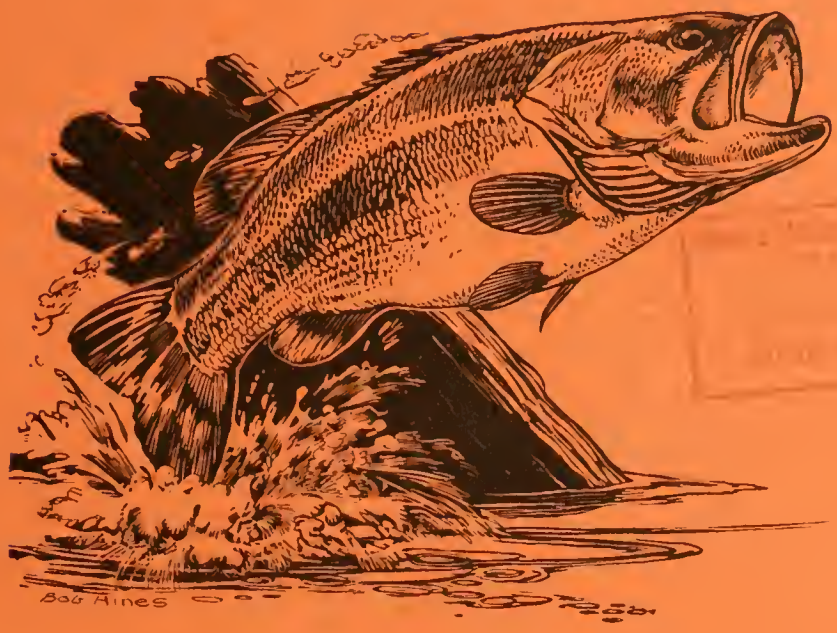
SURVEY OF SPORT FISHERY PROJECTS, 1954



CIRCULAR 26

FISH AND WILDLIFE SERVICE

UNITED STATES DEPARTMENT OF THE INTERIOR

SURVEY OF SPORT FISHERY PROJECTS, 1954

CIRCULAR 26

Compiled in the Branch of Federal Aid

FISH AND WILDLIFE SERVICE
John L. Farley, Director
UNITED STATES DEPARTMENT OF THE INTERIOR
Douglas McKay, Secretary

WASHINGTON - APRIL 1954

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PURPOSE AND DESCRIPTION OF THE SURVEY

This circular is the second annual catalog of sport-fishery programs in the United States. Its objective is to provide fishery administrators, teachers, research workers, and managers a means of keeping abreast of current work in fish conservation and restoration activities. It is believed that the publication will stimulate a greater exchange of ideas among those engaged in similar projects, will aid in preventing needless duplication of effort, and will furnish a comprehensive picture of our sport-fishery programs.

The Survey is a cooperative venture which deals primarily with work in progress. Past accomplishments or future plans have been included only when they were directly related to current work. Because of space limitations it was necessary to exclude reports on fish stocking, law enforcement, public relations, and similar routine management operations.

Reports on individual projects are necessarily brief, and the space assigned does not reflect the importance of a project. So far as possible, the Fish and Wildlife Service has limited its editing of completed questionnaires to the standardization of format and attainment of clarity. The Service serves only as a clearinghouse and means of publication. Readers desiring additional information are requested to direct inquiries to the responsible agency as given under the project description rather than to the Fish and Wildlife Service, except where the project is listed as an undertaking of the Service.

Since there is no complete directory of agencies and institutions engaged in projects covered by the Survey, undoubtedly some have been overlooked. Readers knowing of such omissions are urged to notify the Fish and Wildlife Service, so that the omitted agency may have opportunity to provide reports for the next edition. It

3. Minnow Production in Ponds.

The project aims to develop a commercial method of producing minnows for bait; to control tadpoles in minnow ponds; to control parasites affecting minnows in ponds; and to determine the food requirements of goldfish, golden shiners and fathead minnows.

Department of Conservation cooperating; hdqrs. Auburn; began 1936, indefinite; $20,000; E. E. Prather, J. R. Sheridan, Leaders; reports available.

Address inquiries to: E. E. Prather, Farm Ponds Laboratory, Alabama Polytechnic Institute, Auburn, Ala.

4. Management of Game Fish Population in Ponds.

Project objectives are to study the factors affecting the catch in game fish population in ponds; the methods of population manipulation to increase and maintain the catch; the effect of species and stocking methods on the catch; the effect of fishing rates on the population; and the use of fertilization and supplemental feeding.

Department of Conservation cooperating; hdqrs. Auburn; began 1934, indefinite; $25,000; H. S. Swingle, Leader; reports available.

Address inquiries to: Dr. H. S. Swingle, Fish Culturist, Farm Ponds Laboratory, Alabama Polytechnic Institute, Auburn, Ala.

5. Commercial Fish Production.

The objectives of the project are to test various species for commercial production in ponds; to evaluate the use of fertilization and supplemental feeding in commercial production; and to try methods of inducing spawning of various species in ponds.

Department of Conservation cooperating; hdqrs. Auburn; began 1950, indefinite; $5,000; H. S. Swingle, Leader.

Address inquiries to: H. S. Swingle, as in No. 4 above.

6. Stream and River Surveys.

The project objective is the investigation of the composition and dynamics of fish populations in streams and rivers.

Department of Conservation cooperating; hdqrs. Auburn; began 1949, indefinite; $5,000; H. S. Swingle, J. S. Dendy, Leaders.

Address inquiries to: H. S. Swingle, as in No. 4 above.

Tennessee Valley Authority

1. Reservoir Studies.

(See under Tennessee)

Fish and Wildlife Service, Branch of Game-fish and Hatcheries

1. Warm-water Pondfish Culture.

Existing methods of producing warm-water species of pond fishes under hatchery conditions are critically examined with the objective of improving present procedures and techniques in hatchery management. Production methods for warm-water species of fish which show promise of improving the quality and quantity of the hatchery output are tested. Studies are being conducted on methods of fertilization, vegetation control, and other pond management techniques under hatchery conditions.

U. S. Fish Cultural Station, Marion; began January 1950, continuing; $7,230; Jack R. Snow, Leader.

Address inquiries to: Jack R. Snow, Fishery Management Biologist, U. S. Fish Cultural Station, Marion, Ala.

Game and Fish Commission

1. Winter Kill Prevention.

The object of this project is to prevent winter kill in Big Lake until the reservoir has filled to its new capacity. A 210 compressor has been installed at the lake, along with 2,700 feet of perforated plastic pipe anchored across the lake bottom. Perforations are 1/32 holes spaced 15 feet apart. It is expected that the rising air bubbles will create an up-current which will circulate the warmer bottom water (40° F.) against the ice, thus clearing a strip of open water completely across the lake at midpoint.

Big Lake, Apache County; began December 1, 1953, to close March 1, 1954; $700.

Address inquiries to: Game and Fish Commission, 105 Arizona State Building, Phoenix, Ariz.

2. Big Lake Development. (FA: FW-4-D)

Big Lake, one of the better trout waters of Arizona, has been subject to severe winter kill every third year since original impoundment in 1936. The lake has an area of 465 surface acres, an average depth of 8 feet. In the past the entire lake bottom has been completely covered with vegetation during the late summer months. To correct this condition the dam was raised 10 feet. The lake now covers 545 surface acres and has an average depth of 16 feet. The weed beds will be reduced by very nearly 80 percent.

Big Lake, Apache County; began July 1953, to close October 1953; $35,000; Robert Smith, Leader; reports available.

Address inquiries to: Game and Fish Commission, as in No. 1 above.

3. Fisheries Investigation of Region I (Colorado River Area). (FA: F-2-R)

This project has numerous and diversified objectives, the most important being: (1) to determine the differences in mortality rate of trout planted from hatcheries having hard or soft water, when planted into the highly saline water of the Colorado River; (2) to determine the changes in the population balance of the fish of Lake Mohave as affected by the filling of the new reservoir. This problem is somewhat complex since there is an over-lapping rainbow trout and largemouth bass fishery.

Lake Mohave; began January 15, 1953, to close January 15, 1956; $17,000; R. A. Wagner, Leader; reports available.

Address inquiries to: Game and Fish Commission, as in No. 1 above.

4. Rough Fish Trapping.

This project was initiated to reduce the carp population in Roosevelt Lake. Twenty traps are being used by one fisherman. Cottonseed cake is being utilized for bait.

Roosevelt Lake; began July 15, 1953, indefinite; $6,000; William Hulett, Leader.

Address inquiries to: Game and Fish Commission, as in No. 1 above.

5. Statewide Rough Fish Control. (FA: F-1-R in part)

This project was initiated to reduce or eliminate rough fish from various waters of the State by use of fish toxins. A carp population control measure was carried out on San Carlos Reservoir to determine effectiveness of toxaphene as a "spot" poison.

Statewide; continuing; $5,000; reports available.

Address inquiries to: Game and Fish Commission, as in No. 1 above.

ARKANSAS

Game and Fish Commission

1. A Statewide Fisheries Survey. (FA: F-1-R)

The objectives of the project are to provide information on the location and physical features of the State's public streams and lakes; to determine the principal use of waters involved and the effects on sport fishing; to provide data on the success of reproduction, survival, growth, age and fishing success; and to provide recommendations for management, and future investigation and development work.

Statewide; began August 1, 1951, to close August 1, 1954; $42,300; Andrew Hulsey, Leader.

Address inquiries to: Andrew Hulsey, Game and Fish Commission, Lonoke, Ark.

2. The Construction of State Fishing Lakes.

The project objectives are to select areas over the State where fishing opportunities are limited and to construct dams for the impoundment of water in new sites, and to re-establish water levels in old lakes and bayous that have been partially drained.

Statewide; began 1948, to close 1958; $150,000; Joe Hogan, John Buxton, Leaders.

Address inquiries to: Game and Fish Commission, P. O. Box 543, Lonoke, Ark.

CALIFORNIA

Department of Fish and Game

1. Statewide Warm-water Fish Research Program.

The objectives of the project include: 1. A study of forage fish introductions to find more suitable species for fluctuating water level reservoirs. Threadfin shad and the plains red shiner are being brought in from other States, and two native species of fresh-water smelt are also being tried. 2. Experimental introduction of new sports fishes is being carried out. The redeye bass has been brought in from Tennessee and is being introduced in a restricted watershed. 3. Carp control by using several poison baits is being investigated. Current investigation is directed towards finding a suitable carrying agent and determining the effect of the poison bait on other animals. 4. The fishing mortality of largemouth bass is being investigated in Clear Lake, Lake County, by means of a tagging program. Tests on tags and tagging methods are carried on at the same time.

Statewide; hdqrs. Sacramento; began March 1953, continuing; $10,000; J. B. Kimsey, Leader.

Address inquiries to: Inland Fisheries Branch, California Department of Fish and Game, 926 J Street, Sacramento 14, Calif.

2. Brown Trout Management Study. (FA: F-8-R in part)

The objective is to determine methods of improving brown trout fishing. Representative waters in each of the fish and game regions of California have been selected for study. Test plants of marked fingerlings and catchables will be made in selected waters, and the results measured by population studies made with electric shocker.

Rock Creek, Madera County; Arroyo Seco Creek, Monterey County; Tate Creek, Siskiyou County; Cucamonga Creek, San Bernardino County; Pilot Creek, Eldorado County; began July 1953, indefinite; $10,000; J. H. Wales, Leader; Edgar Best, Assistant Leader.

Address inquiries to: Inland Fisheries Branch, as in No. 1 above.

3. Mountain Lake Trout Management Study. (FA: F-8-R in part)

All studies will be conducted in a group of accessible lakes lying between 5,000-7,000 feet elevation. Marked lots of rainbow, brook and brown trout will be liberated in about ten lakes and the results measured by a partial creel census together with field observations. The first test will compare the success of four strains of rainbow-steelhead in a single lake to select the most suitable strain for planting. Other tests will determine the practicability of eliminating rough fish through trout planting; the comparison of trout fed on different hatchery diets; the comparison of different planting methods; and the comparison of trout reared in warm and cold-water hatcheries.

Gold Lake Recreation area, Sierra and Plumas Counties; began October 1953, indefinite; $10,000; J. H. Wales, Leader; H. D. Boles, Assistant Leader.

Address inquiries to: Inland Fisheries Branch, as in No. 1 above.

4. A Study of the Catfish Fishery of California. (FA: F-2-R)

The principal objective of this study is to provide adequate information concerning fishing pressure and life history data necessary for the sound management of California's catfish resources. The Sacramento-San Joaquin Delta and Clear Lake have received concentrated attention. Several thousand white catfish have been tagged to furnish data relative to rate of exploitation and migratory tendencies. Samples are collected for study of age and growth, food habits, and reproductive characteristics. Less extensive investigation of other catfish fishing areas is planned.

Statewide; began January 15, 1952, to close June 30, 1957; $15,000; J. B. Kimsey, Leader; reports available.

Address inquiries to: Inland Fisheries Branch, as in No. 1 above.

5. Sacramento-San Joaquin River Salmon and Steelhead Study. (Fa: F-7-R)

This study has three objectives: First, to estimate and evaluate losses in irrigation diversions of seaward migrating salmon and steelhead; second, to study the steelhead and its fishery in the Sacramento River to determine if it is economically feasible to improve steelhead angling in this river system by stocking yearling hatchery fish; and finally, to conduct a long-range quantitative study of the salmon and steelhead populations of Mill Creek with weir counts of upstream and downstream migrants. Creel census, netting, and the examination of fish at a fish ladder are being done to determine the contribution of planted fish.

Hdqrs. Los Molinos; began October 1952, indefinite; $40,000; Leo Shapovalov, Leader.

Address inquiries to: Inland Fisheries Branch, as in No. 1 above.

6. Selective Breeding of Trout. (FA: F-8-R in part)

The primary objective is to eliminate the physical abnormalities now so common in the fall-spawning rainbow brood stock of the State. Incidental to this will be the development, through selection, of certain desirable characteristics now absent or poorly developed.

Mt. Shasta Trout Hatchery; began November 1953, indefinite; $5,000; J. H. Wales, Leader; E. R. German, Assistant Leader.

Address inquiries to: Inland Fisheries Branch, as in No. 1 above.

7. Castle Lake Trout Management Study. (FA: F-8-R in part)

Castle Lake is a fairly typical mountain lake found between 5,000 and 7,000 feet elevation. A complete creel census which has been conducted for the past 13 years is being continued. Since 1951, only rainbow have been liberated, and the success of this species is now being studied. Returns to the angler will be

obtained from trout planted at different ages, of different strains, given different hatchery care, and liberated in different manners.

Castle Lake, Siskiyou County; began 1941, indefinite; $5,000; J. H. Wales, Leader; E. R. German, Assistant Leader.

Address inquiries to: Inland Fisheries Branch, as in No. 1 above.

8. Rush Creek Trout Management Study. (FA: F-8-R in part)

This is a continuation of a complete creel census made at this stream since 1947. Until 1953, only rainbow were planted, with special emphasis on the survival to the angler of catchable plants. Since 1953, only brown trout have been planted, and the objective will be to find out if it is possible to produce good brown trout fishing for the average trout fisherman.

Rush Creek, Mono County; began 1947, indefinite; $10,000; J. H. Wales, Leader; reports available.

Address inquiries to: Inland Fisheries Branch, as in No. 1 above.

9. Striped Bass Study.

The striped bass study is providing the information needed for management of the species. Emphasis during 1953 was placed on winding up a prolonged series of tagging experiments aimed primarily at determining the rate of harvest, and secondarily at improving tagging techniques. A second phase of the work was the annual survey of the abundance of fry during July. California's striped bass fishery supports an estimated 2,000,000 angling days a year, with a total catch of about 1,500,000 fish.

Central California; began March 1946, indefinite; $15,000; reports available.

Address inquiries to: Inland Fisheries Branch, as in No. 1 above.

10. Pit 4 Fish Study.

The aim is to determine the release of water necessary to adequately maintain trout in the section of the river to be dewatered when the Pit 4 Power Plant goes into operation in 1955. Electrofishing is being used for population sampling.

Pacific Gas and Electric Company cooperating; Pit River, Shasta County; began January 1953, indefinite; Brian Curtis, Leader.

Address inquiries to: Inland Fisheries Branch, as in No. 1 above.

11. Experimental Backcountry Fish Management. (FA: F-3-R)

The objectives of the project are to evaluate the success of past and current management policies in backcountry waters and make any necessary changes; to determine new or improved management procedures through experimentation; and to evaluate rapid survey or inventory methods used throughout the State. Field operations include examination of stream improvement devices previously installed, possibility of reclaiming a drainage for golden trout, results of fish population control using chemicals, and competition between introduced species.

Mountainous areas of the Sierra Nevada; began April 1952, to close June 1954; $12,000; Joseph H. Wales, Leader.

Address inquiries to: Robert R. Ehlers, California Fish and Game Department, 106 South Main Street, Bishop, Calif.

12. Investigation of Disease and Nutrition Problems in California Freshwater Fishes.

This project is concerned chiefly with disease and nutrition in trout hatcheries, but related problems in trout and diseases of other freshwater fishes are studied as occasion demands. Current studies are being made of the blood flagellate Cryptobia, the trout myxosporidian, Ceratomyxa, of the microscopic appearance of normal trout tissues, and of hypnotic and anesthetic drugs useful in the transportation of trout.

Hdqrs. Berkeley; indefinite; $8,000; Harold Wolf, Leader.

Address inquiries to: Harold Wolf, California Fish and Game Laboratory, 2809 Telegraph Avenue, Berkeley, Calif.

13. Ocean Salmon Sportfishery Investigation and Spawning Area Survey. (FA: F-7-R in part)

The offshore phase objectives are to obtain reliable estimates of the number of king and silver salmon landed by the offshore sport fishery; to estimate the annual value of this fishery to the State; to determine age and size composition of the catch as distinguished from the landings; and to evaluate effect of present regulations in regard to efficient utilization of the resource.

The river phase objectives are to estimate numerical size of each major watershed's spawning population; to determine size and sex composition and spawning success of individuals in these populations; to establish optimum numerical size of each watershed's population; and to keep account of barriers or other conditions inimical to salmon.

Off Central and Northern California and on major spawning streams; began 1946, indefinite; $13,000; Eldon P. Hughes, Leader.

Address inquiries to: Eldon P. Hughes, Marine Fisheries Branch, Department of Fish and Game, North Rotunda, Museum Building, Stanford, Calif.

14. Coastal Sportfishing and Live Bait Study.

The project is faced with the problem of determining the effect of fishing on many species of fish. The kelp bass has come in for special attention. Basic information is obtained through a system of daily catch records that are required of all sport boats operating for hire and from the boats that furnish live bait to the sportfishing fleet. Field notes are used to amplify catch records in order to detect over-utilization. Limited life history work involving tagging, migration, maturity studies, age and rate of growth data are employed where such a need is indicated.

Statewide, but principally Southern California; hdqrs. Terminal Island; began 1936, indefinite; $15,000; Parke H. Young, Leader; reports available.

Address inquiries to: California State Fisheries Laboratory, Marine Fisheries Branch, Terminal Island Station, San Pedro, Calif.

15. Surf Fishing Investigation. (FA: F-5-R)

Four surf species, the corbina, the spotfin and yellowfin croakers, and the barred perch are under study to evaluate the fishery and make recommendations for management. Selected groups of surf fishermen submit records of their catch; these records are the basis of a statistical analysis by species, area, time interval, and catch per unit of effort, as well as importance of each species.

Potential fishing grounds are being surveyed between Pt. Conception and the Mexican border. Observations are made by aqua-lung diving. Sampling is done mainly by beach seine. Biological studies include: Age and rate of growth, food habits, maturity and fecundity, and spawning. Movements are being studied by the tagging of all four species.

The coast of Southern California; hdqrs. Terminal Island; began March 1952, to close March 1955; $20,000 per year; John G. Carlisle, Jr., Leader.

Address inquiries to: State Fisheries Laboratory, as in No. 14 above.

16. Yellowtail Study. (FA: F-1-R)

This project was undertaken to gain the knowledge necessary for proper management of the yellowtail. Tagging, to determine whether the fish move from Mexican waters, where they are most abundant, to the California sportfishing grounds, has been the largest single phase of the project. Data on oceanographic

conditions which may affect yellowtail distribution and movements are recorded. Various experiments are being conducted to determine the type of tags best suited for yellowtail. These include testing the tags in a high speed water tunnel, aquarium observations, and testing the physical effects on the tags of a prolonged period on the bottom of a vessel.

Studies of age, rate of growth, maturity, fecundity and food habits are carried on. Morphometric measurements and meristic counts are taken. A statistical analysis of the commercial catch is in preparation to determine the relative availability of yellowtail throughout the history of the fishery.

Southern California and Baja California; hdqrs. Terminal Island; began January 1952, to close December 1955; $25,000 per year; Robert D. Collyer, Leader; reports available.

Address inquiries to: State Fisheries Laboratory, as in No. 14 above.

17. Rockfish (Scorpaenidae) Investigation.

The first approach to the investigation of the rockfish in California is a proper definition of the various species. There are approximately 50 species of this family of fishes in California marine waters and none in fresh water. About one-half of the total number of species are of some importance, either from a sportsman's or from a commercial standpoint. Life history studies on the most important species will be conducted.

Coastwise; indefinite; J. B. Phillips, Leader.

Address inquiries to: J. B. Phillips, Marine Fisheries Branch, Hopkins Marine Station, Pacific Grove, Calif.

University of California

1. Sagehen Creek Project.

Long-term studies of the abundance, distribution and survival of trout, and other fishes.

Fifteen miles north of Truckee; began June 1951, indefinite; $15,000; Paul R. Needham, Leader.

Address inquiries to: Dr. Paul R. Needham, University of California, Department of Zoology, Berkeley 4, Calif.

2. Beaver-trout Interrelationship in a Sierra Nevada Mountain Stream.

Objectives of the project are: (a) A physical factor comparison between beaver pond and typical stream environments; (b) a quantitative and qualitative comparison of the bottom organisms occurring in beaver pond and typical stream habitats; (c) a comparison of the composition, number, and weight of fish populations in beaver pond and stream habitats; (d) a trapping and tagging program to determine the effect of beaver dams upon the spawning migrations of trout in the fall; (e) a comparison of the species and sizes of trout caught in beaver pond and stream habitats.

Sagehen Creek, Nevada County; began February 1954, indefinite; $2,000; Richard Gard, Leader.

Address inquiries to: Paul R. Needham, as in No. 1 above.

3. Age, Growth, and Mortality Rates of Cottus beldingi.

The objective is to determine the reasons for the abundance of this fish in Sagehen Creek, and the effects of such abundance on trout populations. This is to be accomplished through age analysis of samples of fish collected from May 1953 to January 1954; population estimates for different areas of the creek; fecundity; spawning season; and mortality rates.

Sagehen Creek, Nevada County; began May 1953, to close June 1954; $50; Albert C. Jones, Leader.

Address inquiries to: Paul R. Needham, as in No. 1 above.

4. Salton Sea Research Program.

The project objective is to do the research necessary for the establishment and maintenance of a sports fishery in the Salton Sea, Imperial and Riverside Counties, California.

California Department of Fish and Game cooperating; University of California, Los Angeles 24, and Fish Springs Resort, Thermal; began February 1954, planned for 3 years; $28,000; Boyd W. Walker, Leader; reports available.

Address inquiries to: Dr. Boyd W. Walker, Department of Zoology, University of California, Los Angeles 24, Calif.

Stanford University

1. A Survey of the Fishes of Arctic Alaska.

Objectives of the Project are: (a) To determine the nature and composition of the fish fauna of Arctic Alaska; (b) to ascertain what forms are available as food and if any approach a degree of abundance sufficient to warrant commercial exploitation; and (c) to determine the contribution of fish noises to the general under-water ambient noise level of arctic waters.

Office of Naval Research cooperating; Arctic Research Laboratory, Point Barrow, Alaska; began April 1, 1951, to close March 31, 1955; Norman J. Wilimovsky, Leader; reports available.

Address inquiries to: Norman J. Wilimovsky, Natural History Museum, Stanford University, Stanford, Calif.

2. Fish Population Study on Ikroavik Lake.

Objectives of the project are to: (a) estimate population size, growth rates, and death rates of fish in Ikroavik Lake (near Point Barrow, Alaska) with comparisons of growth rates of same species from nearby marine waters; (b) determine, species for species, age and growth compositions of various populations on the arctic Alaskan slope, to note which populations could be exploited for sport or food; and (c) for one or more species which occur in marine migratory populations and in isolated populations, to investigate physiological differences in growth and fat deposition.

Office of Naval Research and the Arctic Institute of North America cooperating; Arctic Research Laboratory, Point Barrow, Alaska; began April 1, 1952, to close March 31, 1955; Donald E. Wohlschlag, Leader; reports available.

Address inquiries to: Dr. Donald E. Wohlschlag, Natural History Museum, Stanford University, Stanford, Calif.

Humboldt State College

1. A Survey of Private Trout Enterprises in the West.

The project objectives are to determine the kinds, number, and location of private trout enterprises in nine western States, and to determine the importance of these enterprises in terms of financial investment, gross income, production and sale of fish and eggs.

California Department of Fish and Game cooperating; covers nine western states; began May 1952, to close December 1954; $100; John W. DeWitt, Leader.

Address inquiries to: John W. DeWitt, Fisheries Department, Humboldt State College, Arcata, Calif.

2. The Coast Cutthroat, Salmo clarki clarki Richardson, in California.

The objective of the project is to determine the physical characteristics, life history and distribution of the coast cutthroat in California.

California Department of Fish and Game cooperating; North Coastal California; began June 1951, indefinite; $300; John W. Dewitt, Leader.

Address inquiries to: John W. DeWitt, as in No. 1 above.

California Regional Water Pollution Control Board, U. S. Public Health Service, Oregon State Sanitary Board

1. Investigation of Pollution of the Klamath River.

(See same title under Oregon)

U. S. Fish and Wildlife Service, Branch of Game-fish and Hatcheries

1. Tracy Fish Protection.

The objective is to develop suitable means for the screening and diversion of large numbers of small striped bass, chinook salmon, catfish, shad, and other fish in the San Joaquin-Sacramento River Delta which are affected by a large diversion of water (4,600 second-feet) through a pumping plant and into the Delta-Mendota Irrigation Canal. Various types of fish screens and fish collection devices are being studied.

U. S. Bureau of Reclamation and the California Department of Fish and Game cooperating; Tracy; began December 4, 1950, indefinite; Daniel W. Bates, Leader.

Address inquiries to: Lewis R. Garlick, Regional Supervisor, Branch of Game-fish and Hatcheries, Fish and Wildlife Service, Swan Island, Portland 18, Ore.

2. Shasta Salmon Maintenance Project.

The objective is to obtain information on the effects of Bureau of Reclamation projects on the runs of salmon and steelhead. The work includes data on the size of runs, the extent of natural spawning, time and extent of downstream migration, study of fish protective facilities, records of physical factors as water temperatures, water releases and river flows, and sport catch records.

U. S. Bureau of Reclamation cooperating; Upper Sacramento River system; hdqrs. Red Bluff; began 1950, continuing; $8,000; Robert L. Azevedo, Leader; reports available.

Address inquiries to: Lewis R. Garlick, as in No. 1 above.

U. S. Fish and Wildlife Service, Office of River Basin Studies

1. Northwestern California Coastal Streams.

This project will be initiated to assess the fish and wildlife resources of the California North Coast area which may be affected by water development proposals.

Bureau of Reclamation, California State Water Board, California Department of Fish and Game, Field Committee of Interior Department cooperating; California north coast; began 1954, indefinite; $10,000; S. G. Jewett, Jr., Leader.

Address inquiries to: Regional Director, U. S. Fish and Wildlife Service, Swan Island, Portland 18, Ore.

U. S. Fish and Wildlife Service, Branch of Fishery Biology

1. Limnology and Biology of High Sierra Lakes.

The object of this project is to determine the relationship between biological, physical, chemical, thermal, climatic, and seasonal conditions and the growth and abundance of trout as a means of understanding those factors that limit or control productivity to improve basic fertility and trout management practices.

Convict Creek Basin, Calif.; hdqrs. Reno, Nevada; began July 1951, to close September 1955; Norman Reimers, Leader.

Address inquiries to: Reed S. Nielson, Chief, California-Nevada Inland Fishery Investigations, Reno, Nev.

2. Survival of Hatchery-reared and Wild Trout in Streams.

The objective is to evaluate the extensive and expensive practice of stocking hatchery-reared, catchable-size rainbow trout in streams and to determine the factor or factors that limit their survival as a means of establishing improved stocking practices and procedures.

Hdqrs. Reno, Nev.; began October 1950, to close October 1955; Reed S. Nielson, Leader.

Address inquiries to: Reed S. Nielson, as in No. 1 above.

COLORADO

Game and Fish Department

1. Fishhook and Lost Lake Studies. (FA: F-1-R in part)

This project was designed primarily to give return-to-the-creel information on marked plants of rainbow trout -- 3- and 5-inch fish. Data also was obtained on fishing pressure and fishing success, limnology, food habit studies, and age and growth studies.

Continental Divide, in northwest portion of Colorado; began June 1948, to close December 1953; $3,500; C. A. Weberg, Leader; reports available.

Address inquiries to: W. D. Klein, Colorado Game and Fish Department, 1530 Sherman Street, Denver, Colo.

2. Experimental Fertilization of High Elevation, Relatively Unproductive Trout Lakes. (FA: F-1-R in part)

The objective of the study is to determine the relative effectiveness of commercial fertilizer in increasing the productivity of high, unproductive trout lakes. The project was extended in 1953 to include study of an additional lake which was fertilized and a control lake. Plankton has been used as an index of the value of the fertilization program initiated.

Near top of Medicine Bow Range of Mountains, Larimer County; began June 1951, to close October 1955; $3,500; Dr. John R. Olive, Leader; reports available.

Address inquiries to: W. D. Klein, as in No. 1 above.

3. Parvin Lake Studies. (FA: F-1-R in part)

An intensive creel census is being conducted to obtain return-to-the-creel information from plants of hatchery-reared trout. Previous studies involved rainbow trout, but studies initiated in 1953 will be devoted to return-to-the-creel information from plants of brown trout. Routine limnological, food habit and spawning migration studies are being continued. Considerable information is being obtained on contribution to the creel of naturally produced trout. Extensive data is being obtained on fisherman use, fishing methods and fishing success, in conjunction with the other studies.

Larimer County; began April 1949, to close November 1959; $10,000; James Boyd, Leader; reports available.

Address inquiries to: W. D. Klein, as in No. 1 above.

4. Skaguay Reservoir Studies. (FA: F-1-R in part)

These studies are designed to provide information for the management of fluctuating water level trout reservoirs. The return-to-the-creel from marked plants of hatchery-reared rainbow trout of various sizes is being studied. Kokanee salmon have been stocked on an experimental basis, spawning migrations are being intensively studied, and a study of the contribution of naturally produced trout to the creel is under way. Intensive sucker control work is being carried out and the practicality of various methods of sucker control is being determined. Every effort will be made to determine the effectiveness of sucker reductions on the game fish population.

Teller County; began April 1952, indefinite; $10,000; R. L. Moore, Leader; reports available.

Address inquiries to: W. D. Klein, as in No. 1 above.

5. Forest Lake Return-to-the-Creel Studies. (FA: F-1-R in part)

The primary objective of the study is to obtain data on contribution to the creel of similar plants of rainbow and brook trout approximately two inches long. Also, return to the creel information is being obtained on a plant of native fry made in the lake prior to the initiation of the project. The fishing intensity, methods and fisherman success are recorded. Data is also being obtained on food habits and rate of growth of the fish.

Delta County; began June 1952, to close October 1954; $3,500; P. T. Barrows, Leader; reports available.

Address inquiries to: W. D. Klein, as in No. 1 above.

6. Bonny Reservoir Project.

A study of the limnological and fishery conditions of this impoundment to aid in establishing a management program for the future.

Yuma County; began March 10, 1954, to close 1958; $5,800; Robert L. Jones, Leader.

Address inquiries to: Robert L. Jones, Game and Fish Department, Bonny Reservoir, Burlington, Colo.

7. Holbrook Lake Project.

A physical, chemical and biological survey coupled with a habitat improvement and population manipulation program is being carried out in order to determine if sport fishing can be improved in this impoundment.

Otero County; began January 1, 1953, to close 1958; $7,000; Eugene Cook, Leader.

Address inquiries to: Eugene Cook, Game and Fish Department, 502 Colorado, Ordway, Colo.

8. Greeley Lakes Project.

An experimental management program including a general survey of the physical, chemical and biological conditions, and some habitat improvement work toward improvement of the sport fishing of these waters.

Three impoundments in Weld County; began January 5, 1953, to close 1955; $8,500; Robert Evans, Leader.

Address inquiries to: Robert Evans, Colorado Game and Fish Department, 775 Linden Street, Ft. Collins, Colo.

Colorado Cooperative Fisheries Research Unit

1. Recreational Trout Fishing.

Objective of the project is an evaluation of experimental regulations which include a size limit of 12 inches on trout, and a creel limit of 3-5 fish. The problem will be approached through (1) creel census, under present regulations

and under new regulations; (2) population studies on selected sections before and during new regulations; and (3) age and growth studies to check for changes in growth rate.

Game and Fish Department and Colorado A and M College cooperating; South Platte River near Denver; began June 1954, to close December 1956; Howard A. Tanner and W. D. Klein, Leaders.

Address inquiries to: Dr. Howard A. Tanner, Leader, Cooperative Fishery Research Unit, Colorado A and M College, Ft. Collins, Colo.

2. Development of Electrofishing Techniques and Equipment.

The project objective is the development of electrofishing equipment of maximum efficiency for the waters of Colorado with particular emphasis on development of portable equipment for back country work. The use of AC and DC current, and various types electrodes will be evaluated. The physiological effects of AC and DC current of various intensities will be an important phase of the study.

Game and Fish Department and Colorado A and M College cooperating; hdqrs. Ft. Collins; began April 1953, to close March 1955; $3,500; Howard A. Tanner, Leader.

Address inquiries to: Howard A. Tanner, as in No. 1 above.

3. Rough Fish Control in Fluctuating Reservoirs.

Objectives of the project are to evaluate the feasibility and value of a rough fish (carp) control program in the large irrigation reservoirs of eastern Colorado. Four years' data exist on the growth, food habits, abundance, and creel census values of each species present. These data will continue to be collected during a reduction of rough fish program.

Game and Fish Department and Colorado A and M College cooperating; Lonetree Reservoir, Larimer County; began June 1950, to close December 1955; Howard A. Tanner, Leader.

Address inquiries to: Howard A. Tanner, as in No. 1 above.

4. Walleye Spawn Taking, Using Pituitary Extracts.

The project is an experimental attempt to develop a source of walleye eggs within the State. Evaluation of several methods of capture and the use of pituitary injections to obtain early and uniform ripening dates will be carried out.

Game and Fish Department and Colorado A and M College cooperating; Reservoir near Eades; began April 1954; to close June 30, 1954; $500; Howard A. Tanner and Tom Lynch, Leaders.

Address inquiries to: Howard A. Tanner, as in No. 1 above.

5. Evaluation of Toxaphene as a Fish Toxicant.

Objective of the project is to evaluate by laboratory and field experimental applications the advantages and disadvantages of toxaphene as a fish toxicant, having in mind its adaptation in rough fish elimination if it appears satisfactory.

Game and Fish Department and Colorado A and M College; laboratory and irrigation reservoirs, Fort Collins; began September 1953, indefinite; $500; Howard A. Tanner, Leader.

Address inquiries to: Howard A. Tanner, as in No. 1 above.

U. S. Forest Service

1. Effect of Timber Cutting on Water Yields in the Central Rocky Mountains.

The objective of the project is to determine the effect of timber harvesting upon streamflow and stream-borne sediment. Study area is a 700-acre watershed near Fraser, Colorado, in lodgepole pine and spruce-fir timber types.

Water yield from the watershed was measured for 10 years before treatment began and for 3 years during and after construction of logging roads. About one-half the timber will be removed in 1954-55 and streamflow and sediment production records continued to determine effect of logging. Stream temperatures observed and water analyses made at intervals to determine changes caused by timber cutting.

Hdqrs. Fraser; began 1940, to close 1960; B. C. Goodell, Leader.

Address inquiries to: Raymond Price, Director, Rocky Mountain Forest and Range Experiment Station, Room 221 Forestry Building, Ft. Collins, Colo.

CONNECTICUT

Board of Fisheries and Game

1. Population Estimates and Angler Harvest of Game Fishes in Stillwater Reservoir. (FA: F-6-R)

   The object of the project is to obtain population estimates for largemouth bass, smallmouth bass, chain pickerel, and yellow perch and in addition, to obtain complete catch records. Population estimates, percent of harvest, etc. will be calculated from recovery data on tagged and untagged fish.

   Stillwater Reservoir, Torrington; began March 1953, to close January 1954; $1,373; Douglas D. Moss, Leader.

   Address inquiries to: State Board of Fisheries and Game, Fish Division, State Office Building, Hartford, Conn.

2. Creel Census on Wononscopomuc Lake. (FA: F-9-R)

   The objectives of this project are to: (1) Determine the most suitable species of trout for stocking; (2) determine whether one or two year old fish furnish the most satisfactory angling at the least cost; and (3) determine whether spring or fall stocking is most advantageous.

   Wononscopomuc Lake, Lakeville; began December 1953, to close November 1954; $6,100; Douglas D. Moss and Cole W. Wilde, Leaders.

   Address inquiries to: Fish Division, as in No. 1 above.

3. A Fisheries Survey of the Impounded Waters of the State. (FA: F-4-R)

   The purpose of the project is to complete the preliminary surveys of the lakes and ponds in the eight counties of the State.

   Statewide, began February 1953, to close February 1956; $19,133; Ernest Karvelis, Leader.

   Address inquiries to: Fish Division, as in No. 1 above.

DELAWARE

Board of Game and Fish Commissioners

1. Fresh Water Investigations. (FA: F-1-R)

   The objective of this study is to obtain an understanding of the present existing conditions of ponds which can support fishing. The chemical and physical properties, the productivity, the number and kinds of fish present and their growth and age characteristics are being determined to form the basis of any future management.

   Southern Delaware; began July 1953, to close June 1954; $10,110; Jay L. Harmic, Leader.

   Address inquiries to: Jay L. Harmic, Fisheries Biologist, Board of Game and Fish Commissioners, Dover, Del.

2. Fresh Water Developments. (FA: F-2-D)

Objectives of the project are to reclaim lakes and ponds having high carp and stunted panfish populations by use of rotenone; to restock these waters with desired species; and to carry out improvement measures such as installing brush shelters, watershed and bank plantings, weed control, and maintenance improvements on dams.

Statewide; began July 1953, to close June 1954; $4,800; Jay L. Harmic, Leader.

Address inquiries to: Jay L. Harmic, as in No. 1 above.

3. Marine Sports Fishing Investigations. (FA: F-5-R)

The objectives of the project are to determine values of marine sport fishing and to determine the life history of the gray sea trout.

Marine Laboratory, University of Delaware cooperating; statewide; began July 1953, to close June 1954; $10,884; Franklin C. Daiber, Leader.

Address inquiries to: Jay L. Harmic, as in No. 1 above.

U. S. Fish and Wildlife Service, Branch of Fishery Biology

1. Survey of the Sport and Commercial Fisheries of the Delaware Bay Area.

The objective of this project is to obtain data on the areas, seasons, relative abundance, fluctuations in availability, and intensity of fishing, in terms of individual species as a means of determining the most suitable locality for waste disposal and of evaluating the probable effects of such disposal on the sport and commercial fisheries of this area.

Hdqrs. Woods Hole, Mass.; began 1951, continuing; Fred C. June, Leader.

Address inquiries to: Fred C. June, Box 531, University of Delaware, Newark, Del.

FLORIDA

Game and Fresh Water Fish Commission

1. Striped Bass Investigation. (FA: F-4-R)

The objectives of this project are: (a) To investigate the life history of the striped bass in Florida and to review data collected by other workers to obtain information necessary to proper management; (b) to test the effectiveness of artificial propagation as a management technique; and (c) to establish the striped bass in waters where it does not now occur, and to increase its abundance where now found.

Statewide; began October 1953, to close October 1956; $11,310; William M. McLane, Leader.

Address inquiries to: William M. McLane, Game and Fresh Water Fish Commission, P. O. Box 87, Welaka, Fla.

2. Fish Management Investigations. (FA: F-5-R)

The objectives of this project are to test various methods of controlling rough fish populations in limited areas, and to measure the effect of control measures on the composition of the fish populations and angling for desired species, as well as on growth and survival of game fishes. Five working units in different areas of the State of Florida will be established. Emphasis will be placed on controlling known high concentrations of gar, bowfin, gizzard shad, and catfish. Netting, poisoning, and experimental electrical devices will be used in the various areas to determine most practical control under varying conditions.

Statewide; began October 1953, to close October 1956; $89,258; Melvin T. Huish, Leader.

Address inquiries to: Melvin T. Huish, Lake Fisheries Experiment Station, P. O. Box 569, Leesburg, Fla.

University of Miami

1. Oceanic Game Fish Research Program.

A study of the life histories of western north Atlantic oceanic game fishes, with emphasis on the bluefin tuna, is being undertaken. Studies include ecology, taxonomy, occurrence, migrations, habits, development, etc.

Charles F. Johnson Research Foundation cooperating; Caribbean Sea to Nova Scotia; began January 1953, to close December 1954; $5,000; Luis Rene Rivas, Leader; reports available.

Address inquiries to: Dr. F. G. Walton Smith, Marine Laboratory, University of Miami, Coral Gables, Fla.

2. Sailfish Project.

Studies are being conducted on the life history of the sailfish, including growth rate, size frequencies, food, fecundity, migrations and related questions. One problem is the ability of the sailfish to survive after being caught and subsequently released.

State Board of Conservation cooperating; east coast of Florida; began August 1950, indefinite; Robert Young, Leader; reports available.

Address inquiries to: Dr. C. P. Idyll, Marine Laboratory, University of Miami, Coral Gables, Fla.

3. Snook Project.

The life history of the snook is being studied in relation to size, age, growth rates, food, fecundity, occurrence and related questions.

State Board of Conservation cooperating; south Florida, both east and west coasts; began January 1953, to close December 1954; Arthur Marshall, Leader; reports available.

Address inquiries to: C. P. Idyll, as in No. 2 above.

4. Fish Life History Project.

The identity, distribution and life history of fish larvae appearing in marine plankton is being studied with special reference to game fish.

State Board of Conservation and the National Geographic Society cooperating; southeastern coast of U. S.; began January 1953, indefinite; $14,000; F. G. Walton Smith, Leader; reports available.

Address inquiries to: Dr. H. B. Moore, Marine Laboratory, University of Miami, Coral Gables, Fla.

GEORGIA

Game and Fish Commission

1. Warm Water Streams Investigation. (FA: F-1-R)

Objectives of the project are to determine the ratio of game to rough fish; to determine the type, size, seasons, depth to use commercial gear, and to evaluate commercial fishing as a management tool to improve sport fishing; and to determine by creel census, trapping, age-growth and population studies the average weight of the fish, so that after commercial fishing becomes legal determination of the effect of rough fish reduction on the fish population can be made.

South-central Georgia; began December 1951, to close February 1954; $21,000; Otho D. May, Jr., Leader; reports available.

Address inquiries to: Otho D. May, Jr., Game and Fish Commission, Uvalda, Ga.

2. Trout Stream Management Investigation. (FA: F-3-R)

Project objectives are to determine streams which are suitable for trout; to obtain information concerning the trout streams on which to base a management program; and to evaluate stocking, regulations, and stream improvement.

Twelve northern mountain counties; began April 1953, to close April 1956; $25,000; Robert K. Franz, Leader; reports available.

Address inquiries to: Robert K. Franz, Game and Fish Commission, Clayton, Ga.

3. Rough Fish Control Evaluation. (FA: F-4-R)*

The project is to evaluate the effect of removing rough fishes from certain streams. The rough fish are to be removed by licensed fishermen using traps or wire baskets as specified by law. A creel census will be run and fish population sampling will be carried out periodically.

Oconee, Ocmulgee and Altamaha Rivers; began February 1954, indefinite; $14,278; Otho D. May, Jr., Leader.

Address inquiries to: Otho D. May, Jr., as in No. 1 above.

University of Georgia

1. Study of the Movement of Catfish Populations in the Savannah River and Tributary Streams.

Objectives of the project are to determine the extent of interchange between catfish populations of the Savannah River and a tributary stream, and to study the biology of the channel catfish in particular.

U. S. Atomic Energy Commission cooperating; AEC Savannah River Plant; began April 15, 1953, to close April 1955; Robert Humphries, Leader.

Address inquiries to: Robert Humphries, Department of Biology, University of Georgia, Athens, Ga.

2. Productivity of Farm Ponds in Relation to Cash and Food Crops With Emphasis on Catfish Production.

The project objective is to investigate economically feasible methods of producing catfish and other cash crops in farm ponds and relating the productivity of these crops to limnological conditions as affected by fallowing, fertilization and artificial feeding.

Hdqrs. Athens; began September 1953, to close September 1958; James H. Jenkins, Leader.

Address inquiries to: J. H. Jenkins, School of Forestry, University of Georgia, Athens, Ga.

U. S. Fish and Wildlife Service, Branch of Fishery Biology

1. Biochemistry of the South Atlantic.

The objective of this project is to determine the distribution and concentration of nutrients and the relation between these nutrients and the distribution and concentration of fishes, as a means of delimiting potentially productive waters.

Georgia Game and Fish Commission cooperating; hdqrs. Brunswick, Ga.; began February 1953, continuing; W. W. Anderson, Leader.

Address inquiries to: W. W. Anderson, Chief, South Atlantic Fishery Investigation, P. O. Box 283, Brunswick, Ga.

2. Biological Inventory of the South Atlantic.

The objective is to determine the presence, identity, distribution, and interrelationships of marine forms in the area as an aid in understanding the presence, abundance, availability and fluctuations of the fishes. Special attention is directed to the distribution and abundance of fish eggs, larvae and juveniles.

Florida State Board of Conservation and Georgia Game and Fish Commission cooperating; hdqrs. Brunswick, Ga.; began February 1953, continuing; W. W. Anderson, Leader.

Address inquiries to: W. W. Anderson, as in No. 1 above.

3. Shad Investigation of Ogeechee River, Georgia.

The objective is to determine the present status of shad runs (by tagging program and canvass of fishery for catch and effort records) and, provided adequate catch and effort data are available, to evaluate past trends in abundance and the effects of natural and man-made factors on the size of the runs.

Hdqrs. Beaufort, N. C.; began January 1954, to close 1955.

Address inquiries to: G. B. Talbot, Chief, Middle Atlantic Fishery Investigations, Beaufort, N. C.

U. S. Fish and Wildlife Service, Branch of Game-fish and Hatcheries

1. Fishery Management Surveys.

The objective is to develop fish management plans, based on surveys, for specific water areas. Priority is given to Federally controlled areas such as Service refuges, National Forests, Veterans Administration facilities, Defense installations, and Indian reservations.

Hdqrs. Atlanta; field work in the several States comprising Fish and Wildlife Service Region 4; continuing; Jack Snow, James R. Fielding, and Robert C. Nord, Leaders.

Address inquiries to: Regional Director, U. S. Fish and Wildlife Service, Peachtree-Seventh Building, Atlanta 5, Ga.

2. Technical Assistance in Fish Cultural Activities.

Assistance is given to fish cultural personnel toward the solution of biological problems of hatchery management, such as weed control, fertilization, disease, and water quality; and in initiating new or improved techniques. Fish stocking activities are reviewed for correlation with State Conservation Department practices and to direct the distribution of Federally produced fish in accordance with Fish and Wildlife Service policy and known fishery management needs.

Hdqrs. Atlanta; field work in the several States comprising Fish and Wildlife Service Region 4; continuing; Jack Snow, James R. Fielding and Robert C. Nord, Leaders.

Address inquiries to: Regional Director, as in No. 1 above.

IDAHO

Department of Fish and Game

1. Biological and Economic Survey of Fishery Resources in Lake Pend Oreille. (FA: F-3-R)

Biological surveys and creel census are being conducted on Lake Pend Oreille to determine the status and value of the present fishery resource. The study, now in its fourth year, is designed to measure the effects upon the fishery of the construction of Albeni Falls dam on the outlet and Cabinet Gorge dam on

the principal inlet of the lake. Fluctuation of the lake elevation and inlet flow during kokanee and dolly varden spawning presents a serious problem to the maintenance of populations of these species.

U. S. Army Corps of Engineers and Washington Water Power Company cooperating; Bonner and Kootenai Counties; began February 1951, planned for 4 years; $14,000; Paul Jeppson, Leader; reports available.

Address correspondence to: James C. Simpson, Chief, Fisheries Division, Idaho Fish and Game Department, 518 Front Street, Boise, Idaho

2. Effects of Hydroelectric Developments on the Fishery Resources of Snake River. (FA: F-8-R)

The study is designed to evaluate the fluctuating impoundments and river flows above and below a series of five hydroelectric dams on Snake River in southwestern Idaho and, particularly, as they affect the sport fishery of this water. Physical and biological studies and creel census are being used.

From backwaters of Upper Salmon Falls impoundment near Hagerman to just below Swan Falls dam; began July 1952, to close March 1955; $9,000; Robert Irving, Leader; reports available.

Address inquiries to: James C. Simpson, as in No. 1 above.

3. Fisheries Investigations on Bear Lake. (FA: F-10-R)

This study is designed to determine suitable management policies for the sport fishery of Bear Lake. Mackinaw, rainbow and cutthroat trout and several species of whitefish are involved. Limnological studies and creel census are being employed.

Utah Fish and Game Department, Utah Cooperative Wildlife Research Unit, and U. S. Fish and Wildlife Service cooperating; southeastern Idaho and northern Utah; began January 1, 1953, to close December 31, 1955; $5,000; William J. Clark, Leader; reports available.

Address inquiries to: James C. Simpson, as in No. 1 above.

4. Rehabilitation of Roseworth Reservoir. (FA: F-11-D)

This is a development project aimed at the re-establishment of a rainbow trout sport fishery in a 1200-acre irrigation impoundment. The reservoir was treated with rotenone in September 1953, and will be restocked during the spring of 1954.

Twin Falls County; began August 1, 1953, to close July 31, 1954; $12,700; Robert B. Irving, Leader.

Address inquiries to: James C. Simpson, as in No. 1 above.

5. Fisheries Investigations of Henrys Lake. (FA: F-13-R)

This study is designed to implement past studies on Henrys Lake in order to determine the decline in population of adult cutthroat trout, and the need for regulating the popular sport fishery on this water.

Fremont County; began March 1, 1954, to close June 30, 1956; $7,100; Donald Andriano, Leader.

Address inquiries to: James C. Simpson, as in No. 1 above.

6. Utilization of Idaho Waters by Spring Chinook Salmon. (FA: F-1-R)*

A survey is being made of the extent of use by salmon, the number of salmon utilizing each stream studied, and the harvest by fishermen.

Tributaries of the Salmon River; began July 1951, to close June 30, 1954; $4,800; Forrest R. Hauck, Leader.

Address inquiries to: James C. Simpson, as in No. 1 above.

7. The Size and Timing of Anadromous Fish Runs Above McNary Dam.

As part of a comprehensive fishery research program sponsored by the Corps of Engineers, this study is designed to determine the numbers of the several species of salmon and steelhead trout and their time of arrival at various proposed dam-sites on the Snake River and its tributaries.

U. S. Army Corps of Engineers cooperating; Columbia River and tributaries between McNary Dam and Rock Island Dam; began July 1, 1953, continuing; $16,000; Ralph Pirtle, Leader.

Address inquiries to: James C. Simpson, as in No. 1 above.

University of Idaho

1. A Limnological Study of Pend Oreille Lake with Special Emphasis on the Ecology of the Kokanee.

The objective of this study has been the measurement and evaluation of changes in selected physical, chemical, and biological features of Pend Oreille Lake, caused wholly or in part by the construction of large dams on the outlet and major inlet of the lake.

Idaho Fish and Game Department cooperating; Pend Oreille Lake; began June 1952, to close June 1954; Raymond G. Stross, Leader.

Address inquiries to: Virgil S. Pratt, Idaho Cooperative Wildlife Research Unit, University of Idaho, Moscow, Idaho.

2. Age, Growth, and Migration of Steelhead Trout in the Clearwater River, Idaho.

This investigation is one of the first attempts to collect life history information on a population of steelhead trout which have long spawning migrations. A total of 551 adults, 10 percent of the 1952 run, were measured, weighed, and scale sampled. Fresh- and salt-water age and growth, condition factor, sex ratio, and speed of migration, both of spring-run and fall-run fish are studied.

Idaho Fish and Game Department cooperating; Washington Water Power dam, Clearwater River, Lewiston; began January 1952, to close February 1954; Charles R. Whitt, Leader.

Address inquiries to: Virgil S. Pratt, as in No. 1 above.

ILLINOIS

Department of Conservation

1. Fish Management and Development on State-owned and Other Waters in Illinois.

Fisheries investigations, management, and development procedures are being performed on water areas throughout the State. Fisheries biologists work on State waters and with pond and lake owners to create and maintain good fishing areas, improve habitat, and plan new water development. They recommend and supervise such work as fish population studies, coarse fish removal, population manipulations by using chemicals, plant control procedures, stocking needs.

Statewide; began July 1950; continuing; $60,000.

Address inquiries to: Sam A. Parr, Superintendent, Division of Fisheries, Department of Conservation, Room 121, State Capitol, Springfield, Ill.

2. Creation of New Fishing Waters.

A program for the creation of new fishing waters is being undertaken in areas now devoid of good angling waters, using State and Federal Aid funds. During 1953, the Red Hills Lake Development (F-4-D) was completed.

Statewide; began July 1946; continuing; $100,000.

Address inquiries to: Sam A. Parr, as in No. 1 above.

3. Collection of Commercial Fisheries Statistics and River Conditions.

Fisheries biologists and fish conservation agents are collecting data by personal contact with commercial fishermen in order to obtain accurate commercial fisheries statistics and river conditions which have definite values for administration in development and management phases of the over-all fisheries resources in the State.

Statewide; began January 1953, continuing; $6,000.

Address inquiries to: Sam A. Parr, as in No. 1 above.

4. Reconnaissance and Inventory of Waters.

Field surveys and inventory are being made on all waters of the State with the aim of gaining information that will be of value primarily from a sport fishing aspect.

Statewide; began March 1951, indefinite; $4,500.

Address inquiries to: Sam A. Parr, as in No. 1 above.

5. Stream and Lake Pollution Investigations.

The project objectives are to investigate and recommend corrective procedures in order to improve fish habitat and increase fishing to anglers on waters seriously affected by pollution. A fisheries biologist has been assigned to work on water pollution investigation jointly with the Division of Sanitary Engineering in cases in which pollution may adversely affect fish life. Analysis of work performed indicates that stronger cases against polluters can be prepared and corrective action results from specific studies on fish and aquatic life.

Sanitary Engineering Division, Public Health Department cooperating; statewide; began December 1953, continuing; $7,000; Morris L. Brehmer, Leader.

Address inquiries to: Sam A. Parr, as in No. 1 above.

6. Fox Lake Fisheries Investigation. (FA: F-2-R)

This project involves creel censusing, fish population studies, environmental conditions, and survey of possible access areas for State ownership for the Chain O'Lakes Region in order to aid in the establishment of a sound fisheries program for this area.

Chain O'Lakes Region, Lake and McHenry Counties; began March 1952, continuing; $18,000; Maurice A. Whitacre, Leader.

Address inquiries to: Maurice A. Whitacre, Fisheries Biologist, Box 591, Fox Lake, Ill.

Natural History Survey

1. Experimental Stocking of Farm Ponds.

The value of various combinations of fishes in the production of high hook-and-line yields in farm ponds is being investigated.

Statewide; began 1938, indefinite; $3,000; George W. Bennett, Leader; reports available.

Address inquiries to: Dr. George W. Bennett, Head, Section of Aquatic Biology, Natural Resources Building, Urbana, Ill.

2. Management of Largemouth Bass at Ridge Lake.

This study is aimed at finding the factors controlling development of fishable populations of largemouth bass, the relationship of bass to other fishes, and its vulnerability to angling.

Fox Ridge State Park, Coles County; began 1941, indefinite; $2,000; George W. Bennett, Leader; reports available.

Address inquiries to: George W. Bennett, as in No. 1 above.

3. Interspecific Competition Among Pond Fishes.

The two ponds used in this experiment (2.5 and 14 acres) are subjected to moderate fishing pressures. At 2-year intervals, the ponds are drained and the fish populations of several species of warm-water fishes are artificially adjusted with the objective of studying various degrees of interspecific competition.

University of Illinois cooperating; State 4-H Club Camp at Monticello, Piatt County; began 1947, indefinite; $1,500; George W. Bennett, Leader.

Address inquiries to: George W. Bennett, as in No. 1 above.

4. The Value of Pond Fertilization as a Means of Improving Fishing.

Six ponds (three fertilized and three controls) are being tested through controlled fishing to determine the amount of improvement attributable to the addition of inorganic fertilizer.

University of Illinois Agriculture Experiment Station cooperating; Dixon Springs Station, Pike County; began 1946, indefinite; $1,000; Donald F. Hansen, Leader.

Address inquiries to: Dr. Donald F. Hansen, Assistant Aquatic Biologist, Natural Resources Building, Urbana, Ill.

5. Fish Management in Reservoirs on Forest Soils.

Techniques are being developed for the management of the bass-bluegill combination in an impoundment built over clay and rock land of poor quality in Lake Glendale in the Shawnee National Forest.

Pope County; began 1941, indefinite; $2,000; Donald F. Hansen, Leader; reports available.

Address inquiries to: Donald F. Hansen, as in No. 4 above.

6. Abundance and Distribution of Native Lampreys.

The species of lampreys native to Illinois Rivers are being studied to determine their abundance and distribution, also the locations of potential spawning streams, should the sea lamprey invade the State's rivers from Lake Michigan.

Department of Conservation cooperating; statewide; began 1951, indefinite; $1,000; William C. Starrett, Leader.

Address inquiries to: Dr. William C. Starrett, Associate Aquatic Biologist, Natural History Survey Laboratory, Havana, Ill.

7. Collection of Commercial Fisheries Statistics.

An annual inventory is being made of the commercial fish taken from the larger rivers of the State.

Department of Conservation cooperating; statewide; began 1948, indefinite; $5,000; William C. Starrett, Leader; reports available.

Address inquiries to: William C. Starrett, as in No. 6 above.

8. An Investigation of the Sport and Commercial Fisheries of Some Flood Plain Lakes of the Illinois River: Chautauqua, Quiver, and Matanzas Lakes.

The values of sport and commercial fisheries of the Illinois River bottomland lakes will be determined while management practices designed to increase the yield of sport and commercial fishes are being developed. The biology of the fishes in the lakes is being studied and the dynamics of the fish populations are being estimated.

Department of Conservation and the U. S. Fish and Wildlife Service cooperating; Mason County; began 1949, indefinite; $10,000; William C. Starrett, Leader; reports available.

Address inquiries to: William C. Starrett, as in No. 6 above.

9. Life History and Ecology of the Warmouth, Chaenobryttus coronarius.

This is a study of the ecological life history of the warmouth with the objective of determining its suitability as a companion species with largemouth bass in ponds.

Farm ponds in central Illinois; began 1948, indefinite; $900; Weldon Larimore, Leader.

Address inquiries to: Dr. Weldon Larimore, Assistant Aquatic Biologist, Natural Resources Building, Urbana, Ill.

10. The Development of Fish Management Practices for the Small, Warm-water Streams of Illinois.

This is an intensive investigation of the fish populations of a few small streams in the Vermilion River drainage to determine the ecological factors which influence stream fishes. Artificial manipulation of some populations has given information on the importance of competition among the different species.

Department of Conservation cooperating; Vermilion County; began 1950, indefinite; $10,500; Weldon Larimore, Leader; reports available.

Address inquiries to: Weldon Larimore, as in No. 9 above.

11. The Role of Predators in Fisheries Management.

A study of the predation on pond fish populations by piscivorous fishes and fish-eating birds is being conducted on ponds throughout the State.

Department of Conservation cooperating; began 1951, indefinite; $1,000; Leonard Durham, Leader.

Address inquiries to: Leonard Durham, Research Assistant, Natural Resources Building, Urbana, Ill.

Southern Illinois University

1. Strip Mine Waters.

There are extensive areas of stripped land in Southern Illinois which usually include numerous water areas. With a better understanding of the physio-chemical characteristics of these waters it may be possible to develop management techniques for these waters. The study includes such considerations as pH, specific conductance, thermal stratification and dissolved oxygen concentrations.

Sport Fishing Institute and Department of Conservation cooperating; Southern Illinois area with emphasis on the Pyatt stripped area; began July 1953, indefinite; $1,000; William M. Lewis, Leader.

Address inquiries to: Cooperative Fisheries Research Laboratory, Southern Illinois University, Carbondale, Ill.

2. Survey of the Fishes of the Big Muddy River.

The Big Muddy is one of the principal rivers in Southern Illinois. Over a 3-year period investigations of the Illinois Division of Fisheries, the Illinois Department of Public Health, and the Cooperative Fisheries Research Laboratory of Southern Illinois University have attempted to ascertain the water quality picture on the Big Muddy River and to relate this to the existing fish population. The present phase of the study relates to an analysis of the fish population of the river.

Department of Conservation cooperating; Big Muddy River; began March 1951, to close April 1954; William M. Lewis, Leader.

Address inquiries to: Cooperative Fisheries Research Laboratory, as in No. 1 above.

3. Determining the Stomach Contents of the Largemouth Bass Without Sacrificing the Specimen.

In field activities involving the use of electro-fishing equipment the largemouth is particularly vulnerable. This offered an excellent opportunity to study the feeding habits of the bass, but a method of determining the stomach contents of

the bass without having to kill the fish was needed. The technique finally adopted involved the use of a metal cone which forced open the mouth and pharynx and made possible observations of the stomach's contents.

Department of Conservation cooperating; Impoundments in southern Illinois; began May 1953, indefinite; William M. Lewis, Leader; reports available.

Address inquiries to: Cooperative Fisheries Research Laboratory, as in No. 1 above.

4. Survey of the Fish Population of the Big Creek Drainage.

The objective is to determine the species of fish present in Big Creek and its tributaries, one of the few spring-fed streams in the Southern Illinois area.

Department of Conservation cooperating; Big Creek Drainage; began July 1953, to close September 1954; William M. Lewis, Leader.

Address inquiries to: Cooperative Fisheries Research Laboratory, as in No. 1 above.

Truax-Traer Coal Company

1. Fish Population and Harvest Studies.

All fishermen are required to fill out a creel census report for each fishing trip. These reports are analyzed at the end of each season to determine what each impoundment is producing and is checked with previous seasons' returns for changes in fishing success and size of fish caught to see what effects management practices have on creels.

Fulton County; began March 1953, continuing; $975; David E. Elder, Leader.

Address inquiries to: David E. Elder, Aquatic Biologist, Truax-Traer Coal Company, Fiatt, Ill.

2. Population Inventories and Age and Growth Studies.

Periodic samples by various methods are taken from the various impoundments. The data from these specimens are recorded in order to have a complete and constant record of the changes in the fish populations and their condition and growth rates.

Fulton County; began April 1952, continuing; $875; David E. Elder, Leader.

Address inquiries to: David E. Elder, as in No. 1 above.

3. Habitat Improvements.

Plantings are being made on the lake shoreline and the watershed. Aquatic vegetation is treated periodically to control it. Brush shelters are built in the lakes lacking sufficient natural shelter, and spawning facilities are supplied for some species. All this is aimed toward making the impoundments more suitable for certain species and more productive.

Fulton County; began May 1945, continuing; $925; David E. Elder, Leader.

Address inquiries to: David E. Elder, as in No. 1 above.

4. Limnological Investigations.

An investigation is being made to determine what type of habitat is afforded by strip mine impoundments of this area.

Fulton County; began May 1952, continuing; $350; David E. Elder, Leader.

Address inquiries to: David E. Elder, as in No. 1 above.

5. Propagation of Game Fish and Minnows.

A hatchery system has been set up in some of the smaller impoundments formed in the spoil banks. Game and pan fish are being propagated for use in the reclamation program and stocking new impoundments. Fertilization is being tried to increase production and variations of treatment and materials are made to determine best procedure. Minnows will be used primarily for forage in the game fish rearing ponds.

Fulton County; began July 1951, continuing; $600; David E. Elder, Leader.
Address inquiries to: David E. Elder, as in No. 1 above.

6. Introduction of New Species.

Some species of fishes, not normally found in this area, are being introduced into some of the strip mine impoundments. Possibly a new type of sports fishery may be established. Species include northern pike, walleye, rainbow and brown trout, and smallmouth bass.

Department of Conservation cooperating; Fulton County; began June 1952, continuing; $150; David E. Elder, Leader.

Address inquiries to: David E. Elder, as in No. 1 above.

7. Reclamation of Impoundments.

In addition to reclaiming some impoundments by draining or poisoning and re-stocking, various methods of correcting out-of-balance populations without destroying the entire population are being tried.

Fulton County; began May 1953, continuing; $1,500; David E. Elder, Leader.
Address inquiries to: David E. Elder, as in No. 1 above.

8. Construction of New Impoundments.

New impoundments are constructed as sites by building dams across the end of abandoned pits or across valleys between spoil banks.

Fulton County; began July 1938, continuing; $2,000; David E. Elder, Leader.
Address inquiries to: David E. Elder, as in No. 1 above.

9. Electro-fishing Investigations.

New methods and variations of old methods are being tried in an attempt to devise an electro-fishing gear that will give satisfactory results in clear, deep water. Also, studies are being made relative to effects of electrical currents on the physical processes of the fishes.

Fulton County; began July 1952, continuing; $700; David E. Elder, Leader; reports available.
Address inquiries to: David E. Elder, as in No. 1 above.

Forest Preserve District of Cook County

1. Management and Development of Fishing Waters in the Cook County Forest Preserves.

The technical staff of the Forest Preserve District carry out fish population surveys, various fish management activities and make the engineering plans for the improvement of existing waters as well as for the construction of new ones. Almost one-fourth of the State's fishing licenses are sold in Cook County and for a large part of these anglers the impoundments and the 32-mile course of the DesPlaines River through forest preserve holdings are the only waters available. These are the most heavily fished waters in Illinois and, in terms of pounds per acre, furnish some of the highest hook-and-line yields known.

Department of Conservation cooperating; Cook County; continuing; $4,000; David H. Thompson, Leader; reports available.

Address inquiries to: Roland F. Eisenbeis, Superintendent of Conservation, Forest Preserve District of Cook County, 536 North Harlem Avenue, River Forest, Ill.

Department of Conservation

1. Lake Access Acquisition. (FA: F-1-L)

The objective of the project is to acquire through purchase small tracts of land to provide ingress and egress to the public fishing waters of the State. Many of these lakes and streams, previous to the initiation of this project, have been surrounded by private ownership making their usage by the public difficult.

Statewide; began April 14, 1952, continuing; $14,576; Charles E. Scheffe, Leader.

Address inquiries to: Charles E. Scheffe, Indiana Department of Conservation, Division of Fish and Game, 311 West Washington Street, Indianapolis 9, Ind.

2. Public Fishing Access Development. (FA: F-2-D)

The project objective is to develop free public fishing access areas for use of fishermen by providing access roads and parking space for automobiles, and launching and mooring facilities for boats.

Statewide; began September 3, 1952, continuing; $41,172; James Baker, Leader.

Address inquiries to: William B. Barnes, Federal Aid Coordinator, Indiana Department of Conservation, Division of Fish and Game, 311 West Washington Street, Indianapolis 9, Ind.

3. Tri-County Game Preserve. (FA: FW-1-L)

The objective of the project is to acquire a 7,410-acre area including one entire lake and shoreline on two other natural lakes for fish and wildlife purposes.

Kosciusko, Noble, and Whitley Counties; began February 9, 1953, to close January 1, 1956; $98,950; C. E. Scheffe, Leader.

Address inquiries to: William B. Barnes as in No. 2 above.

Indiana University

1. Efficiency of Food Utilization by a Fish Population.

This is a continuing project involving laboratory experiments on the efficiency of protein utilization and field experiments on the abundance, mortality, and growth of fish populations. The objective is to describe the efficiency of productivity at one of the highest trophic levels in the aquatic environment.

Indiana University and lakes of northern Indiana; began 1950, continuing; Shelby D. Gerking, Leader; reports available.

Address inquiries to: Dr. Shelby D. Gerking, Zoology Department, Indiana University, Bloomington, Ind.

2. Bio-assay Procedure for Evaluating Fish Toxicants.

The project is directed at evaluating the advantages and possible disadvantages of toxicity index values as criteria for the comparison of materials which produce acute toxicity to fish. The possibility of describing the physiological response of taxonomic groups of fish by means of these criteria will be explored.

Indiana University; began January 1953, to close December 1954; $1,000; Saul B. Saila, Leader; reports available.

Address inquiries to: Dr. Saul B. Saila, Zoology Department, Indiana University, Bloomington, Ind.

State Conservation Commission

1. Lake and Stream Public Access. (FA: in part)

Objective of the project is to provide free public access to lakes and streams for angling and other recreational purposes. Acquisition of tracts of land adjacent to good fishing waters is undertaken whenever they become available. Several areas are in the process of being purchased at this time.

Statewide; continuing; Lloyd P. Bailey, Leader.

Address inquiries to: Lester F. Faber, Superintendent of Federal Aid, Division of Fish and Game, East Seventh and Court, Des Moines, Iowa.

2. Acquisition and Development of Abandoned Strip Coal Mines. (FA in part)

Current activities consist of development works on three previously acquired areas totaling 758 acres. Fencing of the areas is being completed. Partial grading of spoil banks is being done and earth dams and outlet structures for three small lakes are in the process of construction. Tree and shrub plantings are being made, and formerly abused cropland is being seeded to lespedezas and sweet clover.

Statewide; began 1951, indefinite; Lloyd P. Bailey, Leader.

Address inquiries to: Lester F. Faber, as in No. 1 above.

3. Williamson Pond Fisheries Development. (FA: F-10-D)

This 26-acre railroad reservoir in the past furnished excellent fishing, but in late years had been unproductive. After acquisition, (FA. F-4-L) it was dewatered as far as was practical by pumping and the fish population destroyed with emulsified rotenone.

The spillway in the dam is being repaired and a 10-foot stop-log section is being installed to facilitate drainage should future fish management require it. The pond will be restocked in 1954.

Lucas County; began September 26, 1953, to close March 31, 1954; $9,000; Lloyd P. Bailey, Leader.

Address inquiries to: Lester F. Faber, as in No. 1 above.

4. Blue-green Algae Control.

Several fish and general recreation lakes of Iowa develop large blooms of blue-green algae which are unsightly and occasionally toxic to waterfowl and domestic animals. Aid of a technical nature is provided to communities or organizations in administering copper sulfate to control these growths. A study of toxic algae is receiving special consideration due to waterfowl losses in the fall of 1952.

State lakes; began June 1952, continuing; Earl T. Rose, Leader; reports available.

Address inquiries to: E. B. Speaker, Superintendent of Biology, Division of Fish and Game, East 7th and Court Streets, Des Moines, Iowa.

5. Natural Lakes Survey.

All of the natural lakes of Iowa managed for angling are surveyed by the Biology Section each year. This involves test seining with 500 feet of 1/4-inch mesh (bar) seine at several stations on each lake. Pound and gill nets are used to supplement the seine catch. The small-mesh seine hauls are designed to determine primarily the magnitude of reproduction each year, and the nets to determine population fluctuations and status of the adult fishes. Fishes taken are sorted into young-of-the-year and older groups, weighed, measured, and scale samples taken from representatives for age and growth analyses. Data on vegetation, amount of bottom foods (dredge samples) turbidity and lake

chemistry are also obtained. Electro-fishing devices, both AC and DC, will be used to supplement nets and seines in the population studies in 1954. Information is recorded on forms and recommendations presented for possible improvement of fishing.

Northern half of State; began July 1940, continuing; $5,000; Earl T. Rose, Leader; reports available.

Address inquiries to: E. B. Speaker, as in No. 4 above.

6. Artificial Lakes Survey.

A continuing inventory is maintained in the form of an annual netting survey and limited limnological investigations of the artificial lakes. Although special emphasis is placed on the relative abundance of each species and extent of reproduction, other items such as age and growth, abundance of bottom fauna, extent and species of vegetation, turbidity, and extent of chemical and thermal stratification are determined.

Statewide; began September 1947, continuing; $1,500; Tom Moen, Leader; reports available.

Address inquiries to: E. B. Speaker, as in No. 4 above.

7. Creel Census.

Principal objective of this project is to determine fishing success in the major lakes of Iowa. Annual sampling of anglers is conducted from May 15 to July 1, on five lakes in northern Iowa, and on a year-round basis at Spirit and Okoboji Lakes. Comparisons of tabulated total catch by species and unit effort are made from season to season to indicate trends and evaluate management practices.

Spirit, East and West Okoboji, Lost Island, Storm, Clear and Blackhawk Lakes; began May 1946, continuing; $4,000; Earl T. Rose, Leader; reports available.

Address inquiries to: E. B. Speaker, as in No. 4 above.

8. A Population Study of Walleyes of Spirit Lake.

A long-term walleye fry stocking experiment now in its sixth year is coupled with this study. In addition to the fry, a limited number of fingerlings have been stocked from nursery units. The progress of the walleye population has been followed by extensive gillnetting during the spawning run and through the summer surveys with 500 feet of 1/4-inch seine. A total walleye population estimation of this lake will be made again in 1954.

Spirit Lake; began April 1944, continuing; $500; E. T. Rose and Tom Moen, Leaders.

Address inquiries to: E. B. Speaker, as in No. 4 above.

9. A Study of Hatchery Techniques.

The project was set up to study general hatchery procedures as they are concerned with the hatching and stocking of yellow pike-perch and northern pike. Basic data is collected on production (total number of eggs), number of eggs per quart (size), size at various stages of development, fertility, temperatures, and numbers and sex of fish handled. Some experimental work is being carried on in methods of handling both eggs and fish.

Spirit Lake and Clear Lake Hatcheries; began April 1946, continuing; $500; Tom Moen, Leader.

Address inquiries to: E. B. Speaker, as in No. 4 above.

10. The Value of Stocking Walleyes in Iowa Streams.

The object of this investigation is to study the possibility of supplementing our stream fisheries by the introduction of hatchery-reared walleyes. Stocking is on an alternate year basis. Collections of scales are made to determine whether or not the majority of fish caught come from the years in which walleyes are planted.

Streams, northeast quarter of State; began May 1950, continuing; R. E. Cleary and Harry M. Harrison, Leaders.

Address inquiries to: E. B. Speaker, as in No. 4 above.

11. Factors Affecting Smallmouth Bass Production in Northeastern Iowa.

This project involves a multi-phase study of the life history and ecology of the smallmouth bass in 17 test streams in the area. Data is gathered annually on the nests seen per mile, condition and location of nests, effect of changed environment, effect of stream flow, turbidity, number of fingerlings per 500 feet of seining, age and growth data, quantitative bottom fauna. Effort is also being made to correlate good and poor natural hatches with age and survival data on minnows to attempt to discover forage indicator species which will give accurate insights into annual reproduction success of the smallmouth bass.

Northeastern Iowa; began May 1949, continuing; $2,000; R. E. Cleary, Leader.

Address inquiries to: E. B. Speaker, as in No. 4 above.

12. Modified Voluntary Creel Census.

This project was started to give an insight into the per hour take of especially picked anglers who are deemed "experts" and who fish primarily in the flowing waters of northeastern Iowa. The contacts are picked on a fixed ratio from each county and serve to furnish us with season catch data on a weekly report basis. Their data indicate a measure of the available crop, season take, selectivity of stream, and to correlate against test netting results.

Streams of northeastern Iowa; began April 1950, continuing; $1,000; R. E. Cleary, Leader; reports available.

Address inquiries to: E. B. Speaker, as in No. 4 above.

13. Rough Fish Studies.

This project involves a general collection of data on carp, buffalo, sheepshead and gizzard shad. The primary portion of this study has concerned food habits, but data have also been collected on ecology, age and growth, reproduction, sexual maturity, number of eggs per fish, and condition factors in an overall effort to determine the interrelations existing between rough fish and their environment and between rough fish and game fish.

Natural lakes of northwest Iowa; began January 1946, continuing; $1,000; Tom Moen, Leader; reports available.

Address inquiries to: E. G. Speaker, as in No. 4 above.

14. Techniques of Fish Surveys in Streams.

This project involves a study of the effectiveness of various types of gear used to make stream and river surveys. At present, special emphasis is placed upon determining the best gear suited to the rivers and streams of the type found in Iowa and at what time of year and under what conditions they work best. The types of equipment under observation include the conventional electrical gear, traps and seines of various design used under a variety of conditions, and the use of several instruments to drive fish into traps. In addition to this, studies are underway to determine the possibility of making stream surveys under ice.

Statewide; began July 1948, to close November 1955; $2,000; R. E. Cleary and Harry M. Harrison, Leaders.

Address inquiries to: E. B. Speaker, as in No. 4 above.

15. Continuing Inventory of the Fishes of Iowa.

The project involves population trend determinations by netting surveys at fixed stations. Each survey station is visited annually at the same time each successive year to approximate similar ecological conditions. Specimens are taken with trap and hoopnets and the data is handled on a catch and weigh per net-hour basis. Reproduction indices are gathered at the station by use of a 25-foot drag seine. The geographical distribution of the various species in the State is recorded.

Statewide; began June 1949, continuing; R. E. Cleary and Harry Harrison, Leaders; reports available.

Address inquiries to: E. B. Speaker, as in No. 4 above.

16. Angling Instructions.

The objective is to teach productive methods of catching panfish as an aid in species control to improve game fishing. This is to be accomplished through conducting two angling schools, Kid Fish Day events, departmental instruction as part of the duty of fishery employees as public contacts are made, and through press and radio information releases.

Statewide; continuing; $6,000; Charlie King and Garfield Harker, Leaders; reports available.

Address inquiries to: K. M. Madden, Division of Fish and Game, East Seventh and Court Avenue, Des Moines, Iowa.

17. New Artificial Lake Construction and Stocking.

The objective is to provide water recreation including angling in areas now lacking such facilities. This includes the stocking and opening to fishing of four new artificial lakes (total acres 634); stocking two new artificial lakes (total acres 1,030); stocking and opening of one new city water reservoir (total acres 130); and continuous routine fish management on above areas and all other artificial lakes and city reservoirs.

City of Montezuma cooperating; statewide; continuing; Charle King and William Tate, Leaders.

Address inquiries to: K. M. Madden, as in No. 16 above.

18. Nursery Lakes.

The project objective is to produce from artificial hatching advanced fingerling sized walleye and northern pike for statewide predator stocking as an aid in species control. Shallow Freezeout Lakes and marshes are used for the rearing of these fingerlings.

Statewide; began March 1953, to close December 1953; $16,000; Garfield Harker, Leader.

Address inquiries to: K. M. Madden, as in No. 16 above.

19. Statewide Undesirable Fish Control.

The objective is to reduce undesirable populations in state-owned inland waters to increase game fish growth rates or catchable fish. Thirty permanent traps plus seining by two permanent crews using 1/2-inch up to 2 1/2-ich mesh bar measure net are employed. Except for concentrations in streams at barriers all of the control work is confined to natural lakes.

Began 1909, continuing; $60,000 (Less 50 percent cash return from sale of fish); Chuck O'Farrell, Leader; reports available.

Address inquiries to: K. M. Madden, as in No. 16 above.

20. Lake and Stream Improvement.

Objectives include lake inlet channeling, fish trap installation in bays and estuaries to limit species use for spawning; experimental stream devices to improve habitat, lake outlet fish screens to prevent rough fish entrance or spawning and lake shore rip-rapping to prevent erosion.

Statewide; continuing; Bill Tate, Charlie King, Garfield Harker and Chuck O'Farrell, Leaders.

Address inquiries to: K. M. Madden, as in No. 16 above.

Iowa State College

1. Effect of Dredging on Fish and Fish Food Organisms in Shallow Prairie Lakes.

This study is aimed at evaluation of changes in fish populations and fish food production following the dredging of shallow prairie lakes to improve recreational facilities. Much of the emphasis is on bottom fauna production and upon sampling problems associated with bottom fauna population estimation. Emphasis is also being placed upon the utilization of bottom fauna by various fishes.

State Conservation Commission cooperating; North Twin, Lizard, and Little Wall Lakes; began May 1951, continuing; $4,500; Kenneth D. Carlander, Leader; reports available.

Address inquiries to: Dr. Kenneth D. Carlander, Cooperative Fisheries Research Unit, Department of Zoology and Entomology, Iowa State College, Ames Iowa.

2. Northern Pike Population Studies.

Norther pike are reared in Ventura Marsh from which they move through a trap to Clear Lake in the fall. Tags are placed on a portion of the young pike to determine the percentage which leaves the marsh and to estimate the population within the marsh. The subsequent yield to anglers will also be studied.

State Conservation Commission cooperating; Clear Lake; began September 1952, continuing; $2,000; Kenneth D. Carlander, Leader; reports available.

Address inquiries to: Kenneth D. Carlander, as in No. 1 above.

3. Creel Census on Clear Lake.

The primary aim is to develop a method whereby the angler's rate of success and the annual yield can be estimated on this lake, despite the many access areas. Emphasis will be placed on measures of the variability of estimates. The data will also be of value in connection with the continuing population studies on Clear Lake.

State Conservation Commission cooperating; Clear Lake; began June 1952, to close 1955; $3,000; Kenneth D. Carlander, Leader; reports available.

Address inquiries to: Kenneth D. Carlander, as in No. 1 above.

4. Population Studies on Walleye Pike.

This project is part of a long-term investigation of fish population changes in Clear Lake. It includes extensive tagging during spawning run, followed by creel census and experimental gill netting to estimate population, rate of exploitation, and mortality rates. Fry plantings have been made in alternate years since 1948 to test value of such propogation. Data are collected on all species to determine population dynamics.

State Conservation Commission cooperating; Clear Lake; began June 1947, continuing; $3,000; Kenneth D. Carlander, Leader; reports available.

Address inquiries to: Kenneth D. Carlander, as in No. 1 above.

5. Fish Populations in Artificial Lakes.

Growth and abundance of fishes in two state-owned lakes are studied annually to determine population changes. Particular emphasis has been placed on a study of effects of the greatly decreased turbidity of one lake.

State Conservation Commission cooperating; Lakes Ahquabi and Red Haw Hill; began June 1948, continuing; $2,500; Kenneth D. Carlander, Leader; reports available.

Address inquiries to: Kenneth D. Carlander, as in No. 1 above.

6. Effect of Stream Conditions on Fish Populations.

The present studies deal primarily with effect of drought and winter on fish and bottom fauna, and with an evaluation of various gear for sampling fish populations. Studies on success of reproduction of minnows in relation to water levels will also be continued.

State Conservation Commission cooperating; Story and Boone Counties; began June 1946, continuing; $2,500; Kenneth D. Carlander, Leader; reports available.

Address inquiries to: Kenneth D. Carlander, as in No. 1 above.

7. Management of Small Ponds for Fish Production.

Annual observations are being made on ponds where attempts to correct population balance have been made by adding fingerling and adult fish. Marking and recovery methods of estimating fish populations are being tested to improve the techniques.

State Conservation Commission cooperating; vicinity of Knoxville and Ames; began June 1947, continuing; $1,000; Kenneth D. Carlander, Leader; reports available.

Address inquiries to: Kenneth D. Carlander, as in No. 1 above.

8. Compilation of Data on Fish Growth and Biology.

This project attempts to summarize all growth, length-weight, and similar data on freshwater fishes of the United States and Canada and publishes tabular summaries in a handbook and periodical supplements.

State Conservation Commission cooperating; Iowa State College, Ames; began January 1947, continuing; $1,000; Kenneth D. Carlander, Leader; reports available are: "Handbook of Freshwater Fishery Biology" (1950), and First Supplement, (1953).

Address inquiries to: Kenneth D. Carlander, as in No. 1 above.

KANSAS

Forestry, Fish and Game Commission

1. Fish Population Control on Kanapolis Reservoir.

In this 3,400-acre reservoir a high percentage of the channel catfish population is composed of small, slow-growing fish. During the summer, these fish are lured into shallow areas by baiting with carp and buffalo which have been seined from the reservoir. While the channel catfish are concentrated in the baited areas, drag seines are used to catch them. These fish are transplanted in various lakes over the State where natural reproduction is inadequate to maintain a suitable fishery.

Ellsworth County; began July 1952, indefinite; Seth L. Way, Leader.

Address inquiries to: Dave Leahy, Director, Forestry, Fish and Game Commission, Pratt, Kans.

2. Strip-mine Lake Survey and Management Project.

Physical, chemical, and biological studies are being conducted on a group of state-owned strip-mine lakes in an effort to obtain information which will aid in improving angling success in these waters. Fish population studies are being carried on. Management procedures include total eradication of fish populations, spot eradication, and shoreline removal, using cube root. These operations are followed by subsequent restocking or corrective stocking. A similar project in cooperation with the Sinclair Coal Company was initiated in 1953, for the purpose of developing additional public fishing areas. This will include limited experimentation with commercial fertilization and weed control measures.

Southeast Kansas; began June 1951, indefinite; $5,000; Charles Burner, Leader.

Address inquiries to: Dave Leahy, as in No. 1 above.

3. Construction of Public Fishing Lakes. (FA in part)

The land has been acquired and several contracts awarded for the construction of dams to create new fishing lakes. When these lakes fill, warm-water species of fish including largemouth bass, channel catfish, crappies and bluegills will be stocked.

Cowley, Grant, Brown, and Logan Counties; began July 1953, to close December 1954; Noel Mullendore and Roy Schoonover, Leaders.

Address inquiries to: Dave Leahy, as in No. 1 above.

University of Kansas

1. Fishes of Kansas.

This project is an inventory of the fishes of the State, and is to include descriptions (with keys), distribution maps, and notes on the habitat and abundance, etc., for each species. Attention will be given to changes which seem to have occurred in fish-distribution and in habitat since the first collections of fishes were made in Kansas about 1850. Present plans call for publication in both technical and popular accounts.

Statewide; began July 1951, continuing; $500; Frank B. Cross, Leader.

Address inquiries to: Dr. Frank B. Cross, State Biological Survey, University of Kansas, Lawrence, Kans.

2. Surveys of Kansas Impoundments.

Selected lakes and ponds are sampled at intervals to follow trends in the fish populations and growth rates of fishes from year to year. Currently four lakes with areas of more than 100 surface acres and 14 ponds with areas of 1/2-acre to 5 acres are included. Some are relatively old lakes, others are new, and still others have been renovated one or more times by draining and refilling. Parasitological studies, tagging studies, special stocking combinations, aquatic vegetation control, and turbidity control have been phases receiving consideration in particular cases.

Statewide; began 1951, continuing; $1,500; Frank B. Cross, Leader.

Address inquiries to: Frank B. Cross, as in No. 1 above.

3. Study of the Channel Catfish in Kansas.

This project seeks information leading to a sound basis for management of the species, with specific aims as follows: Determination of ages attained and growth rates, in particular lakes and streams, and as a state average; reproductive success in lakes of various types and sizes; evaluation of results of using stunted individuals from overpopulated lakes for stocking elsewhere; experimentation with marking methods, and extensive application of the one found most suitable; a check on the validity of aging techniques, using known-age fish; comparison of the growth rates of stunted channel catfish and channel catfish which have grown more rapidly when the two types are placed together in new waters; potentialities of the channel catfish as a pond fish under various conditions of stocking ratios, fertilization, and supplemental feeding.

Forrestry, Fish and Game Commission cooperating; statewide; began February 1954, planned for 3 years; $6,000; W. Jackson Davis, Leader.

Address inquiries to: Frank B. Cross, as in No. 1 above.

4. Experiments in Pondfish Production.

Eight small experimental ponds, a larger surface-water reservoir, and an adjacent laboratory building have been constructed on the campus. The ponds were constructed so as to be as nearly identical as possible, and so that water can be added to or drained from each pond at any time, independently of all the others. The purpose of the ponds is to obtain fundamental information on the biology of small ponds in this region, and to seek methods for increasing production of various food and game fishes. Channel catfish and largemouth bass, in combination with various other species, will be the objects of the original studies.

Hdqrs. Lawrence; began June 1953, continuing; $40,000 (cost of construction); Frank B. Cross, Leader.

Address inquiries to: Frank B. Cross, as in No. 1 above.

5. Fishes of Lake Wabaunsee and Mill Creek Drainage Basin.

Objectives are to determine the kinds and relative abundance of fishes in the 150-acre Lake Wabaunsee, and in streams above and below this impoundment, to the confluence of Mill Creek with the Kansas River; the size-distribution, growth rates, and (grossly) food habits of principal species in the lake; and characteristics of the habitat. Fishes are being collected by means of gill nets, hoop nets, seines, and angling. Management recommendations will be presented, especially for the lake, and comparisons will be drawn with other Kansas lakes and streams which are under study.

Lake Wabaunsee Sportsmen's Association and City of Eskridge cooperating; Wabaunsee County; began February 1953, to close June 1954; $500; James W. Booth, Leader.

Address inquiries to: Frank B. Cross, as in No. 1 above.

Kansas State College

1. Biology of Farm Ponds.

Objectives of the project are: (a) To study the ecology of farm ponds, particularly those combinations of fishes which are best suited to Kansas ponds; (b) to determine the fish production obtainable with chemical fertilizers; (c) to control aquatic vegetation; and (d) to determine production and reproduction of channel catfish.

Forestry, Fish and Game Commission cooperating; vicinity of Manhattan; began July 1953, indefinite; O. W. Tiemeier, Leader.

Address inquiries to: Dr. O. W. Tiemeier, Department of Zoology, Kansas State College, Manhattan, Kans.

Department of Fish and Wildlife Resources

1. Regional Fishery Investigations.

Fish populations and the conditions thereof are being inventoried in all major waters of the State in an effort to determine what measures should be undertaken for the improvement of fishing.

Statewide; began April 1937, continuing; Bernard Carter and Charles Bowers, Leaders; reports available.

Address inquiries to: Minor E. Clark, Director, Division of Fisheries, Department of Fish and Wildlife Resources, Frankfort, Ky.

2. Farm Fish Pond Investigation. (FA: F-3-R in part)

The objective of this project is to improve upon stocking ratios and species combinations now being used so as to provide the best fishing possible in small reservoirs. Attention is also being given to diversity of soil types, chemistry of the water, pond size and location, and the use of fertilizer.

Statewide; began January 1948, continuing; William A. Smith, Jr., Leader; reports available.

Address inquiries to: Minor E. Clark, as in No. 1 above.

3. Warm-water Stream Investigation. (FA: F-4-R)

Species composition is being manipulated in streams carrying an almost wholly rough fish population. Two streams have already had the entire population removed and have been restocked with game and pan fishes. No effort has been made to control migration. In some cases, an electrical screen will be placed down stream to prevent migration into treated areas.

Statewide; began March 1952, to close March 1957; James R. Charles, Leader; reports available.

Address inquiries to: Minor E. Clark, as in No. 1 above.

4. Kentucky Lake Investigations. (FA: F-2-R)

The project aims to determine by a program of tag and recovery the percentage of harvest of the adult population of the crappie in Kentucky Lake, and the amount of movement of the crappie population in this Lake. A continuation of previously initiated age and growth studies and biological observations of the species involved are also included in the project, as well as life history studies of the white and black crappie. The project is divided into two phases, one carried on in the Lake, covering an area of 6 mile radius, the other in the Tennessee River, including 10 miles of the tailwater section. Records are also kept regarding the efficiency of several commercial net types which might be suitable for use in this State. Netting studies and rotenone samplings are correlated in an effort to bring about improved methods of determining the species representation in a major lake. An analysis of food habits of white crappie is also in progress.

Kentucky Lake and Tennessee River below dam in Marshall County; began July 1951, to close January 31, 1954; $14,056; Ellis R. Carter, Leader; reports available.

Address inquiries to: Minor E. Clark, as in No. 1 above.

5. Pollution Control.

The purpose of this project is to detect and eliminate pollution which adversely affects fishing and to indict and prosecute offenders who fail to remedy such conditions.

Statewide; began August 1945, continuing; Mercer Peters, Leader; reports available.

Address inquiries to: Mercer Peters, Chief Chemist, Division of Fisheries, Department of Fish and Wildlife Resources, Frankfort, Ky.

6. Classification, Distribution and Ecology of Kentucky Fishes. (FA: F-7-R)*

The objective is to bring together information on the game, food and forage fishes of the State. A semi-popular bulletin covering the fishes most commonly encountered by sports fishermen is planned. This bulletin will be followed by a more extensive publication on the fishes of Kentucky.

University of Louisville cooperating; began December 1953, planned for 3 years; $6,000; William M. Clay, Leader.

Address inquiries to: Dr. William M. Clay, University of Louisville, Louisville, Ky.

7. A Population Estimation of the More Important Fishes of Dewey Reservoir. (FA: F-8-R)*

Objectives of the project are to conduct a netting and tagging program, a creel census, and population estimates with rotenone sampling, in order to determine the condition of the present fish population which has sharply declined. Extent of reproduction and survival of young game fish is to be investigated.

Began March 1954, indefinite; $10,518; Ellis R. Carter, Leader.

Address inquiries to: Minor E. Clark, as in No. 1 above.

LOUISIANA

Department of Wild Life and Fisheries

1. Fish Population Investigation. (FA: F-1-R)*

This project was set up to sample fish populations in selected areas. Collections will be made using rotenone, nets, traps, and seines. The relationship between game and non-game species, growth rate of important species, and success of natural reproduction will be determined. This information will be used in planning the distribution of fish obtained through fish rescue operations.

Statewide; began April 1, 1953, planned for 3 years; $13,869; James A. DeJean, Leader.

Address inquiries to: L. D. Young, Jr., Executive Director, Wildlife and Fisheries Commission, New Orleans, La.

2. Aquatic Vegetation Control. (FA: F-2-D)*

An area lying in the south-central portion of the State between Alexandria and the Gulf contains waters now choked with water hyacinths. These plants will be removed from the water areas by means of 2,4-D. The compound will be sprayed from power units mounted on small barges.

Began April 1, 1953, to close June 30, 1954; $44,697; John G. Dutton, Leader.

Address inquiries to: L. D. Young, Jr., as in No. 1 above.

3. Biological Study of Lake Pontchartrain.

Objectives of the project are to gain information needed in establishing a sound fisheries management program for Lake Pontchartrain, and to establish and develop a basis for a continuous long-term study. Such a program would be essential to continued maintenance of productivity and recreational advantages.

Tulane University and Commercial Seafoods Division cooperating; New Orleans; began June 1953, indefinite; $12,000; Royal D. Suttkus, Leader; reports available.

Address inquiries to: Dr. Royal D. Suttkus, Zoology Department, Tulane University, New Orleans, La.

4. Pond Experiments.

Objectives of the project are to ascertain the number and species of fish to stock farm ponds; and to ascertain the best management policies for keeping a farm pond balanced for the control of aquatic vegetation.

Lacombe Fish Hatchery; began June 1953, continuing; $1,000; Harry E. Schafer, Jr., Leader.

Address inquiries to: Harry E. Schafer, Jr., Wild Life and Fisheries Commission, 117 Civil Court Building, New Orleans 16, La.

5. Possible Changes in the Population of Bayou Lafourche.

The project objective is to ascertain any possible change in fish population and plankton population of Bayou Lafourche after the addition of approximately one million gallons of Mississippi River water per day.

Bayou Lafourche from Donaldsonville to the Gulf of Mexico; began January 1954, to close June 1955; approximately $800; Harry E. Schafer, Jr., Leader.

Address inquiries to: Harry E. Schafer, Jr., as in No. 4 above.

6. Warm-Water Fishes and Fishways.

The objective of the project is to ascertain whether warm-water fishes will use fishways during the spring of the year when water is flowing from the lake into the lower pool.

Lake Bistineau and Lake Chicot; began February 1954, indefinite; Harry E. Schafer, Jr., Leader.

Address inquiries to: Harry E. Schafer, Jr., as in No. 4 above.

MAINE

Department of Inland Fisheries and Game.

1. Investigation of Eastern Brook Trout, Land-locked Salmon and Lake Trout in Cold Stream Watershed. (FA: F-5-R)

The above species are being studied with relation to life history and survival, population estimates, age and growth characteristics. Creel censuses are conducted, and fish movements observed.

Enfield and Lincoln twps.; began November 1950, to close June 1954; $3,300; Lyndon H. Bond, Leader; reports available.

Address inquiries to: Lyndon H. Bond, Department of Inland Fisheries and Game, State House, Augusta, Maine.

2. An Investigation of the Fresh-water Fisheries of Mount Desert Island. (FA: F-2-R)

Two coastal lakes deemed suitable for management of the land-locked salmon and eastern brook trout are being surveyed to obtain information on interrelationships of existing populations of warm-water and cold-water game species; to increase natural reproduction of salmon; to establish a natural run of alewives by stocking; to determine the effects of ice-fishing on salmon and trout; and to study spawning habits, survival rates, and returns to the angler of hatchery-reared, land-locked salmon and eastern brook trout planted in the lakes.

Mount Desert Island; began April 1950, to close June 1954; $3,000; Keith A. Havey, Leader; reports available.

Address inquiries to: Keith A. Havey, Department of Inland Fisheries and Game, Sullivan, Maine.

3. Statewide Lake and Stream Survey. (FA: F-8-R)

Biological surveys of the reconnaissance type are being continued on Maine waters with special emphasis on large and heavily fished lakes and ponds. The principal objective is to collect essential basic data on limnological characteristics and fish populations of each body of water. Analysis of results will permit proper classification of lakes and formulation of management policies.

Statewide; began December 1951, to close 1955; $39,055; W. Harry Everhart, Leader; reports available.

Address inquiries to: Dr. W. Harry Everhart, Fishery Office, University of Maine, Orono, Maine.

4. An Investigation of the Branch Lake Fisheries With Emphasis on the Brown Trout. (FA: F-8-R in part)

The objective of the project is to gain information as to the interrelationships between brown trout and other game fishes, their spawning habits and movements, food habits, and age and growth studies. A thorough study of the fishery is also in progress including summer and winter creel censuses, intensive lake survey, and the marking or tagging of both wild and hatchery raised fish.

Hancock County; began June 1952, to close June 1954; $2,000; Carll N. Fenderson, Leader; reports available.

Address inquiries to: Carll N. Fenderson, Department of Inland Fisheries and Game, Birch Street, Greenville Junction, Maine.

5. A Study of the Fish Population, Fish Migrations and Habitat Conditions of the West Branch of the Penobscot River. (FA: F-8-R in part)

An intense study of the Penobscot River is being conducted from Mattaseunk Dam to the headwaters of the West Branch of the Penobscot River. From this study a management plan will be determined that will give the best possible fishing for this section of the Penobscot drainage. Anadromous as well as resident species will be considered.

University of Maine cooperating; Penobscot, Piscataquis and Aroostook Counties; began November 1953, to close January 1956; $3,000; Richard E. Cutting, Leader; reports available.

Address inquiries to: Richard E. Cutting, Coburn Hall, University of Maine, Orono, Maine.

6. Investigation of the Fisheries of the Belgrade Lakes. (FA: F-8-R in part)

This is one phase of a statewide project involving many lakes and streams. It is designed to provide information necessary for the proper management of the warm-water fishes in these waters with special emphasis on the smallmouth black bass and white perch fisheries. Objectives are: harvest studies, age and growth studies, and food habits investigations of white perch and bass.

Kennebec County; began June 1952, to close June 1954; $3,000; Robert E. Foye Leader; reports available.

Address inquiries to: Robert E. Foye, Department of Inland Fisheries and Game, State House, Augusta, Maine.

7. Reclamation of Potential Trout Ponds. (FA: F-6-R)

Seven ponds were reclaimed in the State during the summer of 1951. These ponds are being studied to determine the results of restocking. Information gathered will be used in determining the possibilities of reclaiming other ponds, the proper methods to be used, and the probable value to the angler.

Kennebec County; began June 1951, to close June 1954; $3,320; Robert E. Foye Leader; reports available.

Address inquiries to: Robert E. Foye, as in No. 6 above.

8. An Investigation of the Smallmouth Black Bass Fishery in Big Lake Drainage.

Exploitation of the smallmouth black bass is being studied through an analysis of creel census and age-and-growth data. Particular attention is being paid to the early fly fishing season regulations and their effects. Observations are also being made on movements into spawning areas, food habits, and effects of parasitism.

University of Maine cooperating; Washington, Hancock and Penobscot Counties; began June 15, 1953, to close June 1954; $3,000; John E. Watson, Leader.

Address inquiries to: John E. Watson, Fishery Office, University of Maine, Orono, Maine.

9. A Study of the Metazoan Parasites of the Fresh-water Fishes of the State.

The objective of this project is to determine the species of parasites present in the waters of the State, the host species in which they are found, their effects on these fishes at various stages, their distribution in different waters, and their importance in relation to the economic production of hatchery stock and fish of natural waters.

University of Maine cooperating; statewide; began June 1952, to close June 1954; $2,000; Marvin C. Meyer, Leader; reports available.

Address inquiries to: Dr. Marvin C. Meyer, 23 Coburn Hall, University of Maine, Orono, Maine.

MARYLAND

Game and Inland Fish Commission

1. Investigation of Striped Bass Spawning Grounds. (FA: F-3-R in part)

Objectives of the project are: to determine the upper and lower limits of the major striped bass spawning areas; to determine the season and duration of spawning; to compare the contribution of each area to the total of the striped bass population; and to determine the effect of the licensed and unlicensed net fishery on the spawning areas.

Department of Tidewater Fisheries and Department of Research and Education cooperating; Chesapeake Bay - Estuarine Rivers; began July 1953, to close June 1956; $8,000; Edward Hollis, Leader.

Address inquiries to: Director, Department of Tidewater Fisheries, State Office Building, Anapolis, Md.

2. Community Fish Pond Project. (FA: F-1-D)

The objectives of the project are to provide greater fishing opportunity on a statewide basis and to create small lakes of approximately 1.4 acres in extent to be stocked with trout, black bass, and bluegills, depending on the impoundment.

Statewide; began July 1953, to close June 1954; $24,496; Edwin M. Barry, Leader.

Address inquiries to: Edwin M. Barry, Chief, Inland Fish Management, Game and Inland Fish Commission, 516 Munsey Building, Baltimore 2, Md.

Department of Research and Education

1. Inventory and Classification of Water Areas With Reference to Water Quality and Fish Productivity.

The project objectives are to survey and classify all lakes, ponds, and streams in the State. A stream classification has been devised and streams are classified accordingly. Lake and impoundment surveys include mapping and general lake survey.

Game and Inland Fish Commission cooperating; statewide; began 1949, continuing; R. D. Van Deusen, Leader.

Address inquiries to: R. D. Van Deusen, Department of Research and Education, Solomons, Md.

2. A Study of the Distribution and Relative Abundance of Fish Species in Maryland.

Objectives of the project are to determine the distribution of the various fish species in the State and gather information concerning their relative abundance. Data are obtained from seining, trapping, drugging and creel census projects. Distribution records now numerous enough for publication and report are being prepared.

Statewide; began 1948, indefinite; Romeo Mansueti, Leader.

Address inquiries to: Harold J. Elser, Department of Research and Education, Solomons, Md.

3. Study of the Harvest of Sports Fishes from Various Bodies of Water in Maryland.

Creel census studies are designed to determine total harvest of fish in several Maryland waters. These studies include analysis of species taken, estimated weights, habits of fishermen, etc.

Selected waters; began 1951, indefinite; Harold J. Elser, Leader; reports available.

Address inquiries to: Harold J. Elser, as in No. 2 above.

4. A Test of the Solunar Tables.

The objective of the project was to test the ability of the Solunar Tables to forecast the times at which fish bite best. Data from 1,538 fishing trips on Loch Raven, Maryland, were used for the study.

Began January 1953, to close September 1953; Harold J. Elser, Leader; reports available.

Address inquiries to: Harold J. Elser, as in No. 2 above.

5. Determination of the Average Growth Rates of Maryland Fish Species.

Scales from fish collected by various methods are analyzed for length at each annulus. Results are to be combined into average growth rates for each species for each of the three geographic provinces of Maryland.

Began 1948, indefinite; Harold J. Elser, Leader.

Address inquiries to: Harold J. Elser, as in No. 2 above.

6. The Economic Value of Sport Fishing in Tidewater Maryland.

The objective of the project is to determine the value of sport fishing in tidewater Maryland in terms of numbers of persons, numbers of trips, and estimated expenditures. Interviews and mail survey returns were employed to obtain the data and several expense categories were established, including boat rental, bait purchases, food and lodging, transportation, tackle, special equipment and miscellaneous.

Sport Fishing Institute, George Washington University cooperating; hdqrs. Solomons; began June 1953, to close December 1953; R. D. Buzzell, Leader; reports available.

Address inquiries to: R. E. Tiller, Department of Research and Education, Solomons, Md.

7. The Sport Fishery of Tidewater Maryland.

The project objective is to determine the magnitude of the sport fishing industry in Maryland in terms of value, numbers of persons and boats, and the catch of different species. The survey consists of (a) an intensive survey of a single area supplemented by (b) data from interviews and log books distributed in representative areas throughout Tidewater.

Hdqrs. Solomons; began June 1952, to close December 1956; E. T. Walker, Leader.

Address inquiries to: R. E. Tiller, as in No. 6 above.

MASSACHUSETTS

Bureau of Wildlife Research and Management

1. Warm-water Pond Reclamation.

The rehabilitation of warm-water ponds is done by complete eradication and restocking with desirable species. Experimental stocking has been limited to largemouth bass, smallmouth bass, chain pickerel, yellow perch, white perch and brown bullhead in two or three species combinations.

Statewide; began September 1950, continuing.

Address inquiries to: William A. Tompkins, Chief Aquatic Biologist, Phillips Wildife Laboratory, Upton, Mass.

2. Harvesting Studies.

The objective is to determine the rate of harvest of game and pan species by anglers. The means employed are: (a) creel censuses on experimental ponds, both warm-water and reclaimed cold water; and (b) tagging of fishes both extensively and intensively. About 15,000 fish are being tagged annually.

Statewide; began April 1950, continuing; Harold Bitzer, Leader.

Address inquiries to: William A. Tompkins, as in No. 1 above.

3. Pan and Weed Fish Control.

The purpose of this project is to restore balance to populations overcrowded with pan and weed species. Methods now in use include netting, partial poisoning, spawn destruction, and draining. Several demonstration areas have been set up in addition to the routine activities engaged in on a statewide basis.

Statewide; began April 1950, continuing; Harold Bitzer, Leader; reports available.

Address inquiries to: William A. Tompkins, as in No. 1 above.

4. Pond Management Investigations. (FA: F-3-R)

Survey reports are being prepared with recommendations on 206 individual ponds surveyed in 1951 and 1952. All material is collected to develop detailed management programs for both cold and warm-water fishes. Chemical and physical data of the waters and their basins, and biological data, particularly that of fish samples (including scale samples) is being analyzed. Growth analysis of several thousand fishes by the scale method is involved.

Statewide; began March 1952, indefinite; $9,000.

Address inquiries to: William A. Tompkins, as in No. 1 above.

5. Salter Brook Trout Investigations. (FA: F-5-R)

Objectives are to determine whether it is feasible to stock Cape Cod tidal streams with hatchery trout, in relation to the stocking of typical freshwater streams, and, if so, to determine the most satisfactory method, as to season and size, of stocking these streams. The project involves the tagging and release of 16,000 brook trout in five experimental streams, and the sampling of populations and movements of same through electrofishing, two-way fish traps, and creel censuses.

Bureau of Wildlife Research and Management cooperating; Five Cape Cod trout streams; began April 1949, to close March 1956; $5,000; John H. Ryther, Leader.

Address inquiries to: John H. Ryther, Woods Hole Oceanographic Institute, Woods Hole, Mass.

6. Trout Pond Reclamation.

The purpose is to reclaim, over a period of years, most of the ponds in the State which qualify as trout habitat. Rotenone is employed in eradicating existing populations, and the ponds are restocked with brook, brown, or rainbow trout. Alewives have been stocked in combination with rainbows.

Statewide; began September 1950, continuing; James W. Mullan, Leader.

Address inquiries to: James W. Mullan, Aquatic Biologist, Phillips Wildlife Laboratory, Upton, Mass.

7. Stream Investigations. (FA: F-1-R)

Primary purposes are to determine to what extent major stream systems may be classed as trout or warm-water streams; what is the actual nature and extent of the fishery they support; and the extent of management improvements that can be instituted to improve the trout fisheries. Trout to be stocked in the Merrimac and Ipswich drainages are being marked. Creel censuses will be operated. Summer inventories are made with a shocker and with chemicals.

Statewide; began October 1951, planned for 5 years; $22,000; Lewis C. Schlotterbeck, Leader.

Address inquiries to: Lewis C. Schlotterbeck, Phillips Wildlife Laboratory, Upton, Mass.

8. Inventory of the Striped Bass Fishery of Massachusetts. (FA: F-4-R)*

The objective of the project is to obtain basic information on the life history, migration and population of striped bass in the coastal waters. Creel census, tagging, seining, and other netting will be done. The project will be coordinated with other striped bass projects being conducted in several other States.

Began February 1954, planned for 3 years; $12,572; J. Arthur Posgay, Leader.

Address inquiries to: William A. Tompkins, as in No. 1 above.

University of Massachusetts

1. Fish Management of a Marginal Trout Pond.

The objective of this project is to determine how effective and productive management for trout in a marginal pond can be accomplished. Growth studies on each of the species are being made; also, a continuous creel census of both ice and summer fishing is being conducted.

Division of Fisheries and Game cooperating; Mt. Toby Demonstration Forest - Sunderland; began October 1948, continuing; $60; R. E. Trippensee, Leader.

Address inquiries to: Dr. R. E. Trippensee, Professor of Wildlife Management, University of Massachusetts, Amherst, Mass.

U. S. Fish and Wildlife Service, Branch of Game-fish and Hatcheries

1. Fishery Management Surveys.

The objective is to develop fish management plans, based on surveys, for specific water areas. Priority is given to Federally controlled areas such as Service refuges, National Forests, Veterans Administration facilities, defense installations, and Indian reservations.

Hdqrs. Boston; field work in the several States comprising Fish and Wildlife Service Region 5; continuing; John G. Appelget and James Otis, Leaders.

Address inquiries to: Regional Director, Fish and Wildlife Service, 1105 Blake Building, 59 Temple Place, Boston 11, Mass.

2. Technical Assistance in Fish Cultural Activities.

Assistance is given to fish cultural personnel toward the solution of biological problems of hatchery management, such as weed control, fertilization, disease, and water quality; and in initiating new or improved techniques. Fish stocking activities are reviewed for correlation with State Conservation Department practices and to direct the distribution of Federally produced fish in accordance with Fish and Wildlife Service policy and known fishery management needs.

Hdqrs. Boston; field work in the several States comprising Fish and Wildlife Service Region 5; continuing; John G. Appelget and James Otis, Leaders.

Address inquiries to: Regional Director, as in No. 1 above.

U. S. Fish and Wildlife Service, Branch of Fishery Biology

1. Biology of the Redfish.

Objectives of the project are to determine the effect of fishing on the stocks of redfish; to obtain information necessary for the understanding of fluctuations in abundance; to establish rates of growth of stocks in order to understand rate of recruitment; and to define the races of redfish in the northwest Atlantic.

Hdqrs. Woods Hole; continuing; George F. Kelly, Robert S. Wolf, George M. Clark, Claude F. Bocken, Leaders.

Address inquiries to: Herbert W. Graham, Chief, North Atlantic Fishery Investigations, Woods Hole, Mass.

MICHIGAN

Department of Conservation

1. Fishes of Michigan.

A comprehensive reference book on fishes of the State, on their structure, habits, distribution, abundance, etc., with illustrations and keys for general use of sportsmen, biologists, and students is under preparation.

Statewide; began 1946, continuing; $3,267; Gerald P. Cooper and Reeve M. Bailey of University of Michigan, Museum of Zoology, cooperating.

Address inquiries to: Institute for Fisheries Research, University Museums Annex, Ann Arbor, Mich.

2. Fish Population Studies.

Determination of the size of populations of legal-sized game fish is the basis for interpretation of creel census data, and effects of special regulations. Estimation techniques are evaluated by use of mark and recapture methods.

Several warm-water lakes; began October 1952, continuing; $5,940; G. P. Cooper, Leader; reports available.

Address inquiries to: Institute for Fisheries Research, as in No. 1 above.

3. Lake Inventory. (FA: F-2-R in part)

The project is a physical-chemical-biological survey of lakes on a statewide basis to obtain basic information for management program, growth rates, habitat requirements of fish fauna of Michigan.

Statewide; began 1932, continuing; $19,008; C. M. Taube, Leader; reports available.

Address inquiries to: Institute for Fisheries Research, as in No. 1 above.

4. Stream Inventory. (FA: F-2-R in part)

A physical-chemical-biological survey of streams is conducted to obtain basic information for management program, distribution, growth, habits, etc., for stream fish fauna in Michigan.

Statewide; began 1952, continuing; $15,741; C. M. Taube, Leader; reports available.

Address inquiries to: Institute for Fisheries Research, as in No. 1 above.

5. Lake Inventory Reports.

Research findings on some of the larger, popular lakes of the State are briefly explained and the purpose and methods of inventory made available for public distribution.

Statewide; began 1952, continuing; $551; C. M. Taube, Leader; reports available.

Address inquiries to: Institute for Fisheries Research, as in No. 1 above.

6. Winter Lake Mapping. (FA: F-3-R)

The project is providing maps of inland lakes showing shape, size, depths, and bottom soil types for use in fisheries management.

Statewide; began 1939, continuing; $17,820; B. V. Hughes, Leader; reports available.

Address inquiries to: Institute for Fisheries Research, as in No. 1 above.

7. General Creel Census.

Random creel census records secured by conservation officers are compiled and interpreted.

Statewide; began 1927, continuing; $3,564; K. G. Fukano, Leader; reports available.

Address inquiries to: Institute for Fisheries Research, as in No. 1 above.

8. Survival to the Creel of Spring Versus Fall Planted Brown and Rainbow Trout.

Determine, by planting equal numbers of legal-sized brown and rainbow trout in spring and fall, relative survival to the creel of spring versus fall planted fish.

Four trout streams; began October 1951, continuing; D. S. Shetter, Leader; reports available.

Address inquiries to: Institute for Fisheries Research, as in No. 1 above.

9. South Branch AuSable River Trout Management.

The project was set up to evaluate special regulation on South Branch AuSable; to conduct creel census, population, and growth rate checks.

South Branch AuSable River, Crawford County; began Spring 1952, planned for 5 years; $5,643; D. S. Shetter, Leader.

Address inquiries to: Institute for Fisheries Research, as in No. 1 above.

10. Trout Management, Pine River, Lake County.

Creel census, population checks, and growth analysis are employed to determine the effect of a 10-inch size limit.

Pine River, Lake County; began Spring 1952, planned for 5 years; $5,568; D. S. Shetter, Leader.

Address inquiries to: Institute for Fisheries Research, as in No. 1 above.

11. Birch Lake Fish Management.

The project is designed to determine value and effects of planting trout and smallmouth bass, effect of cisco gill netting, need for screen in outlet, and effect of May 15 opening, by creel census, marked plantings, two-way weir in outlet, etc.

Birch Lake, Cass County; began 1937, continuing; $2,376; A. S. Hazzard, Leader; reports available.

Address inquiries to: Institute for Fisheries Research, as in No. 1 above.

12. Deep Lake Fish Management.

Periodic fish collections are taken to study survival and growth of species planted since lake was poisoned in 1941. Present population is composed of bluegills, largemouth bass, rainbow trout.

Deep Lake, Oakland County; began 1952, continuing; Walter R. Crowe, Leader; reports available.

Address inquiries to: Institute for Fisheries Research, as in No. 1 above.

13. Fingerling Trout Planting, Pigeon River Lakes.

Survival to the creel of fingerling brook trout planted in the fall is determined by creel census.

Pigeon River Lakes, Otsego and Montmorency Counties; began 1952, continuing; $1,188; E. L. Bacon, Leader.

Address inquiries to: Institute for Fisheries Research, as in No. 1 above.

14. Relative Survival of Wild Versus Hatchery Reared Fingerlings.

The project expects by creel census and population estimates through two to three years of stream life to determine survival of wild versus hatchery reared fingerlings.

Pigeon River, Otsego and Cheboygan Counties; began August 1951, planned to 1954; $1,485; E. L. Bacon, Leader.

Address inquiries to: Institute for Fisheries Research, as in No. 1 above

15. Experimental Planting of Sub-legal Trout.

Plantings of sub-legal brook and brown trout are being made in a section of trout stream where natural reproduction is limited to determine the benefits of this type of stocking.

Pigeon River, Otsego County; began 1952, planned to 1954; $594; E. L. Bacon, Leader.

Address inquiries to: Institute for Fisheries Research, as in No. 1 above.

16. Management of Special Trout Ponds.

Various stocking programs are tested by creel census and counts of residual populations after draining.

Hillsdale Ponds, Hillsdale County; began 1946, continuing; $2,376; K. G. Fukamo, Leader; reports available.

Address inquiries to: Institute for Fisheries Research, as in No. 1 above.

17. Angling Experiments, Hillsdale Ponds.

Complete angling record is secured under a permit system enabling study of the rate of removal by angling from a known fish population.

Hillsdale County; began 1946, continuing; $2,376; K. G. Fukano, Leader; reports available.

Address inquiries to: Institute for Fisheries Research, as in No. 1 above.

18. Creel Census, Rifle River Area.

From records of all angling, angling pressure is determined and trends noted in angling quality throughout Rifle River Area.

Rifle River Area; began 1945, continuing; $9,504; D. S. Shetter, Leader.

Address inquiries to: Institute for Fisheries Research, as in No. 1 above.

19. Stream Bottom Fauna - Rifle River Improvement Project.

The objective is to determine abundance and composition of bottom fauna in Houghton Creek and other tributaries of Rifle River over a period of years by quantitative and qualitative sampling. The importance of bottom fauna in trout production is part of the study.

Houghton Creek and other tributaries in upper end of Rifle River drainage; began 1950, continuing; $4,669; Robert J. Ellis, Leader.

Address inquiries to: Institute for Fisheries Research, as in No. 1 above.

20. Trout Population - Rifle River.

Through various techniques the population trends of trout in Upper Rifle River are followed as a method of evaluating effects of watershed improvement.

Upper Rifle River, Ogemaw County; began 1950, continuing; $4,752; Howard Gowing, Leader.

Address inquiries to: Institute for Fisheries Research, as in No. 1 above.

21. Experimental Planting of Fingerling Brown Trout.

The project will determine survival of marked fingerling brown trout through creel census and periodic population checks.

Rifle River, Ogemaw County; began 1952, planned for 6 years; $297; Howard Gowing, Leader.

Address inquiries to: Institute for Fisheries Research, as in No. 1 above.

22. Creel Census, Pigeon River.

The project, aided by a permit system, secures complete record of angling pressure and fishing quality on 4.8 miles of Pigeon River.

Pigeon River area; annually throughout trout season; $5,049; E. L. Bacon, Leader.

Address inquiries to: Institute for Fisheries Research, as in No. 1 above.

23. Creel Census, Hunt Creek.

By securing records of all fishing on the experimental area, trends are followed in angling pressure and success. Creel census results are also used to evaluate the experimental program.

Hunt Creek Trout Experiment Station; began 1939, continuing; $9,504; D. S. Shetter, Leader.

Address inquiries to: Institute for Fisheries Research, as in No. 1 above.

24. Brook Trout Spawning Studies, Hunt Creek.

The project is set up to secure exact information on length of spawning season, number of redds in which eggs are deposited, preferred sites for redds, and number of young resulting from spawning of known numbers of adults of

known sizes. This information is secured from experimental stream, and from screened natural raceways.

Montmorency County; began October 1943, continuing; $1,102; D. S. Shetter, Leader.

Address inquiries to: Institute for Fisheries Research, as in No. 1 above.

25. Population Studies, Hunt Creek.

The objective is to determine residual populations of brook trout through the use of various estimation techniques in waters of Hunt Creek Drainage at the close of angling season.

Montmorency County; began September 1949, continuing; $1,782; D. S. Shetter, Leader; reports available.

Address inquiries to: Institute for Fisheries Research, as in No. 1 above.

26. Trout Migration Studies, Hunt Creek.

Determination of extent of movement into or out of experimental sections of Hunt Creek is possible by operation of weirs and maintenance of marking records.

Montmorency County; began April 1949, continuing; $6,757; D. S. Shetter, Leader.

Address inquiries to: Institute for Fisheries Research, as in No. 1 above.

27. Age and Growth Studies, Hunt Creek.

Growth analysis is made of brook trout in anglers catch from various experimental waters, and of the residual population of brook trout.

Hunt Creek Trout Experiment Station, Montmorency County; began 1950, continuing; $5,568; D. S. Shetter, Leader.

Address inquiries to: Institute for Fisheries Research, as in No. 1 above.

28. Age and Growth, Michigan Game Fishes.

Activities are carried out which enable determination of statewide average growth and sex ratio of each species for comparisons between waters.

Statewide; began 1932, continuing; $6,989; J. E. Williams, Leader; reports available.

Address inquiries to: Institute for Fisheries Research, as in No. 1 above.

29. Periodicity of Fish Growth.

By analysis of scale samples collected throughout the year from fish in four lakes, the investigation seeks to determine time of year during which fish grow and the percentage of growth in the various months of the growing season.

Four Michigan lakes; began 1946, to close 1954; $1,566; J. E. Williams, Leader.

Address inquiries to: Institute for Fisheries Research, as in No. 1 above.

30. Cycles in Growth Rate of Fish.

The project is set up to determine if natural cycles in rate of growth of game and pan fish occur in Michigan lakes and to make yearly scale sample collections from experimental lakes for growth comparisons.

Eighteen lakes throughout the State; began 1947, to close 1954; $1,566; J. E. Williams, Leader.

Address inquiries to: Institute for Fisheries Research, as in No. 1 above.

31. Availability of Fish Food Organisms in Selected Southern Michigan Lakes.

Year around quantitative and qualitative samples of fish food organisms are taken from selected warm-water lakes in Michigan to determine the factors which influence the availability and utilization of fish food organisms. Also,

limnological studies on plankton, nitrogen and phosphorus, and chemical characteristics of bottom soils are made.

Seven selected lakes in southern Michigan; began October 1952, continuing; $4,669; Frank F. Hooper, Leader.

Address inquiries to: Institute for Fisheries Research, as in No. 1 above.

32. Life History and Ecology of Stream Chironomids.

The study aims to secure a better knowledge of the kinds and abundance of midges in trout streams, and to learn their habitat requirements and importance as trout food.

Hunt Creek, AuSable River, Pigeon River, Rifle River; began June 1952, continuing; LaVerne L. Curry, Leader.

Address inquiries to: Institute for Fisheries Research, as in No. 1 above.

33. Lake and Pond Fertilization.

The project aims to determine the practical value of commercial fertilizer as a tool in warm-water fish production by experiments in lakes and ponds.

South Twin Lake, Cheboygan County, Hatchery Ponds at Hastings and Wolf Lake Hatcheries; began 1946, continuing; R. C. Ball, Leader; reports available.

Address inquiries to: Institute for Fisheries Research, as in No. 1 above.

34. Increasing Productivity of Marl Lakes.

Additions of organic matter and inorganic fertilizers are made to marl soils to determine the factors limiting production of fish food organisms in marl lakes. Methods of modifying marl lakes so as to increase their productivity are being investigated.

North Lake, Pintail Pond, Ogemaw County; Fish Lake, Barry County; began June 1952, continuing; $2,376; David L. Shull, Leader.

Address inquiries to: Institute for Fisheries Research, as in No. 1 above.

35. Chemical Modification of a Soft-water Lake.

Effort is being made to accomplish alkalization through addition of CaO and $CaCO_3$. Evaluation of the changes is being made by chemical and biological investigation.

Stoner Lake, Delta County; began 1952, continuing; R. C. Ball, Leader.

Address inquiries to: Institute for Fisheries Research, as in No. 1 above.

36. Introduction of Redear Sunfish.

Introductions into selected ponds are being made to test the value of the species for farm ponds.

Ponds at Hastings and Wolf Lake Hatcheries; began 1949, continuing; $297; R. C. Ball, Leader.

Address inquiries to: Institute for Fisheries Research, as in No. 1 above.

37. Walleye Sport Fishery Management.

Introductions of marked (or unmarked) fingerlings are made into selected lakes to determine survival and value of maintenance plantings.

About 10 lakes; began 1951, continuing; $297; Walter R. Crowe, Leader; reports available.

Address inquiries to: Institute for Fisheries Research, as in No. 1 above.

38. Walleye Sport Fishery, Muskegon River System.

This study of the walleye fishery on the Muskegon River system is concerned with the effectiveness of power dams as barriers, effect of turbines on walleyes passing through them, fate of immature walleyes in Hardy Reservoir, possibility

of using an electric screen for walleyes, and magnitude and exploitation of spawning run. Most of these data are secured from tagging studies.

Lower Muskegon River system, from Big Rapids Reservoir to Lake Michigan; began April 1947, continuing; $377; Walter R. Crowe, Leader; reports available.

Address inquiries to: Institute for Fisheries Research, as in No. 1 above.

39. Life History of Black Crappie.

A synthesis of earlier studies on the species is being compiled through library research and investigations of lesser known facts concerning it by studies on growth, habits, and ecology.

Duck Lake, Calhoun County and other waters; began February 1950, continuing; $1,160; K. E. Christensen, Leader.

Address inquiries to: Institute for Fisheries Research, as in No. 1 above.

40. Smallmouth Bass in the Great Lakes Water of Michigan.

Intensive investigation through study of ecology, exploitation, and distribution is conducted to set up the conservation and management program for the smallmouth bass.

Statewide, Great Lakes waters; began 1953, continuing; $3,861; A. S. Hazzard, Karl F. Lagler (Universith of Michigan), Leaders.

Address inquiries to: Institute for Fisheries Research, as in No. 1 above.

41. Brook Trout and Brown Trout Fishing Regulations.

The project is designed to test the effect of higher size limits and bait restrictions on angling quality for brook and brown trout.

North Branch AuSable River, Crawford and Otsego Counties: began 1949, continuing; $1,782; D. S. Shetter, Leader; reports available.

Address inquiries to: Institute for Fisheries Research, as in No. 1 above.

42. Experimental Fishing Regulations on Lakes.

Creel census, age, growth, and population studies are being used to determine the effect of relaxed fishing regulations on 14 "experimental" lakes.

Fourteen selected lakes; began April 1951, planned for 8 years; $38,313; K. E. Christensen, Leader; reports available.

Address inquiries to: Institute for Fisheries Research, as in No. 1 above.

43. Control of Fish Population by Partial Kill.

The objective is to determine effect of lowered population density on growth rates before and after poisoning.

Various waters of the State, especially Sand Lake, Newaygo County; began 1949, continuing; $2,376; J. E. Williams, Leader.

Address inquiries to: Institute for Fisheries Research, as in No. 1 above.

44. Water Level Control, South Twin Lake.

Determine effect of raised water level in a shallow lake by before-and-after comparison of growth and general abundance of fish population.

Cheboygan County; began 1947, to close 1954; Walter R. Crowe, Leader.

Address inquiries to: Institute for Fisheries Research, as in No. 1 above.

45. Lower Gamble Creek Weirs.

By tagging in late fall and early spring, observations are conducted on the nature of spawning run of brown trout and other species from Devoe Lake and Rifle River through Gamble Creek and diversion. Also, the species composition, numerical abundance, and age and growth of weir catch over a period of years are recorded.

Rifle River Area; began October 1952, continuing; $377; Howard Gowing, Leader.

Address inquiries to: Institute for Fisheries Research, as in No. 1 above.

46. Black River Lamprey - Rainbow Trout Research.

In conjunction with operation of the Black River barrier to block spawning run of sea lampreys, studies are being conducted to find its effectiveness as a barrier to rainbow run. A management program is being developed for the rainbow run based on age and growth studies, observations on extent of spawning above barrier, and exploitation by anglers.

Black River, Mackinac County; began 1946, continuing; $3,886; Thomas M. Stauffer, Leader; reports available.

Address inquiries to: Institute for Fisheries Research, as in No. 1 above.

47. Hooking Mortality Experiments on Brook Trout.

Under experimental conditions the relative mortality of brook trout, caught by flies and by bait or artificial lures other than flies, will be determined and the results tested statistically.

Various trout streams in State; began May 1950, continuing; $1,782; D. S. Shetter, Leader; reports available.

Address inquiries to: Institute for Fisheries Research, as in No. 1 above.

48. Autopsy of Brook Trout from Hooking Loss.

Post mortem examination of trout from hooking experiment is made to determine cause of death.

Various trout streams; began June 1952, continuing; $594; L. N. Allison, Leader; reports available.

Address inquiries to: Institute for Fisheries Research, as in No. 1 above.

49. Parasites and Diseases of Fish.

Macro- and microscopic examination is made of sick fish in hatcheries with recommendations for treatment. Study and identification of fish parasites and diseases is conducted on a statewide basis.

Statewide; began 1942, continuing; $2,320; L. N. Allison, Leader; reports available.

Address inquiries to: Institute for Fisheries Research, as in No. 1 above.

50. Check List of Fish Parasites in Michigan.

Preparation and maintenance of a host-parasite-distribution list of parasites found in fish from Michigan waters is under way.

Statewide; began June 1942, continuing; $2,784; L. N. Allison, Leader.

Address inquiries to: Institute for Fisheries Research, as in No. 1 above.

51. Development of Fish Cultural Station for Experimental Work.

Search for a possible site with adequate water supply and other necessary attributes, together with plans for personnel and equipment needed, is under way.

Began 1952, continuing; $891; A. S. Hazzard, Leader.

Address inquiries to: Institute for Fisheries Research, as in No. 1 above.

52. Occurrence of Furunculosis in Rainbow Trout from Great Lakes.

The incidence and origin of furunculosis is being investigated in "wild" lake run rainbows specifically from Lake Huron into the East Branch of the Au Gres River where disease was first reported. Histological examination of preserved kidneys and cultures of fresh material is made when available.

Streams tributary to Great Lakes, specifically the East Branch of the Au Gras River; began April 1952, continuing; $551; L. N. Allison, Leader.

Address inquiries to: Institute for Fisheries Research, as in No. 1 above.

53. Relationship of Length and Weight of Dressed Northern Pike and Channel Catfish to Fish "In the Round."

The objective of the project is to construct a graph and table to determine minimum legal length and/or weight of dressed northern pike and channel catfish when fish are dressed with either head only removed or with head and tail removed.

Statewide; began September 1953, continuing; $1,782; K. E. Christensen, Leader.

Address inquiries to: Institute for Fisheries Research, as in No. 1 above.

54. Open-water Lake Mapping. (FA: F-3-R)

The objective of the project is to provide maps that show shape, size, depths and bottom types of lakes. Maps are for public distribution and for fisheries management. Maps are made from aerial photographs and a sonic sounder.

Statewide; began 1953, continuing; $4,669; Basil V. Hughes, Leader.

Address inquiries to: Institute for Fisheries Research, as in No. 1 above.

55. Manual For Control of Fish Diseases at Hatcheries.

From literature and experience, a manual, including coversion tables, dilution charts, etc., will be provided for the use of fish culturists.

Hdqrs. Grayling; began November 1953, to close November 1954; $1,566; L. N. Allison, Leader.

Address inquiries to: Institute for Fisheries Research, as in No. 1 above.

56. Library of Colored Illustrations of Fish Diseases and Hatchery Procedures.

Through the use of kodachrome photographs provide illustrations of fish diseases (macro and micro) and hatchery procedures for reference and instruction.

Hdqrs. Grayling; began December 1953, continuing; $297; L. N. Allison, Leader.

Address inquiries to: Institute for Fisheries Research, as in No. 1 above.

57. Experimental Management of Brook Trout Lakes.

The project objective is to determine through creel census correct stocking, rates, proper creel limits, and best regulations.

Selected waters; began April 1, 1953, to close 1958; $17,916; Merle G. Galbraith, Leader.

Address inquiries to: Institute for Fisheries Research, as in No. 1 above.

58. Pine River Watershed Project. (FA: F-5-D)

This is an operational land use program designed to improve fishing conditions by the installation of practices and devices on both the uplands and the stream channels of the watershed. Work includes: Stream improvement structures (deflectors, covers, dams, etc.); bank stabilization; and streamside fencing. The upland work includes: Tree planting for shade and erosion control; grass waterways; small impoundments; and general farm program conservation measures. Compared to the Rifle River program, the Pine River operations include a considerably higher percentage of the work on the stream program, primarily on erosion control of the stream channels.

Pine River drainage in Wexford, Lake, and Osceola Counties; to close 1954.

Address inquiries to: Wayne H. Tody, Watershed Management Supervisor, Watershed Management Office, Department of Conservation, Lansing 26, Mich.

59. Watershed Surveys and Management Plans. (FA: F-4-R)

The project will feature compilation of technical information on all watersheds of the State and provide plans for development of improved fishing conditions within them. Work will involve the assembly of available information, the classification of watershed areas, establish detailed priority for work and develop necessary maps and plans for the management to follow.

Statewide; began (FA) October 1952, continuing $35,000.

Address inquiries to: Wayne H Tody, as in No. 58 above.

60. Cedar River Watershed Project.

This is an operational land use program designed to improve fishing conditions by the installation of practices and devices on both the uplands and the stream channels of the watershed. Work includes: Stream improvement structures (deflectors, covers, dams, etc.); bank stabilization; and streamside fencing. The upland work includes: Tree planting for shade and erosion control; grass waterways; small impoundments; and general farm program conservation measures.

Cedar River drainage in Gladwin and Roscommon Counties; began April 1954, to close July 1956; $65,000; Wayne H. Tody, Leader.

Address inquiries to: Wayne H. Tody, as in No. 58 above.

61. Trout Hatchery Diets.

The objectives of the project are the improvement of the table quality of hatchery trout and a reduction in the cost of their food.

Various hatcheries; began December 1, 1951, to close December 31, 1955; $5,000; E. F. Grassl, Leader.

Address inquiries to: E. F. Grassl, Fish Division, Department of Conservation, Lansing 26, Mich.

62. Studies to Determine Possibilities of Conditioning Trout by Utilization of Psychological Principles.

The objectives of the project are to condition hatchery trout to make them better able to adjust themselves to situations confronting them in nature after planting; and, by applying principles used by psychologists on other animals to fish, it is hoped that greater wariness, ability to elude natural enemies and secure natural food can be developed in artificially propagated trout. Trout of various species and ages are being used in these experiments.

Various field stations; began June 1953, to close June 1954; $16,000; Joseph L. Bingham, Leader.

Address inquiries to: Joseph L. Bingham, 1004 Birch Road, East Lansing, Mich.

University of Michigan

1. Fish Production in Flowing Waters.

Objectives of the project are to summarize methods of stream management for fish production in North America and to compare these methods with ones currently in use in South Africa (with a respondent there).

Food and Agriculture Organization, United Nations, cooperating; hdqrs. Ann Arbor; began January 1954, to close January 1955; Karl F. Lagler, Leader.

Address inquiries to: Karl F. Lagler, Department of Fisheries, Natural Science Building, University of Michigan, Ann Arbor, Mich.

2. Fishes of the Great Lakes Region.

Revision and enlargement of information in existing book bearing name of project title.

Scripps Institute of Oceanography and Cranbrook Institute of Science cooperating; hdqrs. Ann Arbor; began January 1950, to close January 1956; $1,000; Karl F. Lagler and Carl L. Hubbs, Leaders; reports available, current edition Bulletin 26, Cranbrook Institute of Science.

Address inquiries to: Karl F. Lagler, as in No. 1 above.

3. Pike-Waterfowl Relationship on Seney National Wildlife Refuge.

Objectives of the project are to study the relationship of pike to waterfowl production; the ecology and populations of pike and incidence of ducklings in pike food; and management of pike on a waterfowl refuge.

U. S. Fish and Wildlife Service cooperating; Seney National Wildlife Refuge, Germfask; began July 1940, to close September 1954; $1,300; Karl F. Lagler, Leader.

Address inquiries to: Karl F. Lagler, as in No. 1 above.

4. Arctic Plankton Survey.

The project objective is to analyze the plankton collections from sub-arctic lakes, ponds, and rivers.

Canadian Wildlife Service cooperating; began October 1952, to close December 1954; John E. Bardach, Leader; reports available.

Address inquiries to: John E. Bardach, Department of Fisheries, School of Natural Resources, University of Michigan, Ann Arbor, Mich.

5. Temperature Receptors of Fishes.

The project objectives are to ascertain distribution of temperature receptors on various fresh-water fishes and to inquire into the mechanism of temperature reception with the help of tank and aquarium experiments using physological experimentation and electronic recording devices.

Hdqrs. Ann Arbor; began December 1953, indefinite; John E. Bardach, Leader.

Address inquiries to: John E. Bardach, as in No. 4 above.

6. Industrial Pollution of Saline River in Relation to Statutory Permissible Levels.

The objectives of the project are to determine the effects of plating plant effluents on stream biota and test the adequacy of legal quantities of pollution on stream recovery.

Sport Fishing Institute cooperating; Saline River, Washtenaw County; began June 1952, to close June 1955; Quentin Pickering, Leader.

Address inquiries to: Quentin Pickering, Department of Fish, Natural Science Building, University of Michigan, Ann Arbor, Mich.

Sharples Chemicals, Inc.

1. Toxic Evaluation of Various Organic Chemicals Toward Game Fish.

The project objective is to determine the toxic levels of various organic chemicals toward game fish and to determine what dilutions are necessary with our plant wastes.

Hdqrs. Wyandotte; continuing; Leslie Gillette, Leader; reports available.

Address inquiries to: Leslie Gillette, Sharples Chemicals, Inc., Wyandotte, Mich.

Fish and Wildlife Service, Branch of Fishery Biology

1. Further Development of an Electro-Mechanical Sea Lamprey Weir and Trap.

The objective of this project is to develop further and to refine operation of a simple sea lamprey trapping device utilizing ordinary alternating current line

power in which an electrical field in the water is substituted for the screens or "racks" of a conventional fish weir and trap.

Lakes Huron, Superior, and Michigan; hdqrs. Hammond Bay Fishery Lab., Rogers City; began 1951, continuing; Leo F. Erkkila, Leader.

Address inquiries to: James W. Moffett, Chief, 1220 East Washington Street, Great Lakes Fishery Investigation, Ann Arbor, Mich.

2. Development of Fish "Leading" or "Assembling" Devices.

The objective is to develop a device utilizing some form of pulsed direct current which may be used as an accessory to the electro-mechanical weir and trap to aid in the rapid transfer upstream of food and game fishes migrating with the sea lampreys.

Lakes Huron, Superior, and Michigan; hdqrs. Hammond Bay Fishery Laboratory, Rogers City; began 1951, continuing; Alberton L. McLain and Bernard Smith, Leaders.

Address inquiries to: James W. Moffett, as in No. 1 above.

3. Survey of Great Lakes Tributary Streams.

The objectives are to determine the location of all streams in the Superior, Michigan and Huron basins in which successful reproduction of the sea lamprey can occur, and to determine the degree to which such streams are or may be utilized by the species, to determine therefrom where control structures must be located.

Hdqrs. Hammond Bay Fishery Lab., Rogers City; began 1950, to close, 1954; Leo F. Erkkila, Leader.

Address inquiries to: James W. Moffett, as in No. 1 above.

4. Chemical Control Techniques.

The objectives are to determine whether a specific toxicant exists which will be lethal to larval lampreys but harmless to other aquatic life occupying the same environment and to determine whether this toxicant can be applied in streams in an efficient and economical manner.

Lake Michigan; hdqrs. Hammond Bay Fishery Lab., Rogers City; began 1950, continuing; Vernon Applegate, Leader.

Address inquiries to: James W. Moffett, as in No. 1 above.

5. Scale Structure of Lake Trout.

The objectives are to determine the validity of the annulus as a year-mark and to derive a body-scale regression curve for use in the calcuation of growth.

All available sources; hdqrs. Ann Arbor; began January 1950, to close December 1954; Louella E. Cable, Leader.

Address inquiries to: James W. Moffett, as in No. 1 above.

6. Abundance of Small Trout in Lake Michigan and Lake Superior.

The objective is to follow annual, seasonal, and local fluctuations in the abundance of small lake trout as reflected in numbers taken in chub gill nets as a means of measuring trends in the stocks and later of judging the results of attempts at rehabilitation.

Hdqrs. Ann Arbor; began May 1950, to close January 1954; Paul H. Eschmeyer, Leader.

Address inquiries to: James W. Moffett, as in No. 1 above.

7. Movements of Lake Trout in Lake Superior.

Through the tagging of both legal-sized and under-sized lake trout in different regions of Lake Superior to determine the extent of migrations with special

reference to the possible presence of local races and movements across interstate and international boundaries.

Hdqrs. Ann Arbor; began June 1950, continuing; Paul H. Eschmeyer, Leader.

Address inquiries to: James W. Moffett, as in No. 1 above.

8. Limnological Studies of Lake Michigan.

This project is aimed at accumulating information on the physical, chemical, and biological limnology of the Lake for the purpose of establishing typical conditions, their seasonal changes, defining major limnological problems, and obtaining solutions to them.

Operations of research vessel Cisco; began summer 1951, continuing.

Address inquiries to: James W. Moffett, as in No. 1 above.

9. Experimental Fishing in Lake Michigan.

The objective is to test various types of experimental gear (as specially constructed gill nets, bottom trawls, mid-water trawls) to learn their efficiency and limitations in various situations and to obtain information on the distribution and abundance of various species with special reference to the smaller parasitic stages of the sea lamprey, small stages of commercially important species, and small species not sampled by commercial gear.

Operations of research vessel Cisco; began July 1952, continuing.

Address inquiries to: James W. Moffett, as in No. 1 above.

10. Food Relations of Lake Trout.

The objective of this project is to determine from stomach contents the food relationships and the utilization of the potential foods, including the amount, frequency of occurrence, and variation as related to size of trout, seasons, localities and depths of water.

Hdqrs. Marquette; began January 1950, to close December 1954; Leo F. Erkkila, Leader.

Address inquiries to: James W. Moffett, as in No. 1 above.

11. Life History Studies of Lake Superior Fishes.

The objectives of this project are to obtain fundamental information on the life histories of commercially important species in such matters as identity of populations, movements, seasonal and local abundance, fluctuations in growth and strength of year classes.

Hdqrs. Marquette; began May 1950, continuing; Stanford H. Smith, Leader.

Address inquiries to: James W. Moffett, as in No. 1 above.

12. Food of Blue Pike in Lake Erie.

From study of stomach contents at different seasons and localities the project is planned to determine the food habits of blue pike with special reference to the possible role of the blue pike in determining the abundance of such prey species as the cisco.

Hdqrs. Ann Arbor; began 1951, to close 1955; Willis S. Glidden, Leader.

Address inquiries to: James W. Moffett, as in No. 1 above.

13. Life History and Habits of Lake Trout in Lake Superior.

The objective of this project is to determine the growth, distribution, reproduction, and relative abundance of lake trout in Lake Superior with special emphasis on the juvenile stages.

Hdqrs. Ann Arbor and Marquette; began 1951, continuing; Paul H. Eschmeyer, Leader.

Address inquiries to: James W. Moffett, as in No. 1 above.

14. Experimental Control of Sea Lamprey Spawning Populations in Streams Tributary to Lake Superior and Lake Michigan.

The objectives are to install electrical or physical barriers in streams known to be utilized by sea lampreys for spawning and to operate these structures in a manner sufficient to reduce or eliminate reproduction and ultimately predation on lake trout and other fishes, and to determine the effects of barriers on species of fish migrating into streams at the same time as the sea lamprey.

Hdqrs. Marquette; began 1953, continuing; Leo F. Erkkila, Leader.

Address inquiries to: James W. Moffett, as in No. 1 above.

15. Characteristics and Abundance Indices of Lake Huron Sea Lamprey Stocks.

Objectives of this project are to determine the relative abundance of adult sea lamprey spawning stocks by continued operation of mechanical weirs which have been in use for four or five years; to ascertain the number of larval generations normally inhabiting a stream, from which spawning sea lampreys have been blocked for several years, by capturing each downstream migrating year class as it reaches maturity.

Hdqrs. Hammond Bay Fisheries Laboratory, Rogers City; began 1951, continuing. Vernon Applegate, Leader.

Address inquiries to: James W. Moffett, as in No. 1 above.

MINNESOTA

Department of Conservation

1. Yield and Dynamics of a Lake Trout Lake.

Information on yield, fish mortality, and population structure of a typical trout lake is being gathered with a view toward better management.

Lake near Grand Marais; began January 1951, indefinite; Donald Franklin, Robert E. Schmacher, Leaders.

Address inquiries to: Dr. John B. Moyle, Supervisor, Fisheries Research Unit, 355 Shubert Building, St. Paul, Minn.

2. Development of Better Methods of Pond Management for Rearing Minnows and Warm-water Game Fishes.

Better methods of pond management will be determined through detailed studies of pond dynamics, including water and soil chemistry, and fish yield.

Statewide; began January 1948, continuing; John Dobie, Leader; report available.

Address inquiries to: John B. Moyle as in No. 1 above.

3. Survival of Walleye from Fingerlings to Yearlings.

The objective is to determine the survival rate of planted walleye fingerlings under varying degrees of competition.

Lake near Brainerd; began September 1951, continuing; John E. Maloney, Leader; reports available.

Address inquiries to: John B. Moyle as in No. 1 above.

4. Effect of Stream Improvement on Trout Populations and Fishing.

The value of stream improvement of the usual type to survival of planted trout, stream carrying capacity, and fishing yield of trout is being investigated.

Split Rock River in northeastern Minnesota; began May 1950, planned for 5 years; John Hale, Leader; reports available.

Address inquiries to: John B. Moyle, as in No. 1 above.

5. Relationship of Net Catches to Size and Structures of Fish Population and Angling Harvest.

A study to obtain better methods for evaluation of fish management procedures and for interpreting lake survey data is being carried out on 12 lakes scattered over the State. Evaluation of the effectiveness of various types of nets for sampling populations, and the relationships between net catches, angling harvest, fish populations and environmental factors are being examined. Data on fish mortality and interspecific competition are being gathered.

Began December 1951, planned for 4 years; reports available.

Address inquiries to: John B. Moyle, as in No. 1 above.

6. Lake Inventory and Mapping.

Detailed information on physical, chemical, and biological characteristics of Minnesota lakes is being gathered for use in fish management.

Statewide; began 1931, continuing; Charles R. Burrows, Leader.

Address inquiries to: John B. Moyle, as in No. 1 above.

7. Survival of Walleyed Pike Fingerlings to Catchable Size in Lakes.

The objective of the project is to determine mortality of fingerling walleyes during the two years following stocking.

Statewide, 24 selected lakes; began June 1953, to close June 1955; John B. Moyle, Leader.

Address inquiries to: John B. Moyle, as in No. 1 above.

8. Survival of Marked Walleye Fingerlings to Catchable Size in a Typical Walleye Lake.

The project objective is to gain experimental evidence on survival of 67,000 fin-clipped walleye from stocking as fingerlings to catchable size.

Moose Lake, Itasca County; began September 1953, to close September 1956; F. E. Johnson, Leader.

Address inquiries to: John B. Moyle, as in No. 1 above.

9. Survey and Evaluation of Minnesota Smallmouth Bass Streams.

Little work has been done on smallmouth black bass in Minnesota, the survey is designed to evaluate present bass streams.

Statewide; began June 1954, to close June 1957; Robert E. Schumacher, Leader.

Address inquiries to: John B. Moyle, as in No. 1 above.

10. Re-survey of Minnesota Trout Streams.

The purpose of survey is to evaluate the changes that have occurred since original trout stream surveys were made about 10 years ago.

Northeastern and southeastern Minnesota; began June 1954, to close June 1957; Robert E. Schumacher, Leader.

Address inquiries to: John B. Moyle, as in No. 1 above.

11. Effect of Rough Fish Removal Operation on Fish Populations and the Habitat.

The objective of the project is to study the effect of rough fish removal operations and methods upon game and rough fish populations and on the habitat.

Southern Minnesota lakes; began November 1953, to close November 1956; W. J Scidmore, Leader.

Address inquiries to: John B. Moyle, as in No. 1 above.

12. Improved Methods of Water Weed and Algal Control.

Experimental control of weeds and algae to determine best methods, using newly developed herbicides and chemicals.

Lakes in southern Minnesota; began June 1954, to close June 1956; E. J. Longtin, Leader.

Address inquiries to: John B. Moyle, as in No. 1 above.

13. Reclamation of Small Lakes for Trout Management. (FA: F-3-D)*

The objective of the project is to reclaim several small, former trout lakes which have become overrun with such species as yellow perch, sunfish, pickerel and walleyes which usually remain in a stunted condition and afford little fishing. Following reclamation the lakes will be stocked with trout.

Northeast part of State; began August 1952, indefinite; $3,000; Jerome H. Kuehn, Leader.

Address inquiries to: John B. Moyle, as in No. 1 above.

14. Statewide Creel Census. (FA: F-4-R)*

The project objective is to obtain catch data on 12 selected lakes representing the varied conditions found in the State. The creel census is designed to determine the total yield in numbers and pounds of game fish per lake. The composition of the catch as to size and age groups will be determined and an evaluation of the effects of natural reproduction and artificial stocking will be made.

Began December 1952, indefinite; $35,600; Don Franklin, Leader.

Address inquiries to: John B. Moyle, as in No. 1 above.

15. Fish Population Control. (FA: F-5-D)*

Objectives of the project are to salvage fish from waters normally subject to winter kill and drought, removal of excess populations of designated species and stocking in waters where those species can be expected to thrive and contribute to public fishing.

Began May 1953, indefinite; $25,906; Warren Kirsch, Leader.

Address inquiries to: John B. Moyle, as in No. 1 above.

University of Minnesota

1. Distribution and Intraspecific Variation in Minnesota Fishes.

Investigations are under way to determine the distribution of fishes in various types of waters in Minnesota and to discover if any structural differences occur in the same species in different drainages.

Began April 1952, to close September 1954; $200; James Underhill, Leader.

Address inquiries to: James Underhill, Department of Zoology, University of Minnesota, Minneapolis, Minn.

2. Toxicity of the Eggs of the Longnose Gar.

The project is concerned with the effect of feeding eggs of longnose gar to various animals including fishes, and is attempting the isolation and identification of the toxic agent present in the eggs of the longnose gar. The project is continued to determine the toxicity of the eggs at different stages of their development.

University of Minnesota; began May 1952, to close September 1954; $500; Samuel Eddy, Leader.

Address inquiries to: Dr. Samuel Eddy, Professor of Zoology, Department of Zoology, University of Minnesota, Minneapolis, Minn.

3. Taxonomy and Habits of the Siscowet of Lake Superior.

The objective of the project is to determine the taxonomic relationship of the siscowet to the lake trout and to study its feeding habits and distribution. Stomach analyses have been made. Studies have been made on the structures and measurements of both siscowets and lake trout to determine the taxonomic relationship. Studies on the skeleton and other internal structures are now underway.

Minnesota waters of Lake Superior; began June 1946, to close September 1954; $700; Samuel Eddy, Leader.

Address inquiries to: Samuel Eddy, as in No. 2 above.

4. The Social Behavior of the Largemouth Bass Under Laboratory Conditions.

The object of this project is to determine the type of territories and hierarchies which are established by groups of bass under variable laboratory conditions. Experiments have been done using the largemouth bass and several other species. Other experiments using other species are planned.

Hdqrs. University of Minnesota; began November 1952, to close 1954; Alfred H. Grewe, Leader.

Address inquiries to: Alfred H. Grewe, Department of Zoology, University of Minnesota, Minneapolis 14, Minn.

U. S. Fish and Wildlife Service, Branch of Game-fish and Hatcheries

1. Fishery Management Surveys.

The objective is to develop fish management plans, based on surveys, for specific water areas. Priority is given to Federally controlled areas such as Service refuges, National Forests, Veterans Administration facilities, defense installations and Indian reservations.

Hdqrs. Minneapolis; field work in the several States comprising Fish and Wildlife Service Region 3; continuing; Robert W. Sharp and Paul S. Handwerk, Leaders.

Address inquiries to: Regional Director, Fish and Wildlife Service, 1006 West Lake Street, Minneapolis 8, Minn.

2. Technical Assistance in Fish Cultural Activities.

Assistance is given to fish cultural personnel toward the solution of biological problems of hatchery management, such as weed control, fertilization, disease, and water quality; and in initiating new or improved techniques. Fish stocking activities are reviewed for correlation with State Conservation Department practices and to direct the distribution of Federally produced fish in accordance with Fish and Wildlife Service policy and known fishery management needs.

Hdqrs. Minneapolis; field work in the several States comprising Fish and Wildlife Service Region 3; continuing; Robert W. Sharp and Paul S. Handwerk, Leaders.

Address inquiries to: Regional Director, as in No. 1 above.

MISSISSIPPI

Game and Fish Commission

1. Development of Lake Mary. (FA: FW-1-D)

The objective of this project is to establish and manage a 140-acre lake in a dry area of the State for public fishing of largemouth bass, bluegill and redear sunfish.

Lawrence County near Monticello; began June 1954, to close November 1954; $68,084; Spencer H. Smith, Leader.

Address inquiries to: Spencer H. Smith, Chief, Fisheries Division, Box 451, Jackson, Miss.

MISSOURI

Conservation Commission

1. August A. Busch Memorial Wildlife Area Lake Development.

Primarily this area is managed as a field trial unit and for public fishing. Thirty-two lakes and ponds, with a total area of 145 acres, have been constructed and managed for largemouth bass, bluegill, and channel catfish fishing. The numbers and kinds of fish caught on the area are reported by the anglers and the total creel for each lake, insofar as possible, is computed for each year's fishing.

St. Charles County; began 1947, continuing; William E. McDannold, Leader.

Address inquiries to: G. B. Herndon, Chief, Fisheries Section, Conservation Commission Jefferson City, Mo.

2. Trimble Wildlife Area Development.

Fishing is available in a 170-acre lake on this area which was developed primarily for waterfowl hunting and as a waterfowl refuge. This fishing area was opened to public fishing for the first time in 1953. A record of the creel is being maintained. The lake is being managed for largemouth bass, bluegill, and channel catfish fishing. Walleye fry were stocked experimentally in 1952 and 1953.

Clinton County; began 1950, continuing; Fay Grogan, Leader.

Address inquiries to: G. B. Herndon, as in No. 1 above.

3. Lake Paho Public Fishing Area Development.

The objective of this project was to establish a large lake (270 acres) for public fishing of largemouth bass, bluegill, and channel catfish. Intensive watershed control is also being carried on in order to create interest in watershed management on private land in the drainage area. Walleye fry were stocked experimentally in 1952 and 1953.

Mercer County; began 1945, continuing; Eugene M. Holman, Leader; reports available.

Address inquiries to: G. B. Herndon, as in No. 1 above.

4. Trout Stream Management.

Special trout fishing programs are maintained at Bennett Spring, Montauk, and Roaring River State Parks. Ten-inch trout are stocked daily in an amount governed by fishing pressure on the various streams. The trout fishermen carry a material part of the cost through a special tag system which makes trout fishing available for the fee of $1 per day.

Statewide, in selected waters; began September 1938, continuing; A. G. Morris, Leader; reports available.

Address inquiries to: G. B. Herndon, as in No. 1 above.

5. Lake Management Service.

The objective of this project is to assist the public in managing and developing small impounded waters. This service includes guidance in developing new

lakes and in restoring old ones to satisfactory fishing. The latter involves renovating the lakes by poisoning and then restocking them with largemouth bass and bluegills.

Statewide; began 1950, continuing; Gilbert Weiss, Leader.

Address inquiries to: G. B. Herndon, as in No. 1 above.

6. Hunnewell Public Fishing Lake Development. (FA: F-3-D)

The objective of this project is to establish a large lake (228 acres) for public fishing for largemouth bass, bluegills and channel catfish. Construction on the dam has been completed but the lake has not filled.

Shelby County; began 1953, continuing.

Address inquiries to: G. B. Herndon, as in No. 1 above.

7. The Rate of Growth of the Rock Bass in Several Ozark Streams of Missouri.

This project is a comprehensive study of the age, rate of growth, and other aspects of the biology of the rock bass in eight Ozark streams. Scale samples were collected between 1947-1951. Material also is available for a study of food habits and the reproductive potential of this species.

Southern Missouri; began December 1948, to close June 1954; Mercer H. Patriarche, Leader.

Address inquiries to: Mercer H. Patriarche, Fish and Game Division, Conservation Commission, 903a Elm Street, Columbia, Mo.

8. Test Net Sampling of Fish Populations in the Large Impounded Waters in Missouri.

Test netting is carried out in many of the large Missouri impoundments in September and October to measure trends in abundance of several species of fish, follow the development of populations in new reservoirs, and obtain material for age and growth studies.

Statewide; began August 1949, indefinite; Mercer H. Patriarche, Leader.

Address inquiries to: Mercer H. Patriarche, as in No. 7 above.

9. An Investigation of the Spawning Success of Important Game and Non-game Fishes in the Large Impounded Waters in Missouri.

The two objectives of this project are: (1) To obtain a measure of the yearly spawning success of important fishes; and (2) to acquire a knowledge of the species composition and trends in relative abundance of the forage fishes.

Statewide; began July 1950, indefinite; Mercer H. Patriarche, Leader.

Address inquiries to: Mercer H. Patriarche, as in No. 7 above.

10. Censusing Fish Populations in Small Sample Areas of the Large Impounded Waters with Emulsifiable Rotenone.

This project is designed to obtain quantitative population data for certain species and sizes of fish. These data are used in conjunction with the other impoundment surveys to evaluate the status of the fish populations in the reservoirs.

Statewide; began August 1950, indefinite; Mercer H. Patriarche, Leader.

Address inquiries to: Mercer H. Patriarche, as in No. 1 above.

11. An Intensive Creel Census of Clearwater, Wappapello, Norfork, and Bull Shoals Reservoirs, Lake Taneycomo and the Niangua Arm of the Lake of the Ozarks.

The objective of these projects is to determine fishing yield, pressure and quality by seasons as an aid to fish management in these impoundments.

Statewide; began May 1949, continuing; Joseph W. Kathrein, Leader; reports available.

Address inquiries to: Joseph W. Kathrein, Fish and Game Division, Conservation Commission, 903a Elm Street, Columbia, Mo.

12. A Fish Tagging Program for the Large Impoundments of Missouri.

This project is designed to obtain an estimate of the annual harvest of game fish in relation to the available population. Fish are netted and tagged during March-June and the tags are recovered by creel census clerks, dock operators, and conservation agents.

Statewide; began April 1951, indefinite; Joseph W. Kathrein, Leader.

Address inquiries to: Joseph W. Kathrein, as in No. 11 above.

13. A Study to Determine the Suitability of Pumpkinseed and Redear Sunfish as Forage Species in Combination With Largemouth Bass.

This project was set up to test a combination of largemouth bass with pumpkinseed and redear sunfish in farm ponds.

Boone County; began September 1949, indefinite; Ralph M. Burress, Leader.

Address inquiries to: Ralph M. Burress, Fish and Game Division, Conservation Commission, 903a Elm Street, Columbia, Mo.

14. Control and Eradication of Aquatic Vegetation With Several Weed Control Agents.

This project is designed to test various herbicides on a number of plants to determine their effectiveness over a period of time, concentrations necessary for control, and their effectiveness when used with various carriers.

St. Charles and Boone Counties; began June 1950, indefinite; Ralph M. Burress, Leader.

Address inquiries to: Ralph M. Burress, as in No. 13 above.

15. Investigations of Stream Pollution.

This is a project to investigate the effect of water pollution upon fish in Missouri streams and to provide information for law enforcement and pollution abatement. Analyses of contaminated waters are made, the source of contamination is traced, and its effect upon the fish determined.

Statewide; began 1941, continuing; Herbert J. Fisher, Leader.

Address inquiries to: Herbert J. Fisher, Fish and Game Division, Conservation Commission, 903a Elm Street, Columbia, Mo.

16. A Study of the Effect Upon Fish of the Drawdown of Navigation Pools in the Missouri Section of the Mississippi River.

Conservation agents and commercial fishermen assist on this project by making daily observations of river conditions relating to the fishery during critical periods and by reporting their findings to the project supervisor. Each report of fish mortality is investigated and detailed study of the situation and an estimate of the extent of the fish kill is made. The U. S. Corps of Engineers cooperate by making available daily records of temperature, ice condition, snow cover, and pool elevation at each lock and dam in the study area.

U. S. Corps of Engineers cooperating; Mississippi River between Alton, Illinois, and Keokuk, Iowa; began December 1946, continuing; Herbert J. Fisher, Leader.

Address inquiries to: Herbert J. Fisher, as in No. 15 above.

17. The Use of Inorganic Fertilizers for Fish Production in Small Lakes and Ponds.

The objective of this project is to measure the availability of several plant nutrients when added to water, and to determine the most economical and

efficient method of fertilization in Missouri farm ponds. The experimental ponds are stocked with bass and bluegill.

St. Charles and Boone Counties; began May 1951, to close 1954; Charles R. Walker, Leader.

Address inquiries to: Charles R. Walker, Fish and Game Division, Conservation Commission, 903a Elm St., Columbia, Mo.

18. A Statewide, Continuing General Creel Census. (FA: F-1-R in part)

The census is carried on to determine the utilization of the fishery resources of the State, detect trends and to determine the effect of regulations. Conservation agents record creel data from 20 percent of all anglers interviewed in the regular course of their duties as enforcement officers. These data are tabulated by fishery technicians. Rate of success and species composition of the catch is determined for the various watersheds and impoundments and for the major zoogeographic areas of the State. Results for previous years are available for comparison.

Statewide; began May 1946, continuing; John L. Funk, Leader.

Address inquiries to: John L. Funk, Fish and Game Division, Conservation Commission, 903a Elm Street, Columbia, Mo.

19. The Estimation of Total Fishing Pressure on Missouri Waters. (FA: F-1-R in part)

This study has the objective of developing a sound method for estimating the number of fishing trips made and the number of fish caught annually in waters of the State. Estimations to be made using information on number of fishing trips, county of residence of fishermen and number of fish caught from the creel census, number of licenses sold in each county, and the average number of fishing trips made by licensees, the latter piece of information obtained by a questionnaire.

Statewide; began 1952, to close 1954; John L. Funk, Leader.

Address inquiries to: John L. Funk, as in No. 18 above.

20. A Study of the Composition and Relative Abundance of the Fish Population in Selected Areas of Study Streams. (FA: F-1-R in part)

This study is carried on to determine the composition and relative abundance of the fish population in three test sections on each of eight watersheds. The cause of any trends observed is to be determined, if possible. Previously, three collections were made annually but starting in 1954 only one collection will be made at each study section.

Statewide; began 1946, continuing; John L. Funk, Perry E. Robinson, Charles E. Purkett, Jr., Leaders.

Address inquiries to: John L. Funk, as in No. 18 above.

21. A Study of the Migration of Stream Fishes. (FA: F-1-R in part)

This study is made to determine the extent of migration of warm-water stream fishes and to correlate, if possible, migration with season, water conditions, and population pressure. Fish collected in the population study are tagged and released. Records of tagged fish reported caught by fishermen are analyzed to determine for each species average time and distance travelled, and direction and season of greatest migratory activity.

Statewide; began 1947, continuing; John L. Funk, Leader.

Address inquiries to: John L. Funk, as in No. 18 above.

22. A Study of the Growth Rate of the Important Stream Fishes in Various Missouri Watersheds. (FA: F-1-R in part)

Objectives of this study are to determine the age and rate of growth of

important stream fishes in certain designated watersheds, to detect growth trends, and to correlate the results of this study with those of other investigations to develop a comprehensive management plan for the watershed. Scale samples collected in the population study are used. All important game and rough fishes are studied. An attempt is made to correlate growth with environmental factors.

Statewide; began 1946, continuing; Edward M. Lowry, Charles A. Purkett, Jr., Leaders; reports available.

Address inquiries to: Edward M. Lowry, Fish and Game Division, 903a Elm Street, Columbia, Mo.

23. The Abundance, Distribution and Ecology of Forage Fishes in Streams. (FA: F-1-R in part)

Objectives of this study are to determine the species composition of small fish collections made in connection with the population study, to evaluate seasonal and yearly fluctuations in species composition and relative abundance and to establish distribution records. The effect of environmental conditions upon the population of forage and other small fishes is given special attention.

Statewide; began 1947, continuing; Perry E. Robinson, Leader.

Address inquiries to: Perry E. Robinson, Fish and Game Division, Conservation Commission, 903a Elm Street, Columbia, Mo.

24. An Intensive Creel Census of Two Similar Smallmouth Bass Streams. (FA: F-1-R in part)

Objectives of this study are to estimate the annual yield to anglers, to determine the effect of annually stocking smallmouth bass upon fishing success and to evaluate the cost of such stocking. One stream is stocked annually with fingerlings, the other serves as a control. Clerks collect creel census information in a systematic manner so that the results can be expanded to provide estimates of the yield for the entire season and the entire length of each stream. Stocked fish are fin-clipped so that their contribution to the creel can be recognized.

Big Piney and Niangua River watersheds; began August 1950, continuing; George G. Fleener, Leader; reports available.

Address inquiries to: George G. Fleener, Fish and Game Division, Conservation Commission, 903a Elm Street, Columbia, Mo.

25. A Study of the Species Composition and Relative Abundance of Fishes Present (With Particular Reference to Smallmouth Bass) in Two Missouri Smallmouth Bass Streams. (FA: F-1-R in part)

Objectives of this project are to ascertain the species composition and relative abundance of fishes present in two similar streams, one of which is stocked annually with fingerling smallmouth bass, to determine the effect of stocking upon the existing population and to evaluate the rate of survival of the stocked fish.

Big Piney and Niangua River watersheds; began August 1950, continuing; George G. Fleener, Perry E. Robinson, Charles A. Purkett, Jr., Leaders.

Address inquiries to: George G. Fleener, as in No. 24 above.

26. A Study of Trends in Reproductive Success of Game, Rough and Forage Fishes in Two Missouri Ozark Streams. (FA: F-1-R in part)

Objectives of this study are to obtain information on the spawning success and survival of important game and rough fishes (especially smallmouth bass), to determine the species composition and relative abundance of forage fishes,

and to evaluate the effects of various physical phenomena upon reproductive success and survival of the fishes in two Ozark streams.

Big Piney and Niangua River watersheds; began August 1950, continuing; George G. Fleener, Perry E. Robinson, Charles A. Purkett, Jr., Leaders.

Address inquiries to: George G. Fleener, as in No. 24 above.

27. Practicality and Economic Feasibility of Rearing and Stocking Largemouth Bass of One Pound Size. (FA: F-1-R in part)

The objective of this study is to determine the practicality and economic feasibility in terms of return to the creel of rearing and stocking bass of one pound size. Various types of ponds have been stocked at various rates with bass fingerlings. Those which reach one pound size will be stocked in Lake of the Ozarks. Economic feasibility will be determined by the prorated cost of the stocked bass which may be caught within a reasonable length of time.

Statewide; began March 1952, to close 1954; Richard Marzolf, Leader.

Address inquiries to: Richard Marzolf, Fish and Game Division, Conservation Commission, 903a Elm Street, Columbia, Mo.

28. Investigation of the Natural Reproduction of Channel Catfish with Special Reference to Small Impoundments. (FA: F-1-R in part)

Objectives of this study are to determine the conditions necessary for effective natural reproduction of channel catfish and to devise methods for creating these conditions in small impoundments. Factors influencing the survival of fry are being investigated. Initial abundance of fry, turbidity of water, suitable escape cover, and presence of predators or competitors are among the factors receiving attention.

August A. Busch Wildlife Area and Columbia vicinity; began March 1952, continuing; Richard Marzolf, Leader.

Address inquiries to: Richard Marzolf, as in No. 27 above.

29. A Survey of Gigging on Representative Streams of the Missouri Ozarks. (FA: F-1-R in part)

Objectives are to determine the portion of the various streams subject to gigging, to ascertain the techniques and equipment used, the effect of various physical factors upon gigging activity, and to determine the rate of success and species composition of the catch of giggers. Four watersheds are to be used for the study. Information is to be obtained by direct observation and from interviews with Conservation Agents, giggers, and other reliable local residents.

Big Piney, Niangua, Current, and James River Watersheds; began March 1954, to close 1955; Richard Marzolf, Leader.

Address inquiries to: Richard Marzolf, as in No. 27 above.

University of Missouri

1. Effect of Carp on the Limnology of Farm Ponds.

A two-year intensive study of the effect of a large population of carp on the limnology and fish populations of Missouri farm ponds. Turbidity, water chemistry, temperature and biological effects are receiving especial attention.

Statewide; began 1953, to close 1955; Joseph L. Hendricks, Leader.

Address inquiries to: Dr. Robert S. Campbell, Wildlife Research Unit, Wildlife Conservation Building, University of Missouri, Columbia, Mo.

2. The Effect of Strip-mine Lake Pollution on the Chemistry and Biota of a Stream.

The study has two major phases: (1) The effect of strip-mine spill (acid pollution) on the chemistry and biota of a stream; and (2) the dynamics of acid

generation within the strip-pit lakes, of spill, and of the movement of the acid head downstream.

Began 1952, to close 1955; John D. Parsons, Leader.

Address inquiries to: Robert S. Campbell, as in No. 1 above.

3. Age and Growth of the Black Redhorse Sucker and Its Relationship to the Smallmouth Bass in Two Missouri Streams.

Age, growth, distribution and food habits of the black redhorse sucker have been under investigation for one year. Food habits of small suckers and young smallmouth bass are compared.

Conservation Commission cooperating; began 1952, to close June 1954; Milton L. Bowman, Leader.

Address inquiries to: Robert S. Campbell, as in No. 1 above.

4. Rough Fish Population Studies in a Missouri Stream Not Subject to Acid Mine-Drainage.

Movement studies and population composition are currently under investigation.

Conservation Commission cooperating; began 1954, to close 1955; James Davis, Willis Hansen, Leaders.

Address inquiries to: Robert S. Campbell, as in No. 1 above.

5. The Fishery of Clearwater Lake.

The development and characteristics of the fishery during the first 5 years of the history of a new impoundment. Study includes growth rate data and qualitative observations on the small fish population.

Conservation Commission, cooperating; Southeastern Missouri; began July 1948, to close 1954; Mercer L. Patriarche, Robert S. Campbell, Leaders.

Address inquiries to: Robert S. Campbell, as in No. 1 above.

6. Nitrogen and Phosphorus Levels in a 14-Year-Old Reservoir.

Nitrogen and phosphorus levels are being measured at 2-week intervals for a 1-year period. Related limnological data are also recorded.

Began 1953, to close 1954; John D. Parsons, Robert S. Campbell, Leaders.

Address inquiries to: Robert S. Campbell, as in No. 1 above.

7. Age and Growth of the White Crappie in the Niangua Arm of the Lake of the Ozarks.

The objective is to follow population trends within a 25-year-old reservoir over at least a 10-year period.

Conservation Commission cooperating; began 1949, to close 1959; Arthur Witt, Jr., Leader.

Address inquiries to: Robert S. Campbell, as in No.1 above.

8. Age and Growth Studies of Fishes in the Largest Missouri Reservoir.

Age and growth of several species are made of black basses, drum (sheepshead) and goldeneye, in the Niangua Arm of the Lake of the Ozarks.

Conservation Commission cooperating; began 1950, continuing; Arthur Witt, Jr., Leader.

Robert S. Campbell, as in No. 1 above.

9. Movement of Centrarchids in a Large Reservoir.

The objective of the project is to study the movement of centrarchids by tagging in the Niangua Arm of the Lake of the Ozarks.

Began 1953, indefinite; Robert McVey, Leader.
Address inquiries to: Robert S. Campbell, as in No. 1 above.

10. Detailed Study of Age and Growth of Green Sunfish.
The objective of the project is to determine the age and growth rate of the green sunfish in the Niangua Arm of the Lake of the Ozarks.
Began 1953, indefinite; Jack Hoffman, Leader.
Address inquiries to: Robert S. Campbell, as in No. 1 above.

11. Detailed Study of the Age and Growth of the Bluegill.
The objective of the project is to determine the age and growth rate of the bluegill in the Niangua Arm of the Lake of the Ozarks.
Began 1953, indefinite; Alexander Montgomery, Leader.
Address inquiries to: Robert S. Campbell, as in No. 1 above.

Northeastern Missouri Teachers College

1. Survey of Utilization of Hybrid Fishes in Stocking Programs.
Objectives of the project are to determine the extent to which hybrid fishes have been, or are, used in stocking programs; and to determine the advisability of further work in this field.
Hdqrs. Kirksville; began May 1953, to close July 1954; John D. Black, Leader.
Address inquiries to: John D. Black, Northeastern Missouri State Teachers College, Kirksville, Mo.

MONTANA

Department of Fish and Game

1. The Contribution of Hatchery Reared Trout to the Total Catch. (FA: F-5-R, F-9-R in part)
This project is designed to measure, under various conditions, the relative contribution to the creel of hatchery-produced and wild trout. Total creel census is not made, but spot checks are made in sufficient volume to assure significant results.
Central and southern Montana; began June 1950, continuing; Nels A. Thoreson, Boyd R. Opheim, Leaders; reports available.
Address inquiries to: Montana State Department of Fish and Game, Helena, Mont.

2. Cataloging the Lakes and Streams of Montana. (FA: F-5-R, F-7-R, F-9-R, F-11-R in part)
The purpose of this project is to determine the chemical, physical, and biological characteristics of the waters of the State. Emphasis is placed on those waters which are most important to recreational fishing. Depending upon the water involved, quantitative and/or qualitative measures of trout stream populations are made by electric fishing census methods.
Statewide; began April 1951, continuing; Frank Stefanich, Nels Thoreson, Boyd Opheim, and William Alvord Leaders; reports available.
Address inquiries to: Department of Fish and Game, as in No. 1 above.

3. Effects of Boat Fishing on the Cutthroat and Dolly Varden Trout Population of the North Fork of the Flathead River as Relates to Conventional Bank Fishing.

A great deal of public pressure has been exerted to outlaw fishing from or with the aid of a boat on the North Fork of the Flathead River which borders Glacier National Park. This project was designed to measure the effects of boat fishing and the relative efficiency of boat fishing and bank fishing through creel census and fishermen counts from the ground and with the aid of an airplane. Observations on the life history and movement of the cutthroat trout and dolly varden trout were made as incidental objectives.

North Fork, Flathead River, Flathead County; began May 1953, to close December 1953; Frank A. Stefanich, Leader; reports available.

Address inquiries to: Frank A. Stefanich, Department of Fish and Game, Route 1, Kalispell, Mont.

4. Relationship of Trout and Yellow Perch in Middle Thompson Lake. (FA: F-7-R in part)

Many trout lakes in the western half of Montana have had yellow perch introduced with the usual result of a high population of stunted perch and a seemingly decreased trout population. This project is designed to determine the most economical and effective methods of restoring either or both perch and trout fishing to this type of lake.

State College cooperating; Thompson Lakes, Lincoln County; began June 1952, to close November 1955; Frank A. Stefanich, Leader; reports available.

Address inquiries to: Frank A. Stefanich, as in No. 3 above.

5. The Effects of Logging on Pinkham Creek's Fish Population. (FA: F-7-R in part)

Pinkham Creek, containing a population of eastern brook and rainbow trout, drains an area of virgin timber in northwestern Montana. Logging operations began in 1952 by controlled cutting under the supervision of the U. S. Forest Service. Annual observations of the streams fish population are made by use of the electric shocker. These observations will be continued over a period of years, as the logging operations progress, so that any changes in the fish population may be noted.

Pinkham Creek, Lincoln County; began August 1951, continuing; $200; Frank A. Stefanich, Leader; reports available.

Address inquiries to: Frank A. Stefanich, as in No. 3 above.

6. Effectiveness of Smith Lake Rearing Pond. (FA: F-7-R in part)

The primary objective of this project is to measure the economics of the operation of Smith Lake as a cutthroat trout rearing pond. The cost of the installation, the cost of the fry planted, the cost of the operation are compared with the value of the yearling trout produced. Production figures are obtained by draining the pond and by making actual counts of the fish captured.

Smith Lake, Flathead County; began July 1951, continuing; $700; Frank A. Stefanich, Leader; reports available.

Address inquiries to: Frank A. Stefanich, as in No. 3 above.

7. Establishment of Measures of Abundance of Cutthroat Trout in Ashley Lake. (FA: F-7-R in part)

At one time the cutthroat trout was abundant in Ashley Lake, but in recent years the number of cutthroat has dwindled to a dangerous low. Trout in Ashley Lake are a source of spawn for hatchery use, and traps are operated on four tributaries. The purpose of this project is to determine the relative efficiency of creel census and counts at the spawning weirs as measures of the size of the cutthroat population.

Ashley Lake, Flathead County; began May 1951, to close July 1954; Frank A. Stefanich, Leader; reports available.

Address inquiries to: Frank A. Stefanich, as in No. 3 above.

8. Natural Reproduction of Kokanee in Flathead Lake and Tributaries. (FA: F-7-R in part)

The water level of Flathead Lake is lowered considerably in the winter months by withdrawal of water for a hydro-electric plant. The spawning beds of kokanee are exposed during these periods. The purpose of this study is to establish the extent of kokanee spawning in Flathead Lake and its tributaries together with the degree of successful spawning.

Flathead and Lake Counties; began October 1951, to close April 1955; Frank A. Stefanich, Leader; reports available.

Address inquiries to: Frank A. Stefanich, as in No. 3 above.

9. Classification of Public Lands. (FA: F-10-R)

Montana statutes provide that the State Board of Land Commissioners may reserve from sale public lands adjacent to lakes and streams which have value for recreational purposes, including fishing. This project provides the means by which the State will make the on-the-site inspections of the various areas, with the objective of reserving lands with particular value from sale to private interests.

Statewide; began July 1952, continuing; $7,500; Clinton G. Bishop, Leader; reports available.

Address inquiries to: Clinton G. Bishop, Montana State Department of Fish and Game, Helena, Mont.

10. Statewide Creel Census. (FA: F-4-R)

This census is being conducted as a field survey by wardens, by guides and outfitters, and by cooperative fishermen, with statistical data compiled and analyzed by punch card system for use in planning future development and management procedures.

Statewide; began July 1951, continuing; $2,820; Clinton G. Bishop, Leader; reports available.

Address inquiries to: Clinton G. Bishop, as in No. 9 above.

11. Trout Disease and Nutrition Study. (FA: F-8-R)

The objects of the project are two-fold: First, to assemble a library as complete as possible on disease and nutrition of hatchery fish, and from this to prepare a manual which may be used by non-technical fish-cultural men. This manual will be prepared in such a manner that it may be supplemented with the latest information published or available. Secondly, to plan and prepare for a new project to study the extent and nature of hatchery trout mortalities in a test stream.

Statewide; began December 1951, continuing; $7,000; Jack E. Bailey, Leader; reports available.

Address inquiries to: Jack E. Bailey, Department of Fish and Game, Box 602, Philipsburg, Mont.

12. Removal and Replacement of the Otter Creek Fish Population.

Stream surveys of 1952 disclosed a large population of coarse fish and less than three percent trout in sample sections of Otter Creek. Poisoning stations were established and the population of fish in a portion of the stream was removed by the use of a commercial toxicant, Fish-tox. Brown trout were introduced into the rehabilitated portion of the stream. Observations will be continued.

Otter Creek, Cascade, and Judith Basin Counties; began May 1, 1953, continuing; $1,000; Nels A. Thoreson, Leader; reports available.

Address inquiries to: Nels A. Thoreson, Department of Fish and Game, Box 252, Belt, Mont.

13. Development of a Silver Salmon Brood Stock.

The silver salmon (Oncorhynchus kisutch) has proven itself to be an effective tool for sport fishery management in the fresh waters of Montana. The future for a supply of eggs from sea-run stock is questionable. As a part of this project it was found that eggs taken from land-locked fish planted from sea-run stocks could be fertilized, hatched, and reared in a hatchery. A brood stock was started from eggs taken from land-locked fish. These fish became ripe for the first time in 1953-54.

Deerlodge County; began January 14, 1951, continuing; Fred Beal, Leader.

Address inquiries to: Fred Beal, State Fish Cultural Station, Anaconda, Mont.

14. Phases of the Life History of the Utah Chub in Montana. (FA: F-9-R in part)

The Utah Chub is native to the Bonneville Basin of Utah and the upper Snake River Drainage. These were introduced into Hebgen Lake, Montana, by minnow fishermen. It is now present in the Missouri Drainage as far downstream as Helena. The Utah chub is a nuisance fish of considerable magnitude. It is felt that a better understanding of this fish may lead to methods of control.

State College cooperating; Hebgen Lake, Gallatin County; began May 1953, to close November 1954; Richard J. Graham, Leader.

Address inquiries to: Richard J. Graham, Zoology and Entomology Department, Montana State College, Bozeman, Mont.

State College

1. Basic Fish-Food Studies -- The Seasonal Succession of Periphyton in the West Gallatin River.

The objective of the project is to determine the seasonal succession of Periphyton in a trout stream in relation to velocity, temperature, depth, bottom type, and ice conditions.

Hdqrs. State College; began September 1952, to close April 1954; $200; Ronald B. Gumtow, Leader.

Address inquiries to: Dr. C. J. D. Brown, Zoology and Entomology Department, Montana State College, Bozeman, Mont.

2. Utilization of the Mountain Whitefish, Prosopium williamsoni, in Montana.

A distributional study is under way to locate the principal concentrations of whitefish. Method of capture, harvest, accessibility of baits, methods of preparation, etc. are included in the study.

Sport Fishing Institute cooperating; Statewide; began June 1952, to close April 1954; John J. Gaffney, Leader; reports available.

Address inquiries to: C. J. D. Brown, as in No. 1 above.

3. Taxonomy of the Mountain Whitefish, Prosopium williamsoni.

An effort is being made to study as many whitefish as possible from "isolated" populations known to occur in the mountain west.

State College; began September 1952, to close December 1954; A. Ramona Denton, Leader.

Address inquiries to: C. J. D. Brown, as in No. 1 above.

State University

1. Size and Population Studies of Oncorhynchus nerka in Flathead Lake.

A study of the changes in average size of the kokanee from spawning season to spawning season, in particular reference to micro-populations within the lake is underway.

Flathead Lake; began 1947, indefinite; $200; Royal Bruce Brunson, Leader.

Address inquiries to: Dr. Royal Bruce Brunson, Department of Zoology, Montana State University, Missoula, Mont.

2. A Limnological Study of Flathead Lake.

The project includes hydrographic mapping, observations on physico-chemical cycles, plankton cycles, and benthos of Flathead Lake. Relationships of these limnological features to the fisheries of the lake are being studied.

Flathead Lake; began 1949, indefinite; Royal Bruce Brunson, Leader.

Address inquiries to: Royal Bruce Brunson, as in No. 1 above.

3. A Limnological and Fisheries Survey of the Lakes of Western Montana.

Hydrographic mapping, physico-chemical analyses, plankton, bottom fauna, and fisheries survey are made on one or more lakes of northwestern Montana each year.

Western Montana; began 1949, indefinite; $100; Royal Bruce Brunson, Leader.

Address inquiries to: Royal Bruce Brunson, as in No. 1 above.

4. A Study of the Dolly Varden Trout, Salvelinus malma, in Flathead Lake.

The age and growth, food, depth distribution, and general ecology of the Dolly Varden trout are being investigated.

Flathead Lake; began 1949, to close 1955; $200; Royal Bruce Brunson, Leader.

Address inquiries to: Royal Bruce Brunson, as in No. 1 above.

5. An Ecological Study of the Fishes of Flathead Lake.

A survey of the fishes of Flathead Lake, in respect to distribution, inter-relationships, and year-round population trends is being conducted.

Flathead Lake; began 1947, indefinite; $400; Royal Bruce Brunson, Leader.

Address inquiries to: Royal Bruce Brunson, as in No. 1 above.

U. S. Fish and Wildlife Service, Branch of Game-fish and Hatcheries

1. Stream and Lake Population Analyses.

The objective is the determination of existing condition of fish populations as an aid in revising stocking programs for Federal hatcheries. Samples are taken to show species, age, growth, and condition. Sampling methods include portable stream shocker and graduated mesh gill nets.

Headwaters of Missouri River, including Madison, Jefferson, and Gallatin Rivers; began July 1952, continuing; $500; Lewis R. Garlick, Leader.

Address inquiries to: Lewis R. Garlick, Regional Supervisor, Branch of Game-fish and Hatcheries, Fish and Wildlife Service, Swan Island, Portland 18, Ore.

Game, Forestation and Parks Commission

1. Biological Aid to Walleye Hatchery.

The objective of the project is to obtain information on temperatures, oxygen content, turbidity, and amounts and quality of plankton in the hatchery ponds.

North Platte; began February 1946, continuing; Walter Kiener, Leader.

Address inquiries to: Paul T. Gilbert, Executive Secretary, Game, Forestation and Parks Commission, State Capitol Building, Lincoln 9, Nebr.

2. Lake McConaughy Study.

Objectives of the project are to obtain information in greater detail of this, our largest lake in Nebraska, about the size of the fish crop, the structure of the fish population, and above all, about the near-disappearance of the crappies from this lake.

Lake McConaughy; began 1954, continuing; Walter Kiener, Leader.

Address inquiries to: Paul T. Gilbert, as in No. 1 above.

3. Survey of Lakes in Fremont Recreation Area.

The project objectives are to obtain more detailed information regarding the creel census, population structure, and limnological conditions in the several lakes of this recreation area.

Fremont; began 1954, continuing; Walter Kiener, Leader.

Address inquiries to: Paul T. Gilbert, as in No. 1 above.

4. Limnological Investigations.

Whenever other work permits, the physical, chemical, and biological conditions of all types of waters in the State are studied and recorded.

Statewide; began 1946, continuing; Walter Kiener, Leader.

Address inquiries to: Paul T. Gilbert, as in No. 1 above.

5. Fish Reference Collection.

In order to establish a good fish reference collection for study by fisheries people, archeologists, zoologists and others, fish, fish skeletons, and parts thereof are collected, preserved, labeled, and organized in cases.

Statewide; began 1946, continuing; Walter Kiener, Leader.

Address inquiries to: Paul T. Gilbert, as in No. 1 above.

6. Fish Growth Studies and Stomach Analysis.

Data is being gathered on the growth rates of different fish in various waters of the State. Food preferences and availability of foods for different species are being recorded. As time permits, fish scales and stomach contents are being preserved for future study and analysis.

Statewide; hdqrs. Laboratory in Lincoln; began 1946, continuing; Walter Kiener, Leader.

Address inquiries to: Paul T. Gilbert, as in No. 1 above.

7. Installation of Brush Shelters.

Brush shelters are placed in reservoirs to attract crappies and make them available to fishermen.

Platte River Valley System of Reservoirs; began January 1948, continuing; Walter Kiener, Leader.

Address inquiries to: Paul T. Gilbert, as in No. 1 above.

8. Aquatic Plant Collection.

Information to benefit the management of fish habitats is being gathered, and, when opportunity and time permit, aquatic plants, including algae are collected and mounted for study, comparison, reference and permanent record.

Statewide; began 1946, continuing; Walter Kiener, Leader.

Address inquiries to: Paul T. Gilbert, as in No. 1 above.

9. Grove Lake Development. (FA: F-2-D)*

The State is constructing a dam to impound a 50-acre lake. Timber is being cleared and some tree trunks and brush piles are being staked down in selected locations to provide fish shelter.

Verdigra Creek, Antelope County; began May 1953, indefinite; $98,659; Eugene Baker, Leader.

Address inquiries to: Paul T. Gilbert, as in No. 1 above.

NEVADA

Fish and Game Commission

1. Lakes Mead and Mohave Investigations. (FA: F-1-R)

The objective of the project is to study reservoir condition in an attempt to better the fishing returns in lakes Mead and Mohave.

Clark County; began July 1951, to close June 1954; $14,394; Al Jonez and Bob Sumner, Leaders.

Address inquiries to: T. Trelease, Nevada Fish and Game Commission, 51 Grove Street, Reno, Nev.

2. Stream and Lake Surveys. (FA: F-2-R)

The project objective is to gather physical and biological data on the lakes and streams of Nevada for management.

Statewide; began October 1951, to close October 1956; $14,367; Ted Frantz, Don Thurston, Leaders.

Address inquiries to: T. Trelease, as in No. 1 above.

University of Nevada

1. The Algae of Nevada.

The projects objectives are: (1) To determine the species of algae present in the State and their distributions, and (2) to make taxonomic and ecologic information on these basic food chain plants available to Nevada State Fish and Game Commission technicians as well as to other fish management studies.

Chicago Museum of Natural History cooperating; Statewide; began March 1952, to close 1955; $500; Ira La Rivers, Leader.

Address inquiries to: Ira La Rivers, Biology Department, University of Nevada, Reno, Nev.

2. The Fishes of Nevada.

The objectives of the project are to adequately list, describe, key and characterize, both taxonomically and ecologically, the fishes of the State so that this information will be available to fish and game technicians, University personnel and biologists in general.

Fish and Game Commission cooperating; statewide; began June 1952, to close 1955; $2,000; Ira La Rivers Leader.

Address inquiries to: Ira La Rivers, as in No. 1 above.

3. The Limnology of Pyramid Lake.

This project is to determine methods of reviving the once extensive cutthroat trout fishing industry in the lake. To date, it has included annual surveys of the physical, chemical and biological characteristics of the lake on the part of both the University and the Fish and Game Commission.

Fish and Game Commission and Piute Indian Tribal Council cooperating; Pyramid Lake; began August 1948, to close 1958; $1,000; Ira La Rivers, Leader.

Address inquiries to: Ira La Rivers, as in No. 1 above.

NEW HAMPSHIRE

Fish and Game Department

1. A Statewide Survey of Fishing Pressure and Fish Resources in New Hampshire. (FA: F-2-R)

The establishment of the New England-New York Inter-Agency Committee has made it necessary to accumulate additional data relative to fishing pressure, natural reproduction of fish, and the economic importance of fishing within New Hampshire. All data of a similar nature collected in the past will be summarized.

A statewide economic survey of fishing and hunting is under way, in which comprehensive questionnaires were sent to randomly selected two percent sample of license holders, with the purpose of obtaining a one percent sample for final analysis.

Statewide; began July 1, 1951, indefinite; $12,000; Robert F. Normandin and David L. White, Leaders.

Address inquiries to: Sumner A. Dole, Jr., New Hampshire Fish and Game Department, Concord, N. H.

2. A Study of Bass Production in New Hampshire Waters. (FA: F-3-R)

Activities include investigations of fish population densities and species ratios, reproductive capacities of smallmouth bass, effects of fishing pressure upon bass in Bow Lake, and the relationship of bass to forage fish and invertebrates.

Statewide; began July 1, 1951, continuing; $7,000; Paul E. Giguere, Leader.

Address inquiries to: Hilbert R. Siegler, Chief, Management and Research Division, New Hampshire Fish and Game Department, Concord, N. H.

3. Game Fish Management. (FA: F-4-D)

This project was set up to apply currently known fish management measures, and as a proving ground for new techniques as they are developed in research projects. Small pools are being operated in cooperation with sportsmen's clubs, in which bass fry are raised to fingerling size aided by the application of fertilizers, and then planted where surveys indicate they are needed. Five experimentally reclaimed ponds received a large portion of these bass along with large quantities of crayfish to test the use of the latter as a forage food, and to determine the length of time it takes bass to reach legal size in northern reclaimed waters.

Statewide; began July 1, 1951, indefinite; $8,600; Arthur D. Riel, Leader.

Address inquiries to: Arthur D. Riel, New Hampshire Fish and Game Department, Concord, N. H.

4. Trout Stream Investigations. (FA: F-5-R)

This is a long-term study of a typical New Hampshire mountain trout stream. Creel censuses have been conducted to determine angling intensity and success,

and weirs have been maintained to obtain data on trout movements by age and size groups.

Swift River and its tributaries in the Passaconaway Valley, Conway; began April 1, 1952, indefinite; $5,000; Arthur E. Newell, Leader.

Address inquiries to: Arthur E. Newell, New Hampshire Fish and Game Department, Concord, N. H.

5. Ecological Study of the Squam Lakes. (FA: F-6-R)

The goal of this study is to make a comprehensive ecological survey of one of the State's more important salmonoid and bass lakes by gathering information relative to: interspecies relationships, effects of angling, extent and effectiveness of natural spawning, effectiveness of present stocking program, evidence of disease and parasitism.

Squam Lakes in Holderness, Sandwich and Moultonboro Counties; began August 1949, to close August 1954; $9,800; Ronald E. Towne, Leader; reports available.

Address inquiries to: Ronald E. Towne, Fish and Game Department, Holderness, N. H.

6. Development of Electric Fish Shocker. (FA: F-7-R)

Currently used fish shockers have been tested and found worthless in New Hampshire streams. Due to the high resistance of New Hampshire waters and higher conductivity of the underlying soils, current of the shocker equipment completes its circuit through the earth rather than the water, with the result that fish are not affected. Attempts will be made to develop a fish shocker which will overcome this difficulty.

Statewide; began September 15, 1953, to close 1954; $5,500; Walter T. Silver, Leader.

Address inquiries to: Walter T. Silver, New Hampshire Fish and Game Department, Concord, N. H.

7. Fish Marking Studies. (FA: FW-2-R)

Studies are underway to find means whereby fish may be marked in such a manner as to circumvent the many inherent difficulties associated with the use of tags. Particular attention is being given the use of dyes.

University of New Hampshire cooperating; hdqrs. Engineering Experiment Station, University of New Hampshire, Durham; began July 1, 1953, indefinite; $500; J. Seiberlich, Leader.

Address inquiries to: Hilbert R. Siegler, as in No. 2 above.

8. Pond Reclamation Project.

The project objective is to remove competitor fishes from ponds through the use of rotenone.

Statewide; began 1945, indefinite; $7,987; Robert B. Knowlton, Leader; reports available.

Address inquiries to: Robert B. Knowlton, Fish and Game Department, State House Annex, Concord, N. H.

NEW JERSEY

Division of Fish and Game

1. Survey of Major Streams in South Jersey. (FA: F-3-R in part)

Objectives of the project are to study the fish populations present in the freshwater sections of these streams and attempt to determine how such

extremely acid waters can best be managed for recreation.

South Jersey; began June 1953, to close September 1953; Hudson Nichols, Leader.

Address inquiries to: Roland F. Smith, New Jersey Fisheries Laboratory, 126 North Main Street, Milltown, N. J.

2. New Jersey Lake and Pond Survey.

The objective of the project is to obtain information on public lakes, ponds and impoundments necessary in the formulation of plans for their management.

Statewide; began June 1950, to close 1954; $8,000; Paul E. Hamer and Richard Gross, Leaders; reports available.

Address inquiries to: Roland F. Smith, as in No. 1 above.

3. Survival of Hatchery-reared Large- and Smallmouth Bass.

The project objectives are to determine the size(s) of bass of both species that can be stocked economically in various lake types in New Jersey, and to determine where the stocking of hatchery-reared bass might be needed. Bass of both species, of various ages and sizes, are being stocked at various times of the year, and in different environmental conditions. The fish are fin-clipped or tagged. The results of this stocking are being evaluated by draining of ponds and creel census.

Rutgers University cooperating; statewide; began August 1952, to close 1957; $5,000; Roland F. Smith, Leader.

Address inquiries to: Roland F. Smith, as in No. 1 above.

4. Establishment of Landlocked Salmon.

The objective of the project is to study the results of an experimental stocking of landlocked salmon in Mountain Lake.

Warren County; began 1953, indefinite; $1,000; Roland F. Smith, Leader.

Address inquiries to: Roland F. Smith, as in No. 1 above.

5. Pickerel Ice Census.

Objectives of the project are to evaluate the effects of the 15 inch minimum size limit on pickerel in those lakes where it has been adopted; to study routine population and fishing statistics on pickerel and to determine if there is a need for size restrictions on this species; and to obtain census data on yellow perch and other species taken through the ice.

Six north Jersey lakes; began January 1950, to close January 1955; $4,000; Roland F. Smith, Leader.

Address inquiries to: Roland F. Smith, as in No. 1 above.

6. Distribution of Fishes in New Jersey.

A general survey is being made of the species of fishes present and their distribution in the State.

Statewide; began 1950, indefinite; Roland F. Smith, Leader; reports availabl

Address inquiries to: Roland F. Smith, as in No. 1 above.

7. Alkalization of Acid Waters. (FA: F-3-R in part)

Limited research on acid water impoundments is continuing with the effects of alkalization on spawning success and growth being investigated.

South Jersey; began 1950, indefinite; $200; Roland F. Smith, Leader; reports available.

Address inquiries to: Roland F. Smith, as in No. 1 above.

8. Evaluation of Fishing Intensity on Various Species of Native and Stocked Fish in Several Important New Jersey Lakes.

Objectives of the project are to evaluate success of stocking brown and rainbow trout in Lake Hopatcong; to evaluate effects of stocking tagged adult largemouth bass and pickerel in Budd and Cranberry Lakes against an equal number of native tagged fish; and to obtain similar data on certain panfish species.

North Jersey lakes; began November 1953, indefinite; $4,000; Paul E. Hamer, Leader.

Address inquiries to: Paul E. Hamer, New Jersey State Fisheries Laboratory, 126 North Main Street, Milltown, N. J.

9. Lake and Pond Reclamation.

The project objective is to reclaim lakes and ponds, presently inhabited by undesirable fishes, for species deemed more desirable.

Statewide; began October 1952, indefinite; $1,000; Paul E. Hamer, Leader.

Address inquiries to: Paul E. Hamer, as in No. 8 above.

10. Percent Mortality of Pickerel Released After Having Been Taken on Various Types of Lures and Bait.

The objective of the project is to determine the mortality of pickerel caugth on live bait, single-hook lures, or multi-hook lures.

Began March 1954, indefinite; $500; Paul E. Hamer, Leader.

Address inquiries to: Paul E. Hamer, as in No. 8 above.

11. Salvage Netting From Closed Waters.

Objectives of the project are to obtain a supply of large panfish for stocking in municipal ponds for kid fishing and to procure a supply of adult game and panfish for tagging experiments.

Statewide; began February 1953, indefinite; $3,000; Paul E. Hamer, Leader.

Address inquiries to: Paul E. Hamer, as in No. 8 above.

12. Introduction of New Forage Species. (FA: F-3-R in part)

The salt-water spearing and anchovy have become landlocked in two fresh-water impoundments and their potential as forage will be investigated. Landlocked herring will be stocked in small impoundments and weedy lakes where they do not now exist. Fresh-water shrimp are being investigated as an intermediate food for bass fry at the State Hatchery, and as forage in ponds.

Statewide; began May 1953, indefinite; $300; Jules Marron, Jr., Leader.

Address inquiries to: Jules Marron, Jr., New Jersey State Fisheries Laboratory, 126 North Main Street, Milltown, N. J.

13. Destruction of Fish Eggs Through Use of Chemicals. (FA: F-3-R in part)

The objective of the project is to test the feasibility of pan fish control through destruction of their eggs with chemicals.

Specific lakes in 3 counties; began March 1953, to close November 1955; $1,500; Jules Marron, Jr., Leader.

Address inquiries to: Jules Marron, Jr., as in No. 12 above.

14. Fingerling Trout Stocking in Certain New Jersey Lakes. (FA: F-3-R in part)

The project objective is to utilize surplus fingerling trout available at the State Fish Hatchery. Fingerling rainbow, brown and brook trout have been finclipped and stocked in five lakes. Survival will be checked by gill nets and creel census.

Northern New Jersey; began November 1953, indefinite; $500; Jules Marron, Jr., Leader.

Address inquiries to: Jules Marron, Jr., as in No. 12 above.

15. Introduction of New Game and Panfish Species. (FA: F-3-R in part)

Objectives of the project are to attempt to establish the yellow pike-perch and striped bass (Roccus lineatus) in several lakes. The major objective is an additional predator large enough to utilize the large golden shiners and miscellaneous fishes. The channel catfish will be used in park ponds where they should be easier to manage and more desirable than other game and pan species. The redear sunfish will be utilized in small impoundments as more desirable because of its low reproductive potential and larger size.

Central and northern New Jersey; began May 1953, indefinite; $2,200; Jules Marron, Jr., Leader.

Address inquiries to: Jules Marron, Jr., as in No. 12 above.

16. Population Manipulation. (FA: F-3-R in part)

The biological changes brought about by manipulating populations will be measured by creel census, analysis of growth and changes in population as shown by net catches.

Statewide; began March 1953, indefinite; $13,000; Jules Marron, Jr., Leader.

Address inquiries to: Jules Marron, Jr., as in No. 12 above.

17. Brush Piles and Brush Pile Areas as Panfish Concentrators. (FA: F-3-R in part)

Objectives of the project are to test brush piles as concentrators for panfish, to perhaps aid in the harvest of these species. The brush piles are being tested with the cooperation of interested fishermen who fish certain designated areas on randomized days.

Specific lakes, 3 counties; began May 1953, to close November 1954; $500; Jules Marron, Jr., Leader.

Address inquiries to: Jules Marron, Jr., as in No. 12 above.

18. Studies on the Landlocked Alewife, Pomolobus pseudoharengus in Lake Hopatcong.

The landlocked alewife is known to be a very important forage fish in many New Jersey lakes. It seems desirable to learn more about the life history and ecological requirements of this fish. Since it is also an important bait fish, information relative to the procurement and handling of this fish is also desirable.

Rutgers University cooperating; Sussex County; began June 1953, indefinite; $200; Richard Gross, Leader; reports available.

Address inquiries to: Richard Gross, New Jersey State Fisheries Laboratory 126 North Main Street, Milltown, N. J.

19. Creel Census on Certain Important New Jersey Lakes.

Objectives of the project are to study fishing success on several important lakes that receive heavy fishing pressure in order to obtain routine population and census statistics, and, also, to establish a basis for comparing fishing success in the years to come.

Statewide; began 1952, indefinite; $1,000; Richard Gross, Leader; reports available.

Address inquiries to Richard Gross, as in No. 18 above.

20. Aquatic Weed Control. (FA: F-1-R)

The project objective is to develop and test practical aquatic weed control methods.

Statewide; began December 1951, to close December 1955; $11,500; Robert K. Huckins, Leader.

Address inquiries to: Robert K. Huckins, New Jersey State Fisheries Laboratory, 126 North Main Street, Milltown, N. J.

21. Inventory of New Jersey Salt Water Fisheries. (FA: F-2-R)

Objectives of the project are to ascertain the number of people who engage in sport fishing in our tidal waters, the man-days spent on various methods, and the catch by species, gear, month, and area; and to analyze their catch and the value of the industry.

Rutgers University cooperating; statewide; began January 1952, to close January 1955; $16,477; Roy R. Younger, Leader; reports available.

Address inquiries to: Roy R. Younger, New Jersey State Fisheries Laboratory, 126 North Main Street, Milltown, N. J.

22. Fishery Survey of the Tidal Portion of Major Streams of South Jersey.

Objectives of the project are to determine the utilization of the tidal portions of the streams by important marine, estuarine, and freshwater fishes; and to determine the relative importance of the tidal portions, with a view towards their development as one means of relieving pressure on inland waters.

Rutgers University cooperating; South Jersey; began June 1953, to close September 1953; Grant Walton, Leader.

Address inquiries to: Dr. James R. Westman, Department of Conservation and Wildlife Management, Rutgers University, New Brunswick, N.J.

NEW MEXICO

Department of Game and Fish

1. Fisheries Survey of the Gila and Mimbres River Drainages. (FA: F-1-R)

This basic fisheries survey is to determine the carrying capacity, record the food content, both qualitatively and quantitatively, make water analysis, readjust a fish stocking policy to conform to the findings of the investigation, investigate waters requiring extensive management in respect to trash fish removal, stream and lake improvement and reservoir development, and generally aim at restoration and improvement of recreational fisheries.

Southwestern New Mexico; began July 1, 1952, to close June 30, 1955; $10,000; Earl H. Huntington, Leader; reports available.

Address inquiries to: Department of Game and Fish, Santa Fe, N. M.

2. Fisheries Survey of the Canadian and Cimarron River Drainages in New Mexico. (FA: F-3-R)

This survey is to determine the carrying capacity, record the food content both qualitatively and quantitatively, make water analysis, readjust a fish stocking policy to conform to the findings of the investigation, investigate waters requiring extensive management in respect to trash fish removal, stream and lake improvement and reservoir development, and generally aim at restoration and improvement of recreational fisheries.

Northeastern New Mexico; began April 1, 1953, to close March 31, 1956; $11,000; W. H. Wolfrum, Leader.

Address inquiries to: Department of Game and Fish, as in No. 1 above.

3. Rio Chama Wildlife and Fishing Area. (FA: FW-2-L)

The objective is to make accessible to the fishing public, for all time, the stream above and below El Vado Lake as well as the reservoir itself. The fishing rights will be secured on $8\frac{3}{4}$ miles of river above reservoir, two miles below the reservoir and $4\frac{1}{2}$ miles of reservoir shoreline.

Rio Arriba County; began April 22, 1953, indefinite; $1,021.

Address inquiries to: Department of Game and Fish, as in No. 1 above.

4. Rio Chama Wildlife and Fishing Area Development. (FA: FW-3-D)

This is a fish and wildlife combination development project. The objective is to build a bridge and road to provide an access to the Chama River for fishermen.

Rio Arriba County; began June 2, 1953, to close June 2, 1956; $600.

Address inquiries to: Department of Game and Fish, as in No. 1 above.

5. Fisheries Survey of Lower Pecos Valley. (FA: F-5-R)*

The project objective is to make a survey of the fishery resources of streams and lakes in Eddy County. A barrier is planned for construction on the Pecos River below Lake McMillan to control migrating non-game fish in the area in an effort to improve the game fish population. Evaluation of the effect of the barrier will be done by creel census and trapping records.

Eddy County; began February 1954, planned for 3 years; $11,000; Donald R. Miller, Leader.

Address inquiries to: Department of Game and Fish, as in No. 1 above.

6. Pecos River Fish Barrier and Trap No. 1. (FA: F-6-D)*

The purpose of the trap is to provide a means of trapping upstream and downstream migrations of non-game species. The barrier is to be an 18-inch high concrete dam, $1\frac{1}{2}$ miles below McMillan Lake.

Eddy County; began December 1953, to close December 1954; $4,536; Richard Allgood, Leader.

Address inquiries to: Department of Game and Fish, as in No. 1 above.

7. Food Habits of Mergansers. (FA: FW-6-R)*

Objectives of the project are to obtain information on the food habits of the mergansers with particular reference to the ratio of game to non-game fish entering the diet. Large numbers of the birds accumulate on certain New Mexico reservoirs.

Began February 1954, to close December 1954; $1,700; Austin Roberts, Leader.

Address inquiries to: Department of Game and Fish, as in No. 1 above.

U. S. Fish and Wildlife Service, Branch of Game-fish and Hatcheries

1. Fishery Management Surveys.

The objective is to develop fish management plans, based on surveys, for specific water areas. Priority is given to Federally controlled areas such as Service refuges, National Forests, Veterans Administration facilities, defense installations and Indian reservations.

Hdqrs. Albuquerque; field work in the several States comprising Fish and Wildlife Service Region 2; continuing; Lynn Hutchens, Leader.

Address inquiries to: Regional Director, Fish and Wildlife Service, P. O. Box 1306, Albuquerque, N. M.

2. Technical Assistance in Fish Cultural Activities.

Assistance is given to fish cultural personnel toward the solution of biological problems of hatchery management, such as weed control, fertilization, disease, and water quality; and in initiating new or improved techniques. Fish stocking activities are reviewed for correlation with State Conservation Department practices and to direct the distribution of Federally produced fish in accordance with Fish and Wildlife Service policy and known fishery management needs.

Hdqrs. Albuquerque; field work in the several States comprising Fish and Wildlife Service Region 2; continuing; Lynn Hutchens, Leader.

Address inquiries to: Regional Director, as in No. 1 above.

NEW YORK

Conservation Department

1. Selective Breeding of Trout for Disease Resistance. (FA: F-2-R)

This project aims to develop methods for decreasing loss in rearing trout (especially through ulcer disease and furunculosis) by testing of partially disease-resistant strains and selective breeding from the best of such strains.

Rome Hatchery Laboratory; began April 1952, indefinite; $10,072; L. E. Wolf, Leader.

Address inquiries to: Dr. John R. Greeley, Chief Aquatic Biologist, Conservation Department, Albany, N. Y.

2. Landlocked Salmon Project.

This is a combined research and management project, to determine practical methods for increasing landlocked salmon and to manage the resource in waters where salmon fishing has been built up. Through marking experiments, Atlantic salmon have been shown to be adaptable to lakes. Tests to determine the degree of survival as compared to landlocked salmon are in progress. Experiments with red salmon (sockeye) in lakes are included.

Statewide; began 1944, indefinite; $7,000; John R. Greeley, Leader; reports available.

Address inquiries to: John R. Greeley, as in No. 1 above.

3. Study of Weakfish, Long Island Waters. (FA: F-3-R)

This is a study of the weakfish resource in Long Island waters to determine factors affecting maintenance. The decline in this resource is not sufficiently well understood to apply remedial action without such basic study.

Long Island; began April 1952, indefinite; $22,399; Alfred Perlmutter, Leader; reports available.

Address inquiries to: John R. Greeley, as in No. 1 above.

4. Stocking Survivals and Population Studies in Trout.

Included here are a number of investigations with brook, brown and rainbow trout, handled through five Fish Management Districts. These involve fin-clipping or tagging and census with electric shocker or through creel census.

Statewide; began 1940, indefinite; $2,000.

Address inquiries to: John R. Greeley, as in No. 1 above.

5. Development and Improvement of Electric Shocker. (FA: F-1-R)

Objectives were to test, design and improve electric shockers, including A.C. and D.C. types, including also battery-operated (portable) apparatus and electric trawl for deep water.

State Fish Hatchery, Rome; began April 1952, to close March 1955; $5,418; D. C. Haskell, Leader; reports available.

Address inquiries to: John R. Greeley, as in No. 1 above.

6. Hudson River Shad Investigation.

In order to evaluate relative success of reproduction from year to year, annual sampling of young shad is carried on by seining in late summer.

Lower Hudson River; began July 1948, indefinite; $800; C. E. Heacox, Leader.

Address inquiries to: John R. Greeley, as in No. 1 above.

7. Striped Bass Study. (FA: F-10-R)

This study will be centered in the Hudson River and Long Island waters, to determine factors affecting maintenance of the resource of striped bass. Through liaison with other Atlantic coast states, many of which are starting similar studies, it is expected that these factors will be studied over the entire region.

Hudson River and Long Island; began January 1954, indefinite; $23,810 (for $1\frac{1}{4}$ years).

Address inquiries to: John R. Greeley, as in No. 1 above.

8. Experimental Carp Control. (FA: F-9-R)

In a number of selected lakes, tests of the value of controlling carp as a fisheries management practice are being carried on through removal of a part of the carp population and a study of associated species of other fish (including game fish) before and after such operations. Observations on habitat changes associated with removal of carp are included.

Statewide; hdqrs. Norwich; began June 1953, indefinite; $21,862; H. A. Loeb, Leader.

Address inquiries to: John R. Greeley, as in No. 1 above.

9. Studies in Disease Control of Hatchery Fish.

In order to improve propagation methods, continuous research on control of disease is necessary, including both experimental work and liaison with fish hatchery personnel to diagnose and cure outbreaks responsible for losses.

Rome Fish Hatchery Laboratory; began 1932, continuing; $12,000; L. E. Wolf, Leader; reports available.

Address inquiries to: John R. Greeley, as in No. 1 above.

10. Studies in Nutrition of Hatchery Trout.

In order to improve propagation methods, continuous research on trout diets and physiology is carried on, including close liaison with fish hatchery personnel concerning problems and practices.

U. S. Fish and Wildlife Service and Cornell University cooperating; Fish Nutrition Laboratory, Cortland; began 1934, continuing; $9,500; D. R. Brockway, Leader; reports available.

Address inquiries to: John R. Greeley, as in No. 1 above.

11. Lake Ontario Lake Trout Investigation.

Objectives of the project are to explore possibilities of improving management of lake trout at eastern end of Lake Ontario, a joint investigation of lake

areas and experimental stocking of fin-clipped fish has been started, fingerling lake trout being planted by New York in 1953.

Department of Lands and Forests, Province of Ontario, cooperating; Lake Ontario; began 1953, indefinite; $500; D. G. Pasko (New York) and N. S. Baldwin (Ontario), Leaders.

Address inquiries to: John R. Greeley, as in No. 1 above.

12. Chautauqua Lake Muskalonge Investigation.

This is a continuing study of the resource, involving checks during the annual netting for spawn, tagging work and inventory of angling catch for management purposes.

Chautauqua Lake; began 1941, continuing; $500; U. B. Stone, Leader; reports available.

Address inquiries to: Dr. U. B. Stone, Senior Aquatic Biologist, Conservation Department, 383 East Main Street, Rochester, N. Y.

13. Great Lakes Fisheries Investigations.

In order to provide a continuous record of catch and status of the fishery of New York waters of the Great Lakes, a survey is in progress through the commercial fishermen. Species of interest to anglers are included.

Lake Erie, Lake Ontario; began 1951, indefinite; $3,000; W. J. Bentley, Leader; reports available.

Address inquiries to: U. B. Stone, as in No. 12 above.

14. Testing of Lake Trout Stocking.

Objectives of the project are to follow survivals of plantings and natural reproduction and obtain other information basic to management of lake trout. A coordinated study involving numerous lakes is being carried on, involving fin-clipping and test netting.

Cornell University cooperating; statewide; began 1951, indefinite; $2,000; District Fish Managers and D. A. Webster, Leaders; reports available.

Address inquiries to: Dr C. W. Greene, Senior Aquatic Biologist, Conservation Department, Albany, N. Y.

15. Stillwater Pond Trout Project.

Work is under way to determine methods for managing brook trout and to manage the fishing on a practical scale in a lake on a state park, adapted to accurate creel census, stocking and population control.

Fahnestock Park, Putnam County; began 1941, indefinite; $500; C. W. Greene, Leader; reports available.

Address inquiries to: C. W. Greene, as in No. 14 above.

16. Lake Champlain Ice Fishing Census.

The project involves creel census sampling by game protectors, aeroplane counts of anglers and analysis of catch data to obtain factual information as a basis for management.

State of Vermont cooperating; Lake Champlain; began December 1950, planned for 8 years; $1,000; R. G. Zilliox, Leader; reports available.

Address inquiries to: R. G. Zilliox, Senior Aquatic Biologist, Conservation Department, Ray Brook, N. Y.

17. Restoration of Trout Fishing in a Chain of Connected Waters. (FA: F-5-R)

A chain of lakes, ponds, and streams located at headwaters of West Branch St. Regis River comprises the project area for developing methods of destroying

populations of yellow perch and other species undesirable for trout management. By use of barrier dams the area is subdivided so as to be handled by rotenone treatment over a 3-year period. Effects are being evaluated.

Franklin County; began April 1952, to close March 1956; $11,253; R. G. Zilliox, Leader.

Address inquiries to: R. G. Zilliox, as in No. 16 above.

18. Adirondack Trout Restoration Project.

This is a combination of research and management work to develop methods for reclaiming Adirondack trout ponds and lakes for trout production. Checks of efficiency of destruction of undesirable fish following rotenone treatment are made, also creel census of trout fishing in several waters following trout stocking.

Northern New York; began 1950, indefinite; $17,000; R. G. Zilliox, Leader; reports available.

Address inquiries to: R. G. Zilliox, as in No. 16 above.

19. Control of Light Intensity to Induce Early Egg Production in Hatchery Trout.

The light cycle is controlled through equipment to light breeder ponds to lengthen the day and equipment to darken the ponds and thus shorten the day. By experimentation in operation of this equipment brown and brook trout have been made to produce eggs much earlier than usual.

Randolph and De Bruce fish hatcheries; began 1950, indefinite; $100; O. R. Kingsbury, Leader; reports available.

Address inquiries to: O. R. Kingsbury, Supervisor of Fish Distribution, Bureau of Fish, Conservation Department, Albany, N. Y.

20. St. Lawrence River and Lake Ontario Smallmouth Bass Investigation.

The purpose of this investigation is to obtain facts basic to management of the important bass resource of the large area of eastern Lake Ontario and upper St. Lawrence, following up through tagging and migration studies previous work which indicated localized nature of bass populations.

Lake Ontario and St. Lawrence River; began 1941, indefinite; $1,000; D. G. Pasko, Leader; reports available.

Address inquiries to: D. G. Pasko, Senior Aquatic Biologist, Conservation Department, 95 Public Square, Watertown, N. Y.

21. Management of Game Fish and Bait Minnows in Farm Ponds. (FA: F-4-R)

This project, handled through Cornell University (contract basis), is designed to test and improve management methods in trout ponds, ponds stocked with warm-water game fish, and bait minnow ponds. Work on trout ponds includes evaluations of experimental stocking rates, determinations of angling yield and natural mortality, and investigations of the relative longevity of various trout hybrids and late-maturing strains of trout. Research on warm-water ponds is concerned with evaluations of various stocking ratios of largemouth bass and bluegill sunfish, of ponds stocked with bass and bluegills plus yellow perch or chain pickerel, and of ponds stocked with channel catfish alone. Objectives of the minnow pond investigations are to determine the production, growth, and optimum stocking rates for golden shiners, fathead minnows, common suckers, and silvery minnows in New York, and to investigate the feasibility of planting green and eyed sucker eggs in farm ponds.

Cornell University cooperating; Central New York State; began April 1952, to close March 1955; $18,841; Alfred W. Eipper, Leader; reports available.

Address inquiries to: Dr. Alfred W. Eipper, Department of Conservation Fernow Hall, Cornell University, Ithaca, N. Y.

22. Statistics of the Marine Recreational Fishery of Long Island. (FA: F-8-R)

As a basis for improving conservation and utilization, the entire fishery is canvassed, including analysis of catch per unit of effort according to species of fish and type of angling. Following preliminary work of the first year, using log book and voluntary post card returns, this project is being put on a personal interview system, including survey of fishing intensity by aeroplane count.

Long Island; began April 1953, indefinite; $8,177; I. M. Alperin, Leader.

Address inquiries to: Dr. Alfred Perlmutter, Senior Aquatic Biologist (Marine), Conservation Department, 65 West Sunrise Highway, Freeport, L. I., N. Y.

23. Marine Fisheries Research (General).

In order to provide information basic to better utilization and conservation, the commercial and recreational fisheries of Long Island are being studied. This includes a statistical study of the commercial net fishery and miscellaneous studies not covered in other projects.

Long Island waters; began June 1938, continuing; $10,000; Alfred Perlmutter, Leader; reports available.

Address inquiries to: Alfred Tucker, Superintendent Marine Fisheries, Conservation Department, 65 West Sunrise Highway, Freeport, L. I., N. Y.

24. Stream Development on Public Fishing Rights Areas.

This work is for the purpose of improving trout carrying capacity and public utilization of streams on which permanent easements affording public fishing have been obtained. It includes structures such as cribbing of eroding banks, planting, marking with signs and development of car parking areas.

Statewide; began 1936, continuing; $200,000; Emerson James, Leader; reports available.

Address inquiries to: Emerson James, Supervisor of Fish Management, Port Henry, N. Y.

25. Investigations Leading to Control of Water Pollution.

Two field units are operated as bearing upon enforcement of Conservation Law and upon classification of waters by the State Water Pollution Control Board. Experimental work on toxicity to fish is carried on.

Statewide; hdqrs. Rochester and Rome; began July 1940, continuing; $20,000; G. E. Burdick, Leader; reports available.

Address inquiries to: G. E. Burdick, Senior Aquatic Biologist, Conservation Department, Albany, N. Y.

26. Acquisitions of Public Fishing Rights. (FA: in part)

This is a continuation of the program of acquiring fishing rights on better trout streams, mainly through perpetual easements and includes also acquisition of access points on lakes by land purchase.

Statewide; began 1935, continuing; $75,000; C. E. Parker, Leader.

Address inquiries to: Dr. W. M. Lawrence, Chief, Bureau of Fish, Conservation Department, Albany, N. Y.

Cornell University

1. Attempted Improvement of the Quality of the Native Brook Trout (Salvelinus fontinalis) Population in an Adirondack Stream Through Population Control.

Experimental management has been set up on Long Pond stream in the northern Adirondacks to test the practicability of improving the average size of the brook trout through reduction of competitive species. Wolf traps modified

to incorporate an upstream trap, are operated here and at the end of the stream where a barrier dam also exists. Rough fish captured are removed and trout are tagged at these points. The traps plus angling at intervening points resulted in the tagging of about 700 trout above 6 inches in length, the purpose of which is to determine relationships of trout populations residing in various sections of the stream. A series of scale samples, length and weights have been taken to establish a criterion upon which to judge progress of the work.

Franklin County; began October 1952, indefinite; $2,300; Dwight A. Webster, Leader.

Address inquiries to: Dr. Dwight A. Webster, Department of Conservation, Cornell University, Ithaca, N. Y.

2. Age Determination of Lake Trout (Salvelinus namaycush) in Cayuga Lake.

Over a period of 12 years scale samples and pertinent data have been collected on some 2618 specimens, a large proportion of which are marked fish of known age. Scales have been mounted in plastic and read independently of knowledge of size, mark, or previous assessments of age. Multiple readings on one series and age determinations on fish of known age will provide indices of scale reading consistency and accuracy in this difficult species.

Hdqrs. Ithaca; began June 1952, to close June 1954; Carl Parker, Leader.

Address inquiries to: Dwight A. Webster, as in No. 1 above.

3. Finger Lakes Investigations: Life History and Population Dynamics of the Smallmouth Bass (Micropterus dolomieui) in Cayuga Lake.

Two-fold objectives consist of long term observations on population and growth trends in relation to possible management practices; and to give students experience in techniques and angler-biologist relations under field conditions. Annual field work consists of fin-clipping hatchery fingerlings planted in lake, tagging bass taken in spawning runs in major tributaries and in creel census and tagging of bass in a concentrated fall fishery in area known as Flat Rock.

State Conservation Department cooperating; Tompkins, Cayuga, and Seneca Counties; began September 1941, indefinite; $3,660; Dwight A. Webster, Leader; reports available.

Address inquiries to: Dwight A. Webster, as in No. 1 above.

4. Finger Lakes Investigations: Contribution of Hatchery Reared Fingerling and Yearling Lake Trout (Salvelinus namaycush) to the Population of Cayuga Lake.

Principal objectives consist of evaluation of relative survival of fingerling and yearling lake trout, observations on the proportion of hatchery reared and naturally produced lake trout in the population, and the relative survival of spot-planted versus scatter-planted fingerlings.

State Conservation Department cooperating; Tompkins, Cayuga, Seneca Counties; began August 1946, indefinite; $3,120; Dwight A. Webster, Leader.

Address inquiries to: Dwight A. Webster, as in No. 1 above.

5. Finger Lakes Investigations: Attempts to Establish Rainbow Trout (Salmo gairdneri) in Cayuga Lake.

For reasons unknown, rainbow trout have never become established in Cayuga Lake, despite hatchery plantings and sizeable self-sustaining populations in the other Finger Lakes of Central New York. Annual plantings of 10,000 yearling and 1,000 year-and-a-half old rainbow trout, all fin-clipped, have been made from spring 1947 to spring 1953 without notable success, as evidenced by gill netting or opening day creel census on the major tributaries. As all plantings to date have been of domesticated stock (Wytheville, West Virginia), eggs

from Finger Lakes (Keuka) parents were obtained and hatchery-reared yearlings planted concurrently with domestic fish in 1952 and 1953.

State Conservation Department and the U. S. Fish and Wildlife Service cooperating; Tompkins, Cayuga, and Seneca Counties; began March 1946, indefinite; $1,520; Dwight A. Webster, Leader.

Address inquiries to: Dwight A. Webster, as in No. 1 above.

6. Management of Landlocked Salmon (Salmo salar sebago) in Little Moose Lake.

A planting of 2,000 yearling landlocked salmon was made in June 1953 and sampling in the fall of the same year indicated good survival and growth. Experiments are underway to determine the practicability of greater utilization of the outlet as a natural rearing area. Fish traps installed at the lake and at a barrier dam 1¼ miles below permit capture of young salmon moving up or downstream. Plans consist of periodic reduction of competitor and predator species (brook trout) in this area, accompanied by fry or eyed egg plantings.

Adirondack League Club cooperating; Herkimer County; began April 1951, indefinite; $1,500; Dwight A. Webster, Leader.

Address inquiries to: Dwight A. Webster, as in No. 1 above.

7. Population Dynamics in the Whitefish (Coregonus clupeaformis) and Frostfish (Prospopium quadrilaterale) in Little Moose Lake, New York: Attempted Management to Provide Increased Forage Fish for Landlocked Salmon (Salmo salar sebago).

The management plan consists of netting of whitefish and frostfish in an effort to increase the production of young fish. Statistics on growth, age composition, mortality rates and estimated population are taken as an aid in assessing success of program.

Adirondack League Club cooperating; Herkimer County; began October 1952, indefinite; $1,000; Paul C. Neth, Leader.

Address inquiries to: Dwight A. Webster, as in No. 1 above.

8. Racial Analysis and Structure of Atlantic Coast Striped Bass.

Objectives of the project are to continue the analysis on racial investigations of the striped bass, Roccus saxatilis (Walbaum). Findings of the past indicate the Hudson River stock is separable from Chesapeake-Delaware stock.

The Sport Fishing Institute, U. S. Fish and Wildlife Service, several State Fish and Game Departments, and Fishery Research Stations cooperating; hdqrs. Ithaca, and in field, Hudson River, N. Y. to Albemarle Sound, N. C.; began September 1952, to close March 31, 1957; $1,600; Edward C. Raney, Leader; reports available.

Address inquiries to: Dr. Edward C. Raney, Fernow Hall, Cornell University, Ithaca, N. Y.

U. S. Fish and Wildlife Service, Branch of Fishery Biology

1. Vitamin Requirements of Trout.

The objective is to determine the vitamin requirements of trout and the symptoms of deficiencies by means of vitamin test diets and microbiological assays.

Hdqrs. Cortland; began 1940, continuing.

Address inquiries to: Arthur M. Phillips, Jr., Chief, Fish Nutrition Laboratory, Cortland, N. Y.

2. Development of Practical Diets for Trout.

The objective is to determine the value of various dietary mixtures in terms of growth, cost of production and mortality of the fish.

Hdqrs. Cortland; began 1935, continuing.
Address inquiries to: Arthur M. Phillips, Jr., as in No. 1 above.

3. Effect of Diet Upon the Chemical Composition of the Trout Body.
The objective is to determine the effect of the diet upon the fat, protein, and ash content of the trout body so that optimum levels for the major food groups (fat, protein and carbohydrate) may be tentatively established.
Hdqrs. Cortland; began 1935, continuing.
Address inquiries to: Arthur M. Phillips, Jr., as in No. 1 above.

4. Use of Radio-active Isotopes in Trout Nutrition Studies.
The objective is to study the absorption, utilization, and retention of dissolved minerals and their role in trout nutrition and physiology.
Hdqrs. Cortland; began July 1951, continuing; Floyd E. Lovelace, Leader.
Address inquiries to: Arthur M. Phillips, Jr., as in No. 1 above.

5. Effect of Metabolic Products Upon the Carrying Capacity of Ponds and Troughs.
The objective is to study the products of metabolism that limit the numbers and weight of fish that may be held in hatchery equipment and to develop methods for their control.
Hdqrs. Cortland; began 1950, continuing; Donald R. Brockway, Leader.
Address inquiries to: Arthur M. Phillips, Jr., as in No. 1 above.

NORTH CAROLINA

Wildlife Resources Commission

1. Fishing Access Area.
It is the aim of this project to make available to the fishing public of the State those waters which provide good sport fishing, but are unavailable because of limitations of private property or physical terrain. Small tracts of land are purchased or taken under long-term lease. These areas are developed as parking sites for cars, boat trailers and boat launching points.
Statewide; began July 1952, indefinite; $51,000; Buford Tatum, Leader.
Address inquiries to: J. H. Cornell, Chief, Fish Division, North Carolina Wildlife Resources Commission, Box 2919, Raleigh, N. C.

2. Fish Management Investigations of Coastal Streams. (FA: F-2-R)
The basic objective continues to be the discovery of the corrective measures necessary to increase the abundance of game fish in the coastal streams of North Carolina. This includes continued checks of the game fish and non-game fish populations in representative streams, the resolving of the factor limiting game fish production, and the testing of types of fishing gear designed to remove unwanted fish species with a minimum of harm to the desired game fish. Tagging, age and growth studies, and angling success will be used as indices in the test areas.
Little River and Brice's Creek; began July 1, 1951, to close December 1, 1954; $23,000; A. W. Dickson, Leader; reports available.
Address inquiries to: D. F. Raver, Jr., North Carolina Wildlife Resources Commission, Box 2919, Raleigh, N. C.

3. Fish Management Investigations of Farm Ponds. (FA: F-3-R)
Data are being secured which will lead to the more efficient management of farm ponds by determining the most successful stocking ratios and species combinations for North Carolina, obtaining general information on farm pond

failures and reasons they failed, and by following the results of various stocking procedures, angling success and harvest from experimental ponds. Experimental farm ponds are being chosen over the entire State, cleaned of existing fish, and stocked according to experimental plans.

Statewide; began December 1, 1951, to close July 1, 1955; $13,400; W. E. Ellis, Leader; reports available.

Address inquiries to: D. F. Raver, Jr., as in No. 2 above.

4. Land Use Practices in Relation to Trout Streams. (FA: F-4-R in part)

The effects of various land use practices on trout streams, with particular emphasis on bottom fauna, water temperature, stream flow, turbidity, trout populations, food habits, and stream fertility are under investigation. The project is using several study areas developed by the U. S. Forest Service Experiment Station on the Coweeta Area. These areas have different land use practices being carried out on them, such as timber cutting, farming, grazing, etc. Sampling stations have been set up on each of these streams which measure water temperature and flow, and from which bottom samples are collected regularly.

U. S. Forest Service cooperating; Coweeta Hydrologic Laboratory, Standing Indian Wildlife Management Area; began July 1, 1952, to close July 1, 1956; $6,000; L. B. Tebo, Jr., Leader; reports available.

Address inquiries to: D. F. Raver, Jr., as in No. 2 above.

5. Fish Management Investigation on Trout Streams. (FA: F-4-R in part)

This section of the project is designed to obtain data on public trout streams and their carrying capacities, present populations, annual yields, angling pressures, and catch per unit effort. Streams on closely supervised management areas are stocked, in part, with marked trout at predetermined times during the trout fishing season. Each trout caught from these management area streams is brought through the respective checking station. In this way numbers, species, weights, and marked fish are carefully recorded. Each fisherman records time fished and stream fished as well as numbers and species caught.

Western North Carolina; began July 1, 1952, continuing; $13,000; H. M. Ratledge, Leader; reports available.

Address inquiries to: D. F. Raver, Jr., as in No. 2 above.

Duke University

1. Relationship of Oxygen Consumption of Tissues of Marine Fishes to Their Activity and Habitat.

Fishes occupy many different habitats and exhibit varying degrees of activity. A basic question arises as to how these organisms are physiologically and morphologically adapted to fit their way of life. The present physiological investigation concerns relationship of the oxygen consumption of fish tissues to their activity and habitat.

Duke Marine Laboratory, Beaufort; began June 1952; $300; F. John Vernberg, Leader; reports available.

Address inquiries to: Dr. F. John Vernberg, Department of Zoology, Duke University, Durham, N. C.

2. Correlation Between Gill Area, Habitat, and Activity in Marine Fishes.

Marine fish species are being studied to determine the correlation between gill area, habitat, and activity of the fishes.

Duke University Marine Laboratory, Beaufort; began 1946, to close 1954; I. E. Gray, Leader; reports available.

Address inquiries to: I. E. Gray, Zoology Department, Duke University, Durham, N. C.

U. S. Fish and Wildlife Service, Branch of Fishery Biology

1. Trout Stream Ecology.
(See under Tennessee)

NORTH DAKOTA

Game and Fish Department

1. Statewide Fisheries Investigations. (FA: F-2-R)

Objectives of the project are to map the water areas of the State and to conduct biological, chemical and physical inventories as a basis for management of the waters. Particular attention is given the status of fish populations which reveal what waters are in need of renovation. Post-impoundment and post-poisoning checks are made to determine the status of newly developing fish populations.

Statewide; began April 17, 1952, to close June 30, 1954; $29,486; John G. Hewston and Leon J. Corning, Leaders; reports available.

Address inquiries to: Dale Henegar, North Dakota Game and Fish Department, Bismarck, N. D.

2. Garrison and Snake Creek Fisheries Investigations. (FA: F-3-R)

The project objective is to gather all information possible concerning the fisheries populations in the two reservoirs along with other information that will be of great value in setting up management proposals.

North Central North Dakota; began June 22, 1953; to close June 30, 1954; $12,000; Louis Carufel, Leader; reports available.

Address inquiries to: Dale Henegar, as in No. 1 above.

3. Strawberry Lake Development. (FA: F-4-D)*

The project entails the construction of a new spillway at the outlet of Strawberry Lake so as to maintain water in the impoundment at a sufficient depth to sustain fish life.

began July 1953, to close June 1954; $10,250; J. J. Walsh, Leader.

Address inquiries to: Dale Henegar, as in No. 1 above.

OHIO

Department of Natural Resources

1. Aquatic Vegetation Control.

Mechanical combination cutters and rakes or chemicals provide fishing channels which are used to create openings for new fishing areas, maintain bank fishing, etc. During 1953, a new jet propelled machine and boat with automatic lift was developed that may change present operations.

Statewide; began 1929, continuing; Clarence F. Clark, Daniel C. Armbruster, Mark O. White, Ray Riethmiller, John D. Walker, Leaders; reports available.

Address inquiries to: E. L. Wickliff, Division of Wildlife, 1500 Dublin Road, Columbus 12, Ohio.

2. Test Netting, Shore Seining, Creel Census, and Nesting Observations.
Yearly inventories of lakes and streams are being conducted to obtain comparable data on fish populations.
Statewide; began 1929, continuing; Robert Cummins, Clarence F. Clark, Daniel C. Armbruster, Mark O. White, Ray Riethmiller, John D. Walker, Leaders; reports available.
Address inquiries to: E. L. Wickliff, as in No. 1 above.

3. Culture of Northern Pike.
This project in experimental propagation is being conducted at the St. Marys Fish Farm. Experimental stocking is underway in two districts.
St. Marys Fish Farm; began 1951, continuing; Clarence F. Clark, Leader; reports available.
Address inquiries to: E. L. Wickliff, as in No. 1 above.

4. Walleye Culture.
The program includes hatchery propagation and experimental stocking in lakes which appear to have a potential for this species.
Put-in-Bay and St. Marys Fish Farm; continuing; Robert Cummins and Clarence F. Clark, Leaders; reports available.
Address inquiries to: E. L. Wickliff, as in No. 1 above.

5. Redear Sunfish Culture.
Experimental fish hatchery propagation and stocking is being conducted in the waters of three districts.
Kincaid, St. Marys, and Akron Fish Farms; continuing; Ray Riethmiller, Clarence F. Clark, Daniel C. Armbruster, Leaders; reports available.
Address inquiries to: E. L. Wickliff, as in No. 1 above.

6. Muskellunge Culture.
Efforts are underway to find out how to efficiently propagate and rear "muskies" for stocking in suitable waters and as a game and predator species. The work includes the Ohio muskellunge and the Great Lakes muskellunge.
Kincaid and St. Marys Fish Farms; continuing; Clarence F. Clark and Ray Riethmiller, Leaders; reports available.
Address inquiries to: E. L. Wickliff, as in No. 1 above.

7. New Fishing Lakes.
Three new lakes, including Oxbow, Forked Run and Rocky Fork, were opened to public fishing during 1953. Knox and Veto lakes will be opened to public fishing in 1954.
Oxbow Lake in Defiance County; Forked Run Lake, Meigs County; Rocky Fork Lake, Highland County; Knox Lake, Knox County; Veto Lake, Washington County; began 1930, continuing; Clarence F. Clark, Mark O. White, Ray Riethmiller, Leaders; reports available.
Address inquiries to: E. L. Wickliff, as in No. 1 above.

8. Facilities for Fishermen at Knox and Hocking Lakes. (FA: F-3-D)
These two Division of Wildlife lakes are under construction and provision is made for permanent facilities, consisting of three parking areas, two wells, and two toilets at each lake.
Knox and Hocking Counties; began 1953, to close 1954; Ray Riethmiller and Mark O. White, Leaders.
Address inquiries to: E. L. Wickliff, as in No. 1 above.

9. Improving Facilities at State-owned and Controlled Lakes.

The project provides for the construction and maintenance of access roads, parking areas, wells, toilets, boat ramps, deep shoreline channels, posters, and fishing piers. Lowering of the lakes, drainage, or restocking is carried out as required. Several projects include marking logs, stumps, and snags to make them more useful to the angler.

Statewide; continuing; Robert Cummins, Clarence F. Clark, Daniel C. Armbruster, Mark O. White, Ray Riethmiller, John D. Walker, Leaders; reports available.

Address inquiries to: E. L. Wickliff, as in No. 1 above.

10. Effects of Land Use Improvement on Stream Fisheries. (FA: F-1-R)

This project, located in southwestern Ohio, is set up to study and apply the best known techniques for land use in the Little Miami River drainage area. The objective being to basically tie down the soil and try to control stream flow, thereby affording more fishing days and increasing the range for desirable stream species.

Little Miami River in Clark and Greene Counties; began May 1, 1952, continuing; Paul V. Shafer, Leader; reports available.

Address inquiries to: E. L. Wickliff, as in No. 1 above.

11. Raccoon Creek Development.

Effort is being made to clear up the Raccoon Creek system of the acid wastes from coal mines which is the factor limiting fish production. This stream has a drainage area of 684 square miles.

Raccoon Creek in southeastern Ohio; began 1952, indefinite; Vernon W. Cole, Leader; reports available.

Address inquiries to: E. L. Wickliff, as in No. 1 above.

12. Lake St. Marys Rough Fish Removal. (FA: F-2-R)

The objective of the project is to determine the effect of removal of rough fish on game species in this 11,000-acre lake. The fish are removed mainly by seines.

Lake St. Marys in Auglaize and Mercer Counties; began 1953, continuing; William M. Zarbock, Leader.

Address inquiries to: E. L. Wickliff, as in No. 1 above.

13. Mapping State-owned and State Controlled Fishing Lakes.

Mapping of State lakes is under way. Maps are 15" long and 10" wide, and show contours, facilities for fishermen, location, fish populations of interest to anglers, methods of fishing and best fishing sites, stocking, fish management activities, recreational facilities, descriptive history and ownership of lake. At present a depth sounder is used for locating contours.

Statewide; began 1952, continuing; Robert Cummins, Clarence F. Clark, Daniel C. Armbruster Mark O. White, Ray Riethmiller, John D. Walker, Leaders; maps are available.

Address inquiries to: E. L. Wickliff, as in No. 1 above.

14. Lake Erie Fish Tagging and Size of Mesh for Trap Nets.

Hook and line commercial species of fish are tagged to ascertain where fish caught in Ohio come from and where they go. Experimental trap nets of different sizes of mesh are operated to determine the sizes of mesh for different parts of the net that are required to retain fish of legal length or weight.

Western end of Lake Erie; began 1953, continuing; Robert Cummins, Leader; reports available.

Address inquiries to: E. L. Wickliff, as in No. 1 above.

15. Sandusky Bay Fishery Project.

This project is set up to obtain basic data on crops of fish in Sandusky Bay and how these crops should be harvested. Anglers' data, test netting, tagging to show movements, age and growth determinations, and commercial fish catch reports are all utilized in the program.

Sandusky Bay and Lake Erie; began 1953, continuing; Robert Cummins, Leader; reports available.

Address inquiries to: E. L. Wickliff, as in No. 1 above.

16. Fish Production in Small Impoundments.

Twelve one-acre ponds, including check ponds, are set aside and stocked with different numbers and sizes of largemouth bass and bluegills. Studies are underway to obtain data on management of small impoundments, including farm ponds.

U. S. Fish and Wildlife Service cooperating; Federal Fish Farm, Hebron; began 1953, continuing; Ray Riethmiller, Leader; reports available.

Address inquiries to: E. L. Wickliff, as in No. 1 above.

State University

1. Preparation of an Illustrated Key to Ohio Fishes.

This is a long-term project with the background of collecting fishes in all parts of Ohio over a period of 27 years. The key will contain structural drawings of each species of fish collected in Ohio with a map to show its distribution. The key proper will consist of text, using the usual system of dichotomus characters.

Hdqrs. Put-in-Bay; began May 1939, to close July 1954; $70,000; M. B. Trautman, Leader; reports available when published.

Address inquiries to: Dr. Thomas H. Langlois, Franz Theodore Stone Institute of Hydrobiology, Put-in-Bay, Ohio.

2. The Phytoplankton of the Western End of Lake Erie.

This project has been carried on to record changes in the character and abundance of phytoplankton in western Lake Erie and to relate such changes with variations in the lake as an environment. Particular attention is paid to light penetration, turbidity, and currents in the area.

Hdqrs. Put-in-Bay; began June 1938, continuing; $10,000; Jacob Verduin, Leader; reports available.

Address inquiries to: Dr. Thomas H. Langlois, as in No. 1 above.

3. Fisheries Bay of South Bass Island as an Ecological Unit in Western Lake Erie.

More information is needed on the use of shallow water areas by all organisms in western Lake Erie. This study is of a shallow water area and will attempt to establish its use by organisms and its relationship to the greater water mass.

Hdqrs. Put-in-Bay; began September 1953, to close June 1955; $4,000; David H. Stansbery, Leader; reports available.

Address inquiries to: Dr. Thomas H. Langlois, as in No. 1 above.

4. Life History and Ecology of the Silver Chub and Troutperch in Lake Erie.

The silver chub and troutperch occur in considerable numbers in the deep water area of the western and central basins of Lake Erie. Their role as forage fish species remains to be determined, and this study is directed toward establishing the relationships of the species to their environment, including predators.

Hdqrs. Put-in-Bay; began June 1948, to close June 1954; $5,000; E. C. Kinney, Leader; reports available.

Address inquiries to: Dr. Thomas H. Langlois, as in No. 1 above.

5. The Life History and Ecology of Gizzard Shad in Lake Erie.

The gizzard shad is near the northern limits of its distribution in Lake Erie, and it finds marginal conditions for existence. Its numbers fluctuate from very low to very great with regulation by some factors of the environment. The gizzard shad is an important food item for most of the fish-eating fishes, so its variations of abundance affect the entire economy of the lake.

Hdqrs. Put-in-Bay; began June 1952; to close June 1955; $6,000; Anthony Bodola, Leader; reports available.

Address inquiries to: Dr. Thomas H. Langlois, as in No. 1 above.

Denison University

1. The Effects of Artificial Feeding.

The objective of the project is to determine the relative growth of bluegills in a natural pond, in a fertilized pond and in a pond where natural fish food was supplemented with soybean meal and ground carp.

State Department of Natural Resources, cooperating; Kincaid Fish Hatchery, Latham; began May 1951, to close August 1954; Dr. George D. Morgan, Leader.

Address inquiries to: Dr. George D. Morgan, Burg Street, Granville, Ohio.

2. The Life History of the White Crappie of Buckeye Lake.

The project objective is to learn as much as possible of the complete picture of the life of the white crappie from fertilization of the egg until death. It includes the description of the species, distribution, school movements, associations, reproduction, attainment of sexual maturity, spawning and nesting habits, egg production, embryonic, larval and post larval development, growth and weight relationships, formation of annuli, the plumpness or K values, food habits and parasites and diseases.

State Department of Natural Resources cooperating; Buckeye Lake; began June 1949, to close January 1954; George D. Morgan, Leader.

Address inquiries to: George D. Morgan, as in No. 1 above.

U. S. Fish and Wildlife Service, Branch of Game-fish and Hatcheries

1. Farm Pond Studies.

Fifteen ponds at U. S. Fish Cultural Station, Hebron, Ohio, and 54 additional ponds under private control in surrounding counties are being utilized and studied. Six types of test-stocking involving bass and bluegills are now in progress. Futur combinations will involve redear sunfish and bass, and golden shiners with bass. Pond food organisms and general plankton conditions are also studied.

Ohio Department of Conservation and Denison University cooperating; U. S. Fish Cultural Station, Hebron; began July 1953, continuing; Paul Handwerk, Leade

Address inquiries to: Paul Handwerk, U. S. Fish and Wildlife Service, Hebron, Ohio.

U. S. Public Health Service

1. Determination of the Toxicity of Industrial Wastes to Fishes.

The objectives of this program are as follows: to critically evaluate the literature on the toxicity of industrial wastes to fishes; to summarize present knowledge; to develop bioassay methods; to determine the toxicity of substances

or combinations of substances to fishes under a variety of conditions; and to develop procedures for the use of bioassays in the safe disposal of toxic wastes.

Studies are being conducted to determine the toxicity of the more uncommon metals as beryllium, titanium, uranium, etc., and certain of the organic insecticides. Studies are to be initiated on the oxygen requirements of selected aquatic organisms.

Sanitary Engineering Center, Cincinnati; began January 1949, continuing; $23,000; C. M. Tarzwell, Leader; reports available.

Address inquiries to: Dr Clarence M. Tarzwell, Chief, Biology Section, Sanitary Engineering Center, 4676 Columbia Parkway, Cincinnati, Ohio.

OKLAHOMA

Game and Fish Department

1. Farm Pond Investigations. (FA: F-1-R)

The objectives of this project are to determine the most suitable combinations and numbers of fish species for different types of farm ponds. In the beginning 30 ponds were selected and all fishes were removed by draining or use of chemicals. Each pond was then stocked with the combinations of species on which information is desired. Project activities include taking of bottom samples, water temperature, and fish samples for age and growth studies.

Atoka County; began April 1952, to close March 1955; $25,000; C. M. Kramer, Leader; reports available.

Address inquiries to: Game and Fish Department, Capitol Building, Oklahoma City 5, Okla.

2. Tenkiller and Fort Gibson Reservoirs Fisheries Investigations. (FA: F-4-R)

The objective of the project is to determine post-impoundment fish population trends in new impoundments, Tenkiller and Fort Gibson Reservoirs. A full time biologist is employed at each lake to sample fish populations, determine anglers take, note fishing trends, determine rate of growth of both food and game fish; study fish population densities, ratios and survival of the year classes.

Tenkiller and Fort Gibson Reservoirs; began September 1953, to close September 1956; $45,000; H. D. Crawley and H. M. Hancock, Leaders.

Address inquiries to: Game and Fish Department, as in No. 1 above.

3. Study of the Streams in the Ouachita National Forest.

The project objectives are to determine the fish populations present in the streams and to outline a program for stream management to increase angling returns in the forest. Upon completion of this preliminary survey the management program will be inaugurated.

Ouachita National Forest; began January 1954, to close December 1954; $10,000; H. A. McCoy, Leader.

Address inquiries to: Game and Fish Department, as in No. 1 above.

4. Municipal Lakes Improvement Program.

The object of this project is to improve sport fishing in water supply reservoirs that have long since ceased to afford good fishing. Since draining or complete poisoning were out of the question, partial poisoning (the State Department of Health cooperating) of the fish populations was attempted. During the summer of 1953, twenty-odd city reservoirs were treated by a special crew. The work will continue each year.

Statewide; began June 1953, continuing; $20,000; H. A. McCoy, Leader.
Address inquiries to: Game and Fish Department, as in No. 1 above.

5. Pollution Abatement Aid.

This project was set up to aid the pollution officers of the department in curtailing and solving industrial pollution problems. A limnologist is retained full time during the summer months and part time during the rest of the year. Most of the pollution problems are studied by the bio-assay method.

Began June 1953, continuing; $5,000; H. P. Clemens, Leader.
Address inquiries to: Game and Fish Department, as in No. 1 above.

University of Oklahoma

1. The Importance of Gars (Genus Lepisosteus) as Predators of Fishes in Lake Texoma.

Objectives of the project are to study the movements of gars, by direct observation, and seining and gillnetting, and their food habits by analysis of stomach contents. Particular attention is given to their role as a predator of game fishes.

Lake Texoma; began June 1953; to close September 1955; Carl D. Riggs, Leader.

Address inquiries to: Dr. Carl D. Riggs, Director, Biological Survey, University of Oklahoma, Norman, Oklahoma.

2. Studies on the Life History of the Gizzard Shad, Dorosoma cepedianum.

To study the life history of the gizzard shad in two impoundments--Shafer Lake, Indiana, and Lake Texoma, Oklahoma; and to learn as much as possible about such phases as: food and feeding, age and growth, movements, spawning, mortality and causes, etc.

Shafer Lake, Indiana, and Lake Texoma, Oklahoma; began June 1945, to close September 1956; Carl D. Riggs, Leader.

Address inquiries to: Carl D. Riggs, as in No. 1 above.

3. Ecology and Distribution of the Fishes of the Buncombe Creek Area of Lake Texoma.

The objective of the project is to study the distribution, movements, seasonal fluctuations of abundance, etc., as revealed by regular periodic collections of fishes in the Buncombe Creek area of Lake Texoma.

Lake Texoma; began June 1953, to close June 1956; Virgil Dowell, Leader.
Address inquiries to: Carl D. Riggs, as in No. 1 above.

4. Age and Growth of the Big Mouth Buffalo, Ictiobus cyprinella, and the Smallmouth Buffallo, Ictiobus bubalus, in Lake Texoma.

Objective of the project is to collect, by seine, gill net, fyke net, electric shocker, and limited rotenone application, a sufficient number of I. cyprinella and I. bubalus to calculate growth, estimate age attained, sex difference in weight and length, etc.

Lake Texoma; began February 1954, to close June 1955; Ronald E. Elkin, Leader.

Address inquiries to: Carl D. Riggs, as in No. 1 above.

5. A Satisfactory Method for Determining Age and Calculating Growth of Gars (Lepisosteus).

The project objectives are to examine several different bony structures of the gars (Lepisosteus), and to find valid annuli or year marks by which age can be accurately determined and growth can be calculated.

Lake Texoma; began June 1952, to close January 1955; Harry Bishop, Leader.
Address inquiries to: Carl D. Riggs, as in No. 1 above.

6. Age and Growth of the River Carpsucker, Carpiodes carpio, in Lake Texoma.
Objective of the project is to determine the age and calculate growth of the river carpsucker. Seine collections were made at widely separated stations on the lake to determine whether there are growth differences at the different stations.
Lake Texoma; began June 1949, to close June 1954; J. Carl Bass, Leader.
Address inquiries to: Carl D. Riggs, as in No. 1 above.

7. A Histological Study of the Development of the Gut of the White Bass, Morone chrysops.
Objective of the project is to study the changes that occur in the gut of the white bass, a carnivorous fish, from early life to old age.
Lake Texoma; began June 1952, to close June 1955; Mary Subleete, Leader.
Address inquiries to: Carl D. Riggs, as in No. 1 above.

8. A Study of Commercial Fishing in Lake Texoma.
objectives of the project are to study the commercial fishing of Lake Texoma, particularly from the standpoint of the species taken, relative numbers of each, and possible effects on game fish and sport fishing. Other general information such as number of fishermen, success of various types of gear, value of the fishery etc., is being collected.
Game and Fish Department and U. S. Army Corps of Engineers cooperating; Lake Texoma; began January 1952, to close August 1954; Alfred Houser, Leader.
Address inquiries to: Carl D. Riggs, as in No. 1 above.

9. Fisheries Investigation of Tenkiller Reservoir During its First Year of Impoundment.
This project is the initial post-impoundment study of the fishes, fish populations, and growth rates in this new eastern Oklahoma impoundment.
Game and Fish Department cooperating; Tenkiller Reservoir; began June 1953, to close December 1953; Gordon E. Hall, Leader; reports available.
Address inquiries to: Gordon E. Hall, Fishery Research Laboratory, Box 14, North Campus, Norman, Okla.

10. Age and Growth of White and Black Crappie in Oklahoma Waters.
Scales of over 10,000 white crappie from 130 bodies of water and 2,400 black crappie from 83 bodies of water are being studied. Analysis is to establish average rates of growth under various environmental conditions in Oklahoma and to create standards for use in comparing crappie growth in future population analyses and management recommendations.
Game and Fish Department cooperating; statewide; began September 1953, to close April 1954; reports available.
Address inquiries to: Gordon E. Hall, as in No. 9 above.

11. Pre-impoundment Survey of the Fishes of the Little River System in Central Oklahoma.
A survey of the fishes, qualitative and quantitative, in this stream and its tributaries through 5 counties in central Oklahoma will be made. A 6,000-acre impoundment has been proposed but not yet approved on this stream about 20 miles downstream from its source in Cleveland County, Oklahoma.

Game and Fish Department cooperating; Little River System in central Oklahoma; began spring 1953; indefinite; Carl D. Riggs and Gordon E. Hall, Leaders.

Address inquiries to: Gordon E. Hall, as in No. 9 above.

12. Age and Growth of Spotted Bass, White Bass, and Bluegill in Oklahoma.

Objective of the project is to establish average rates of growth for these species as an aid in comparing environmental conditions of various waters.

Game and Fish Department cooperating; statewide; began January 1954, to close December 1954; Robert Jenkins, Leader.

Address inquiries to: Robert Jenkins, Oklahoma Fishery Research Laboratory, Box 14, North Campus, Norman, Okla.

13. Growth Histories of the Principal Fishes in Grand Lake (O'The Cherokees), Oklahoma, Through Thirteen Years of Impoundment.

The objective is to establish the history of growth fluctuations of the major species in the oldest of the big impoundments in the State. Growth data based on 6,570 scale and spine samples, taken by gill nets, seines, hoop nets, and rotenone over a 5-year period are being analyzed.

Game and Fish Department cooperating; began June 1948, to close December 1953; Robert Jenkins, Leader; reports available.

Address inquiries to: Robert Jenkins, as in No. 12 above.

14. Quantitative Estimate of the Fish Population of Four Lakes Which Were Partially Rotenoned in 1953.

Methods will include trapping, seining, netting and marking by fin-clipping during a 3-week period at each lake. At conclusion, a small rotenone sample will also be taken.

Game and Fish Department cooperating; Ardmore City Lake, Stringtown Lake, Pawhuska Lake, and Fort Supply Reservoir; to close November 1954.

Address inquiries to: Robert Jenkins, as in No. 12 above.

15. Limnological Study of Spavinaw Creek Between Upper and Lower Spavinaw Lakes.

Current emphasis is on the qunatitative estimate of the bottom fauna of a clear Ozark stream.

Game and Fish Department cooperating; Delaware County; began September 1952, to close September 1954; Phillip Summers, Leader.

Address inquiries to: Phillip Summers, Southeast District Office, Oklahoma Game and Fish Department, McAlester, Okla.

16. A Biological Fishery Survey of Upper and Lower Spavinaw Lakes.

The project is a biological inventory to obtain basic information for a management program.

Game and Fish Department cooperating; began January 1954, to close January 1956; Sam. W. Jackson, Leader.

Address inquiries to: Sam W. Jackson, Oklahoma Fisheries Research Laboratory, Box 14, North Campus, Norman, Okla.

State Game Commission

1. Public Access to Fishing Areas.

The project objective is to establish through acquisition or agreement and development the perpetual right and means of public access to fishing areas.

Statewide; began January 1953, to close December 1953; $4,680.

Address inquiries to: A. V. Meyers, Oregon State Game Commission, 1634 Southwest Alder, P. O. Box 4136, Portland, Oreg.

2. Deschutes River Public Fishing Area. (FA: F-5-L)

Objectives of the project are to provide through acquisition and development, public access to 21 miles of inaccessible, highly productive, trout, salmon, and steelhead stream.

Sherman County; began June 1953, to close June 1955; $5,250.

Address inquiries to: A. V. Meyers, as in No. 1 above.

3. Diamond Lake Fishery Rehabilitation. (FA: F-4-D)

The 3,000-acre Diamond Lake, an excellent rainbow trout habitat, has become so heavily infested with Klamath Lake roach that trout reproduction is practically nil. It is planned to remove the trash fish with rotenone and restock with trout. Legislation and fishing regulations have been firmed up as an attempt to prevent reinfestation.

Douglas County; began June 1953, to close June 1955; Total cost - $126,786; John Dimick, Leader.

Address inquiries to: A. V. Meyers, as in No. 1 above.

Fish Commission

1. Coastal Salmon Studies.

A stream inventory and watershed improvement program is being carried out. Studies of the intensity of the various coastal salmon fisheries are continuing. The relationship between the number of spawning salmon and the resulting progeny is being determined. A study of the natural food supply available to silver salmon throughout the year is being made.

Coastal Streams; continuing; Kenneth A. Henry, Leader; reports available.

Address inquiries to: Kenneth A. Henry, Oregon Fish Commission, Box 226, Bay City, Oreg.

2. Hatchery Biology.

A project to determine best methods of developing suitable hatchery foods, holding requirements of spring chinook salmon, and the relationship between time and size in release of hatchery fish and their survival.

Coastal Rivers and Lower Columbia River tributaries; continuing; Thomas B. McKee, Leader; reports available.

Address inquiries to: Thomas B. McKee, Oregon Fish Commission, Route 1, Box 263B, Sandy, Oreg.

3. Problems of Fishway Passage at Dams.

Two studies are being carried out through contracts with the U. S. Army, Corps of Engineers, and are a part of the Corps of Engineers' research program on problems of fish passage at dams in the Columbia River. One of the current projects is concerned with the planning of delay and mortality studies of salmon and steelhead at Columbia River dams. The other consists of the enumeration of salmon and steelhead in various sections of the Columbia River Basin.

U. S. Corps of Engineers cooperating; Columbia River; continuing; Theodore R. Merrell, Leader; reports available.

Address inquiries to: Theodore R. Merrell, Oregon Fish Commission, Route 1, Box 31 A, Clackamas, Oreg.

4. Lower Columbia River Rehabilitation Program.

A project aimed at locating suitable sites for salmon hatcheries, surveying streams to locate obstructions and assessment of potential spawning areas above natural barriers, and assessment of results of hatchery operations and stream improvement projects.

Columbia River tributaries below McNary Dam; continuing; Chester R. Mattson, Leader; reports available.

Address inquiries to: Chester R. Mattson, Oregon Fish Commission, Route 1, Box 31 A, Clackamas, Oreg.

5. Marine Fisheries.

This is an extensive project involving both sport and commercial fish species. A study of the life histories of the English, Petrale, and Dover soles and the rose fish is being made. Migration and mortality of salmon due to fishing in the ocean is being investigated. The catch per unit of effort in the otter-trawl fishery will be determined, and the racial characteristics of the albacore will be recorded.

Offshore waters; continuing; George Y. Harry, Leader; reports available.

Address inquiries to: George Y. Harry, Oregon Fish Commission, 1236 Taylor Avenue, Astoria, Oreg.

6. Columbia River Studies.

Studies are continuing on the life histories of shad and sturgeon, the effects of fishing upon smelt, and the rate of migration and fishing pressure on Columbia River salmon. Surveys of the Willamette River sport fishery for spring chinook are conducted jointly with the Game Commission. Surveys are made of escapements to the spawning grounds and of conditions existing in the migratory paths of the salmon.

Columbia River; continuing; Robert W. Schoning, Leader; reports available.

Address inquiries to: Robert W. Schoning, Oregon Fish Commission, Route 1, Box 31 A, Clackamas, Oreg.

State College

1. Willamette River Fishes and Fish Food Organisms as Biological Indicators of Pollution.

Fishes and aquatic insects were collected at 12 stations on the Willamette River, above the confluence of Clackamas River at intervals during the low water flow periods in the summer and fall of 1951 and 1952. Only cursory sampling was employed in 1953. The main objectives were to ascertain if biological recovery could be demonstrated resulting from pollution abatement measures; and to establish reference points (locations) at which biological pollution or biological recovery could be measured in the future.

State Sanitary Authority, U. S. Public Health Service, Division of Water Pollution Control cooperating; hdqrs. Corvallis; began June 1951, to close June 1955; $1,500; R. E. Dimick and Glen Carter, Leaders; reports available.

Address inquiries to: Dr. R. E. Dimick, Department of Fish and Game Management, Oregon State College, Corvallis, Oreg.

2. Stream Pollution in the South Saniam River, Oregon, as Measured by Biological Indicators.

Fishes and aquatic insects were sampled at monthly intervals at two stations on the South Santiam River, one above Lebanon and the other below the City. Objectives were to ascertain the seasonal biological changes in a polluted river zone extending over a 12-month period and to ascertain the degrees of biological recovery resulting from abatement measures.

State Sanitary Authority, U. S. Public Health Service, Division of Water Pollution Control cooperating; hdqrs. Corvallis; began September 1952, to close October 31, 1953; $1,000; R. E. Dimick and Charles Ziebell, Leaders; reports available.

Address inquiries to: R. E. Dimick, as in No. 1 above.

3. The Pathology of Fishes Subjected to Kraft Mill Effluents.

The objectives have been to ascertain if Kraft Mill effluents and constituent parts of the effluent cause characteristic tissue damage to fishes. So far all tests have been negative, and the investigation is now directed to studying effects, if any, on blood of fishes.

National Council for Stream Improvement cooperating; hdqrs. Corvallis; began June 1, 1952, to close June 30, 1954; $1,800; Charles Warren and Robert McHugh, Leaders.

Address inquiries to: Charles Warren, Department of Fish and Game Management, Oregon State College, Corvallis, Oreg.

4. The Dissolved Oxygen Requirements of Juvenile Salmon.

Objectives are to ascertain the effects of low D. O. on juvenile salmon at particular temperature levels. The various tests are being conducted in running water aquaria in which the D. O. levels and temperatures are held constant. Young silver and chinook salmon have been employed as test animals. Most of the tests were conducted for 5-day periods and recent trials have been made for over 20 days duration.

National Council for Stream Improvement cooperating; hdqrs. State College Fisheries Laboratory, Yaquina; began June 1952, to close June 1954; $2,000; Charles Warren and Robert Davison, Leaders; reports available.

Address inquiries to: Charles Warren, as in No. 3 above.

5. The Avoidance Reactions of Juvenile Salmon to the Effluents of Pulp Mill Wastes.

The project objectives are to ascertain if juvenile salmon avoid the effluents of Kraft Mill and of sulphite mill wastes. If so, at what concentrations or dilutions does avoidance occur. Studies with Kraft Mill effluents have been concluded and investigations with sulphite mill wastes have just begun.

National Council for Stream Improvement cooperating; hdqrs. Corvallis; began June 1952, to close June 30, 1955; $1,200; Charles Warren and Ben Jones, Leaders; reports available.

Address inquiries to: Charles Warren, as in No. 3 above.

6. A Study of Delayed Mortality in Liberated Hatchery Reared Trout.

The objective of the project is to reduce the cost of fish for stocking by eliminating delayed mortality losses. Project consists of detailed physical and chemical analysis of the entire problem. Tests of equipment with a study of trout responses carried out on both an experimental and practical stream liberation program. This includes testing of tank trucks of various types and with various facilities for water aeration and agitation.

State Game Commission and U. S. Forest Service cooperating; west half of State; began April 1952, indefinite; $4,000; Arthur S. Einarsen, Leader; reports available.

Address inquiries to: Oregon Cooperative Wildlife Research Unit, 325 Snell Hall, Oregon State College, Corvallis, Oreg.

7. A Study of Clear-cut Forest Stands in Relation to Game and Game Fish.

The objective of the project is to learn the effect of logging in areas of virgin timber stands on game and game fish. The project is an observational activity on the Andrews Experimental Forest in the Blue River area of the Willamette Forest east of Eugene, Oregon. The forest is being cut under controlled conditions and the following studies are being carried out: (1) Temperature changes in stream water due to logging, and its effect on fish directly and indirectly; (2) logging effect on stream flows and sedimentation; (3) land erosion; (4) effect of road building and fires; (5) changes in vegetation; (6) terrestrial game use of the cut over land and food changes.

Based on the current plans, changes in logging practices can be invoked to improve the experimental opportunities. Since the area had a good native stock of game fishes, particularly trout, it is an ideal experimental situation and can influence the state of game fish in the heavy rain forest areas.

State Game Commission and the U. S. Forest Service cooperating; Lane County; hdqrs. Corvallis; began November 1951, continuing; $1,000; Arthur S. Einarsen, Leader; reports available.

Address inquiries to: Cooperative Wildlife Research Unit, as in No. 6 above.

State Sanitary Authority

1. The Biological Measurement of Recovery from Pollution in the Lower Willamette and Columbia Rivers.

This project is a study of the fish, bottom fauna and plankton in relation to pollution in the Lower Willamette River. The dissolved oxygen or pollution "block" to the passage of anadromous fish had been an annual occurrence in the lower reach of the Willamette River for many years during the summer low-flow periods. Now that Portland and other communities and industries in the Willamette Valley have undertaken a program of waste treatment, conditions in the River are gradually improving. For the first time in years, the dissolved oxygen was maintained throughout the most critical period in the summer of 1953. The major objective of the project is to measure the recovery and rehabilitation of the river from a biological standpoint. In the past calendar year, the field work has been expanded to include limited fish population studies. Physical and chemical results are provided by the City of Portland, Department of Public Works.

U. S. Public Health Service, City of Portland, State College, cooperating; Lower Willamette River (from above Portland to the Columbia River and in the Columbia from above Vancouver, Washington, to a point about a mile below the mouth of the Willamette River; began August 1951, indefinite; John N. Wilson, Leader; reports available.

Address inquiries to: C. M. Everts, Jr., Secretary and Chief Engineer, Oregon State Sanitary Authority, 1400 Southwest Fifth Avenue, Portland 1, Oreg.

2. Investigation of Pollution from Gold Dredging Operations on the Powder River in Northeastern Oregon.

Effect of heavy turbidity and siltation was determined by physical and chemical tests on the water, quantitative sampling of fish food organisms and fish population studies. Starting with control stations on two of the principal headwater tributaries, water analyses, stream bottom fauna collections, and fish population studies were

undertaken, the latter by means of stream shocker operated over 100-foot sections of the stream. Additional stations were located in the zone of heaviest turbidity downstream from the dredge and in a section several miles downstream where only traces of turbidity could be detected.

State Game Department and U. S. Public Health Service cooperating; Powder River from headwaters to North Powder, downstream from Baker; began September 29, 1953, to close October 1, 1953; H. M. Patterson, Leader.

Address inquiries to: C. M. Everts, Jr., as in No. 1 above.

3. Investigation of Pollution of the Klamath River.

The primary objective was to determine whether or not pollution originating in Oregon was adversely affecting the quality of the water in the Klamath River in California. Except for the very high content of substances conducive to fertility in the water as it flows into California, the results indicated little adverse effect from pollution. Occasional summer fish mortalities in the river below Klamath Falls were attributed to lowered oxygen from respiration and decay of the prolific blue-green algae blooms.

California Regional Water Pollution Control Board, U. S. Public Health Service, State Game Commission, U. S. Fish and Wildlife Service cooperating; Project covered from the outlet of Upper Klamath Lake, Klamath Falls, Oregon, to below Hornbrook, California; began August 1951, to close September 1953; Kenneth Spies - Oregon, and William Shackleton - California, Leaders; reports available.

Address inquiries to: C. M. Everts, Jr., as in No. 1 above.

U. S. Forest Service

1. Delintment Lake.

The project objective is to provide a suitable recreation area and fishing lake for people in the vicinity of Burns, Oregon. Available trout waters and recreational areas in this vicinity are limited. In 1953, through cooperation of local people and Hines Lumber Company, the dam was raised about six feet in hopes the added water depth will make winter survival of fish possible. The lake now comprises about 52 surface acres and holds about 415 acre feet of water.

State Game Commission cooperating; Harney County; began Fall 1949, to close July 1953; $4,000; H. C. Fosburg, Leader.

Address inquiries to: H. C. Fosburg, Forest Ranger, U. S. Forest Service, Burns, Oreg.

2. Kings Reservoir (Walton Lake).

The objectives of the project are to provide a dam and lake for trout fishing, boating, and swimming, and to develop a scenic lake as a background for forest recreational activities. There are no natural lakes on the Ochoco Forest. The lake when finished will cover about 15 acres and contain about 99 acre feet of water. The project is a reconstruction and enlargement of an old sluice dam built in the early 1870's by a gold miner named King. Entire project built with contributed time and funds. No State or Federal monies were used.

Prineville Izaak Walton League and State Game Commission cooperating; Crook County; began Fall 1953, to close June 1954; $5,000; L. J. Sullivan and Joe Mason, Leaders.

Address inquiries to: L. J. Sullivan, Ochoco Ranger Station, Prineville, Oreg.

3. Effect of Logging on Water Yield and Erosion in the Douglas-Fir Region.

Objectives of the project are to determine the effects of logging and construction of hauling roads in an old-growth Douglas-fir forest on water yields, water temperatures, and sedimentation. Stream gages have been installed in three experimental watersheds (180, 240, and 260 acres). Two types of cutting treatments will be tested on two drainages by comparison with the third, an undisburbed area. Pretreatment behavior of streamflow, necessary to evaluate final results, is now being measured.

Lane County; began August 1952, indefinite; $1,500; Roy Silen, Leader.

Address inquiries to: R. W. Cowlin, Director, Pacific Northwest Forest and Range Experiment Station, 423 U. S. Court House, Portland 5, Oreg.

U. S. Fish and Wildlife Service, Branch of Game-fish and Hatcheries

1. Fishery Management Surveys.

The objective is to develop fish management plans, based on surveys, for specific water areas. Priority is given to Federally controlled areas such as Service refuges, National Forests, Veterans Administration facilities, Defense installations and Indian reservations.

Hdqrs. Portland; field work in the several States comprising Fish and Wildlife Service Region 1; continuing; Zell Parkhurst and Marvin A. Smith, Leaders.

Address inquiries to: Regional Director, Fish and Wildlife Service, Swan Island, Portland 18, Oreg.

2. Technical Assistance in Fish Cultural Activities.

Assistance is given to fish cultural personnel toward the solution of biological problems of hatchery management, such as weed control, fertilization, disease, and water quality; and in initiating new or improved techniques. Fish stocking activities are reviewed for correlation with State Conservation Department practices and to direct the distribution of Federally produced fish in accordance with Fish and Wildlife Service policy and known fishery management needs.

Hdqrs. Portland; field work in the several States comprising Fish and Wildlife Service Region 1; continuing; Zell Parkhurst and Marvin A. Smith, Leaders.

Address inquiries to: Regional Director, as in No. 1 above.

U. S. Fish and Wildlife Service, Office of River Basin Studies

1. Rogue River Investigations.

This project was initiated to determine the possible effect of proposed water developments on fish and wildlife of the Rogue River and its tributaries. Information is gathered on catch and spawning distribution of both resident and anadromous species of salmon and trout.

U. S. Bureau of Reclamation and Oregon Game Commission cooperating; Rogue River; began 1949, indefinite; $20,000; S. G. Jewett, Jr., Leader.

Address inquiries to: Regional Director, Fish and Wildlife Service, Swan Island, Portland 18, Oreg.

Fish Commission

1. General Lake Survey.

The project diagnoses factors limiting production and harvest of lake fishes using common field and laboratory techniques. To date, 38 lakes have been examined with management recommendations developed. Findings continue to suggest that unbalanced fish populations underlie poor fishing.

As a direct result of these studies and recommendations, fish toxicants are now legal as a tool of fish management.

Statewide; began June 1949, continuing; $15,000; DeWayne E. Campbell, Leader; reports available.

Address inquiries to: Gordon L. Trembley, Chief Aquatic Biologist, Fisheries Research Laboratory, Pennsylvania Fish Commission, Bellefonte, Pa.

2. Selective Breeding Program for Trout.

Partial completion of the Benner Spring Research Station made available facilities to start preliminary studies to genetically develop better strains of brook, brown and rainbow trout. This will encompass research on growth rate, reaction to domestication (sperm and egg viability under artificial propagation methods, disease resistance, etc.), survival of planted fish, and other qualities which affect the tangible or esthetic value of trout.

Incidental to the genetic experiments is exploration into the field of nutrition, hybrid survival, and growth and vigor as gained or lost through species crossings; use of an anesthetic (ethyl carbamate) on brood trout and recording its effect on the eggs and sperm of these trout; and egg and sperm viability studies after storage in different media over varying periods of time.

Fisheries Research Laboratory, Bellefonte; began October 1952, continuing; $15,000; Keen Buss, Leader.

Address inquiries to: Gordon L. Trembley, as in No. 1 above.

3. Studies on Establishing Rainbow Trout Runs in Pennsylvania Tributaries of Lake Erie.

The project aims to determine whether a significant run of rainbow trout into tributaries of Lake Erie can be established through plantings of fingerlings. Runs of sexually mature rainbows into several tributaries of Lake Erie occur each spring. A test stream and several tributaries were stocked with marked rainbow fingerlings in 1952 and 1953. Seining in streams stocked disclosed rainbow fingerlings migrated downstream into Lake Erie within a few months after stocking. Recapture of marked rainbow fingerlings (planted in 1952) in commercial pound-nets set in Lake Erie revealed excellent growth. Periodic seining is conducted and records kept of number of individuals returning to spawn.

Pennsylvania tributaries of Lake Erie; began August 1952, to close August 1957; $500; Alfred Larsen, Leader.

Address inquiries to: Gordon L. Trembley, as in No. 1 above.

4. Results of Experimental Trout Plantings in Lakes Holding Warm-water Fish Species.

Objectives are to determine survival and catchability of various sizes of brook, brown and rainbow trout when planted in lakes containing warm-water fish species. Legal-size trout up to 20 inches were planted in spring and fall of 1952 and in the spring of 1953. Marked rainbow fingerlings were stocked in the fall of 1953. A complete creel census is conducted on one lake. Test netting will continue.

Six lakes, mostly in northern counties; began March 1952, to close March 1957; $2,500; Gordon L. Trembley, Leader.

Address inquiries to: Gordon L. Trembley, as in No. 1 above.

5. Tagging Program, Lake Erie.

A tagging project is under way to study migratory habits of Lake Erie species including blue pike, yellow pike, yellow perch, and white bass.

Pennsylvania waters of Lake Erie; began August 1953, continuing; $1,000; Alfred Larsen, Leader.

Address inquiries to: Gordon L. Trembley, as in No. 1 above.

6. Evaluation of Waste Materials of the Marine Clam Processing Industry in Hatchery Diets.

The objective is to determine the value of marine clam visceral trimmings as a fish food. Growth rate, color changes, mortality of fish and feeding costs are being studied. Clam trimmings are used alone and in combination with other dietary mixtures. Trout of various sizes are being used presently as test fish.

Fisheries Research Laboratory, Bellefonte; began April 1953, to close 1955; $500; Arthur D. Bradford, Leader.

Address inquiries to: Arthur D. Bradford, Pathologist, Fisheries Research Laboratory, Pennsylvania Fish Commission, Bellefonte, Pa.

7. Biological Survey of Streams.

Objectives are to evaluate the biological, physical and chemical factors of streams, and to obtain basic information to assist in the management of streams. The primary purpose is to determine to what extent major streams shall be classified as to trout or warm-water areas. Special emphasis is placed on fish populations, temperatures, bottom-food organisms, flow and pollution.

Statewide; began 1932, continuing; $15,000; Otis Robbins, Jr., Leader; reports available.

Address inquiries to: C. R. Buller, Chief Fish Culturist, Fisheries Research Laboratory, Pennsylvania Fish Commission, Bellefonte, Pa.

8. Acquisition and Construction of Public Fishing Lakes. (FA: in part)

Objectives of the project are to purchase existing lakes and lake sites and to build dams, thus providing additional acreage of public fishing lakes. An attempt is made to locate lakes near centers of heavy human populations. During 1953, 3 dams to impound 86 acres of water were constructed and one 18-acre pond was purchased.

Statewide; began 1952, continuing; T. F. O'Hara and Cyril G. Regan, Leaders.

Address inquiries to: T. F. O'Hara, Chief Engineer, Fisheries Research Laboratory, Pennsylvania Fish Commission, Bellefonte, Pa.

Department of Health, Industrial Wastes Division

1. Bio-assay Studies of Industrial Wastes.

Objectives of the project are to evaluate the lethality of industrial wastes, their components and other water pollutants to fish. The evaluation, as determined by bio-assay procedures, offers a reasonable judgment tool in administering effective stream pollution abatement.

Fisheries Research Laboratory, Bellefonte; began November 1949, indefinite; C. S. Myers and Thomas Iezzi, Leaders; reports available.

Address inquiries to: Dr. C. S. Myers, Department of Health, Bureau of Sanitary Engineering, Harrisburg, Pa.

Lehigh University

1. Bacterial Digestion of Rotenone.

Objective of the project is to determine if it is possible to select a strain of bacteria capable of breaking down rotenone rapidly. If so, can these bacteria be seeded with rotenone when used as a fish poison, thereby decreasing the period of time that the lake or pond waters will be toxic.

Began January 1954, to close January 1955; F. J. Trembley and B. W. Parker, Leaders.

Address inquiries to: F. J. Trembley, Biology Department, Lehigh University, Bethlehem, Pa.

RHODE ISLAND

Division of Fish and Game

1. Pond and Lake Survey. (FA: F-2-R)*

This project is a comprehensive survey of the fishing waters of the State, including: Physical, chemical and biological studies; fish population studies; and fish harvest studies. Spawning area surveys are also being carried out.

Statewide; began June 1, 1952, planned for 3 years; $15,000.

Address inquiries to: Thomas J. Wright, Administrator, Division of Fish and Game, Veterans Memorial Building, 83 Park Street, Providence, R.I.

2. Acquisition of Public Fishing Access Sites. (FA: F-3-L, F-4-L, F-5-L)*

The objective of the project is to acquire access areas to lakes and streams to guarantee public access to fishing waters.

Statewide; began June 1953, continuing; Thomas J. Wright, Leader.

Address inquiries to: Thomas J. Wright, as in No. 1 above.

3. Access Development to Public Waters. (FA: F-6-D)*

The objective of the project is to open access along state-owned streams to provide for a wider distribution of fishermen.

Statewide; began November 1953, indefinite; Chester Whaley, Leader.

Address inquiries to: Thomas J. Wright, as in No. 1 above.

SOUTH CAROLINA

Wildlife Resources Department

1. Investigation of Fish Populations in Reservoirs. (FA: F-1-R)

The major objective of the project is to collect basic data with regard to the sport fisheries. The work being performed includes population studies, creel censusing, age-growth studies and fish tagging. Also, receiving particular attention is the striped bass. This fish is being taken quite frequently by the sport fishermen even through the winter months.

Lake Marion and Lake Moultrie; began May 1952, to close May 1955; $8,442; George D. Scruggs, Leader.

Address inquiries to: Jefferson C. Fuller, Jr., Chief of Fisheries, South Carolina Wildlife Resources Department, Columbia, S. C.

2. Camp Croft Public Fishing Area. (FA: F-3-D)*

An earthen dam has been constructed impounding a 38-acre lake. The pond will be fertilized and stocked with bass and bluegills after the existing fish population is removed through use of rotenone.

Near Spartanburg; began July 1953, to close June 1954; $26,780; Jefferson C. Fuller, Jr., Leader.

Address inquiries to: Jefferson C. Fuller, Jr., as in No. 1 above.

SOUTH DAKOTA

Department of Game, Fish and Parks

1. Lake Survey. (FA: F-1-R in part)

A lake investigation is conducted primarily to provide a basis for recommending poisoning or commercial fishing activities; to point out future management needs; to improve fishing regulations; and for educational purposes. Nets are used to determine fish population structures. Creel census is used to evaluate fish population alterations. Special activites in lake work include: (1) an evaluation of intensive bullhead removal (over 285 tons in 2 years) from a 3,200-acre lake, (2) a continued study of fish population trends in Angostura Reservoir--a new 5,500-acre impoundment, (3) eradication of warm-water fish from an 18.5-acre trout lake, and (4) an experiment involving partial poisoning of a heavy crappie-bullhead-carp population. Follow-up plantings of largemouth bass and northern pike will be made to see if a more balanced population can be established, and if so, for how long.

Statewide; began November 1951, continuing; $18,000; William D. Clothier, Leader.

Address inquiries to: Bernard A. Nelson, Department of Game, Fish and Parks, Pierre, S. D.

2. Black Hills Trout Stream Investigations. (FA: F-1-R in part)

Stocking of three species of fingerling trout, and more recently, those of legal size, constitutes the major fisheries management tool for Black Hills trout streams. Quantitative information on habitat conditions, population structures, fishing pressure, and other factors which influence survival and harvest are almost wholely lacking. Population and creel census checks on portions of three trout streams during the fishing season represents the first phase of an evaluation of stocking results. Equal numbers of marked brown, brook and rainbow trout (10-13 inches in total length) were planted at regular intervals in two of the study streams; the third received brown trout only.

Northern Black Hills, Lawrence and Pennington Counties; began June 1953, continuing; $2,500; William D. Clothier, Leader; reports available.

Address inquiries to: Bernard A. Nelson, as in No. 1 above.

TENNESSEE

State Game and Fish Commission

1. Investigations of Waters Below Storage Reservoirs. (FA: F-1-R)

This investigation consists of a detailed study of environmental conditions and the methods of fish management in waters which are released below the TVA dams. Determinations are being made of fish populations, bottom organisms,

drift organisms, plankton, and aquatic plants. Plantings of fingerling trout have been made to determine the most suitable species for planting. A creel census has been initiated on two tailwaters.

Various tailwaters in east Tennessee; began January 1951, to close June 1954; $10,000; Donald Pfitzer, Leader; reports available.

Address inquiries to: Donald Pfitzer, State Game and Fish Commission, University of Tennessee Farm, Knoxville, Tenn.

2. Creel Census and Population Studies. (FA: F-2-R)

This study will determine management methods for the U. S. Army Engineer Storage Reservoirs in Tennessee. Creel census, population studies, and growth data have been collected on Dale Hollow and Center Hill Reservoirs. Walleye and white bass populations have been studied closely. Chemical and physical data have been collected. A tagging operation has shown recruitment and movements of game species. Rough fish problems have been studied.

U. S. Army Corps of Engineers cooperating; Dale Hollow and Center Hill Reservoirs; began January 1951, to close June 1954; $24,000; Carlos Fetterolf, Leader; reports available.

Address inquiries to: Carlos Fetterolf, State Game and Fish Commission, 626 North Washington Avenue, Cookeville, Tenn.

3. A Statewide Survey and Evaluation of Streams. (FA: F-3-R)

The objectives of this project are four-fold: First, to determine the spawning success and survival of young of smallmouth bass, rock bass, and Kentucky bass; second, to survey stream habitats and determine species present, population and growth conditions and environmental factors involved; third, to gain information on the relationship between commercial harvest of minnows and the sport fish population; fourth, to conduct a general creel census on a statewide basis and an intensive creel census on certain selected streams.

Statewide; began January 1952, to close December 1954; $18,000; Eugene Ruhr, Leader; reports available.

Address inquiries to: Eugene Ruhr, State Game and Fish Commission, 166 Eighth Avenue North, Nashville, Tenn.

4. Reelfoot Lake Investigations. (FA: F-5-R)

This investigation will determine the relationship between commercial and sport fisheries on Reelfoot Lake. The following types of data will be collected: Creel census of sport fishermen; census of commercial fisheries catch; catch of various types of commercial gear; chemical and physical information; food and growth rates of game species; and influence of fluctuating water levels on fish production.

Reelfoot Lake; began July 1953, to close June 1956; $14,000; Hudson Nichols, Leader; reports available.

Address inquiries to: Hudson Nichols, State Game and Fish Commission, Tiptonville, Tenn.

5. Life History and Propagation of the Muskellunge, Esox masquinongy ohioensis.

Migration, growth rates, and other life history data on the musky have been collected. Muskies will be collected, propagated in a hatchery, and released in several reservoirs in the hope of establishing the species.

Statewide; began January 1, 1952, to close December 31, 1955; $2,000; John Parsons, Leader; reports available.

Address inquiries to: John Parsons, State Game and Fish Commission, Route 2, Crossville, Tenn.

6. Threadfin Shad Study.

The object of this investigation is to study the importance of the threadfin shad to game fish populations in Chicamauga reservoir and to evaluate the results of introductory stocking of threadfin shad in four small reservoirs in Middle Tennessee. The results of these stockings will be followed by population studies and food studies.

Cumberland Plateau; began October 15, 1952, to close December 31, 1954; $1,000; John Parsons, Leader.

Address inquiries to: John Parsons, as in No. 5 above.

7. Redeye Bass (Micropterus coosae) Propagation and Stocking.

Redeye bass have been introduced into several marginal waters in Tennessee and the success of these introductions will be followed closely. Brood stock were obtained from natural populations raised in the hatchery, and released in several suitable streams.

Cumberland Plateau and Middle Tennessee; began January 1952, to close December 1954; $500; John Parsons, Leader; reports available.

Address inquiries to: John Parsons, as in No. 5 above.

8. Sauger Study.

The object of this study will be to determine recruitment, migration, and growth of sauger in Kentucky and Pickwick Lakes. The tagging of sauger has been carried out at Pickwick Dam. Scales have been collected and growth rates are being determined.

Tennessee Valley Authority cooperating; Pickwick and Kentucky Lakes; began October 1953, to close December 1955; $1,000; Eugene S. Cobb, Leader.

Address inquiries to: Eugene S. Cobb, State Game and Fish Commission, Frankland Building, Jackson, Tenn.

9. Catfish Tagging on Kentucky Lake.

Recruitment, migration, and growth rates were determined for blue and channel catfish. A large number were caught and tagged at Pickwick Dam. Growth rates will be determined by vertebrae examination and by tag returns.

Tennessee Valley Authority cooperating; Kentucky and Pickwick Lakes; began June 1953, to close December 1955; $500; Eugene S. Cobb, Leader.

Address inquiries to: Eugene S. Cobb, as in No. 8 above.

10. Experimental Control of Overcrowded Intermediate Bluegills in Farm Ponds.

The overcrowding of intermediate sized bluegills is a common condition in farm ponds. Various traps and chemicals are being tried to control these conditions.

Farm ponds around Jackson; began June 1953, continuing; $500; Eugene Cobb, Leader.

Address inquiries to: Eugene Cobb, as in No. 8 above.

11. Commercial Fisheries Study.

This study was initiated to determine the total value and catch of the commercial fisheries; the influence of various types of commercial gear on game fish; the value of present commercial fishing regulations; and the need of new regulations. Interviews, questionnaires, and direct observations are being used to collect this information.

Statewide; began May 1953, indefinite; $5,000; William Dryer, Leader.

Address inquiries to: William Dryer, State Game and Fish Commission, Box 337, Waverly, Tenn.

12. Fish Rescue and Tagging Project. (FA: F-4-D)*

This project is designed to rescue stranded fish in certain sections of Cherokee and Norris Reservoirs. When water levels are lowered in winter, isolated sections of the lake become cut off and large populations of fish become stranded. Seines are used to collect the fish. Game fish are restored to permanent waters of these reservoirs or used in other approved ways. Some are tagged to provide information on creel census and population studies.

Northeast Tennessee; began June 1951, continuing; $8,000; reports available.

Address inquiries to: L. Price Wilkins, District Fish Biologist, University of Tennessee Farm, Knoxville, Tenn.

Tennessee Valley Authority

1. Fish Harvesting on TVA Reservoirs.

Fish are netted, caught by hook and line or removed from sinkholes and tagged with monel metal jaw tags to indicate extent of harvest, movement of species and to gain an idea of changes in population. These investigations are carried out on both storage and mainstream reservoirs, but not on all reservoirs simultaneously.

Storage reservoirs: Norris, Cherokee, Hiwassee, Nottely, Watauga, and South Holston. Mainstream reservoirs: Fort Loudoun, Guntersville, and Wheeler; began 1945, continuing; C. J. Chance and L. F. Miller, Leaders; reports available.

Address inquiries to: Dr. A. H. Wiebe, Chief, TVA Fish and Game Branch, Norris, Tenn.

2. Spring Creel Census on TVA Reservoirs and Tailwaters.

The census is designed to determine qualitative and quantitative trends in catch, residence of fishermen, and fishing methods during a limited season, April, May, and June on certain reservoirs and tailwaters. Census is taken daily at particular stations but no attempt is made to census entire reservoir.

Cherokee, Norris, and Wheeler Reservoirs; Watts Bar and Guntersville Dam Tailwaters; began 1945, continuing; L. F. Miller and C. J. Chance, Leaders.

Address inquiries to: Dr. A. H. Wiebe, as in No. 1 above.

3. Annual Fall Fish Population Inventory of TVA Reservoirs.

Information is collected on the success of reproduction and survival of young, growth and size distribution of different species, available food for game fish, trends in relative abundance of species, and the presence or absence of certain species. Small areas, 1 to 5 acres, are treated with rotenone and all fish from the area are removed, separated to species, counted, weighed and measured, and scale samples taken.

Reservoirs in the Tennessee Valley; hdqrs. Decatur, Alabama, and Norris, Tennessee; began 1945, continuing; L. F. Miller and C. J. Chance, Leaders.

Address inquiries to: Dr. A. H. Wiebe, as in No. 1 above.

U. S. Fish and Wildlife Service, Branch of Fishery Biology

1. Trout Stream Ecology.

The objective is to determine the numbers of fish that can be harvested at different levels of fishing intensity and still preserve the native trout fishing.

National Park Service, State Fish and Game Departments of North Carolina, Virginia and Tennessee cooperating; hdqrs. Eastern Federal Waters Investigations, Leetown, West Virginia; began 1953, continuing; Robert E. Lennon, Leader.

Address inquiries to: Robert E. Lennon, Eastern Federal Waters Investigations, Kearneysville, W. Va.

Game and Fish Commission

1. Fish Management Service.

Technical assistance is provided to the owners of private ponds and lakes. Fish population surveys are made and recommendations for rehabilitation of their waters given them. Information is given to the owners concerning chemicals and the application of same for fish population control, aquatic vegetation control and fertilization. Fisheries technicians also assist wardens on pollution investigations outside of project waters and fish hatcheries with fish cultural problems.

Statewide; continuing; $75,000; Leo D. Lewis, Edward Bonn, Lawrence Campbell, Leonard Lamb, Robert J. Kemp, Jr., Kenneth C. Jurgens, William H. Brown, Alvin Flury, Leaders.

Address inquiries to: Marion Toole, Chief Aquatic Biologist, Game and Fish Commission, Austin, Tex.

2. Lake Corpus Christi Water Hyacinth Control Project. (FA: F-1-D)

The control of water hyacinths through the application of an alkalanolamine salt of 2,4-D by boats, since state law prohibits the spraying of 2,4-D by airplane. About 625 acres of Lake Corpus Christi will be treated.

Lake Corpus Christi in San Patricio and Live Oak Counties; began September 1, 1953, planned for one year; $10,745.

Address inquiries to: Alvin Flury, Game and Fish Commission, Box 552, Mathis, Tex.

3. Fisheries Investigations and Surveys of the Waters of Region 1B. (FA: F-7-R)

The project provides for physical, chemical and biological inventory on Lakes Kemp and Baylor County, Lakes Diversion and Kickapoo in Archer County, pollution study to determine nature and undesirable species control beginning with lab experiments on concentrations of various toxic substances.

Began June 1953, planned for 3 years; $27,810; Walter Dalquest, Assistant Leader.

Address inquiries to: Leo D. Lewis, Game and Fish Commission, Route 1, Box 169a, Wichita Falls, Tex.

4. Fisheries Investigations and Surveys of the Waters of Region 2B. (FA: F-8-R)

A physical, chemical and biological inventory on the Upper Sabine River watershed within Collin, Hunt and Hopkins Counties; on Lakes Texoma within Cooke and Grayson Counties and Lavon and its drainage in Collin County; creel census on Lake Lavon, check on commercial catch of rough fishes from Lake Lavon; pollution study to determine nature and influence on project waters; white bass tagging experiment in Lake Texoma; and experimental stocking of exotic fishes in Lake Crook in Lamar County.

Began June 1953, planned for 3 years; $31,371; Charles Inman, Assistant Leader.

Address inquiries to: Edward W. Bonn, Game and Fish Commission, 1505 West Johnson, Denison, Tex.

5. Fisheries Investigations and Surveys of the Waters of Region 3B. (FA: F-5-R)

A physical, chemical and biological inventory of those portions of the Middle and South Conchos Rivers within Tom Green, Irion, Reagan and Schleicher Counties; on those portions of the North Concho River and its tributaries within Tom Green, Coke, St erling, and Glasscock Counties; on Lakes Nasworthy and San Angelo in Tom Green County; on Oak Creek Reservoir in Nolan County; and on Lake Brownwood in Brown County; creel census on Lake Nasworthy; and pollution study to determine nature and influence on project waters.

Began June 1953, planned for 3 years; $31,282; Everett Boyd, Assistant Leader.

Address inquiries to: Lawrence Campbell, Game and Fish Commission, 18 West 25th Street, San Angelo, Tex.

6. Fisheries Investigations and Surveys of the Waters of Region 4B. (FA: F-4-R)

A physical, chemical and biological inventory on those portions of the Brazos River watershed within Palo Pinto, Parker, Hood, Somerville and Johnson Counties; on those portions of the Bosque and Leon Rivers within Erath, Bosque, Hamilton, Comanche, Coryell and McLennan Counties; Lakes Whitney in Hill and Bosque Counties, Possum Kingdom in Parker and Young Counties; and Benbrook in Tarrant County; creel census on Lake Whitney; pollution study to determine nature and influence on project waters; and check on commercial catch of rough fishes in Lake Whitney.

Began June 1953, planned for 3 years; $31,488; Robert Hambric, Assistant Leader.

Address inquiries to: Leonard Lamb, Game and Fish Commission, 733 Edgefield Road, Fort Worth, Tex.

7. Fisheries Investigations and Surveys of the Waters of Region 5B. (FA: F-3-R)

A physical, chemical and biological inventory on portions of the Little Cypress, Cypress and Black Cypress Bayous within Marion County; the portion of the Sabine River within and along the boundaries of Gregg County; Caddo Lake in Marion and Harrison Counties and the Tyler City Lake in Smith County; creel census on Caddo Lake; pollution study to determine nature and influence on project waters; and check on commercial catch of rough fishes in Caddo Lake.

Began July 1953, planned for 3 years; $29,842; Charles Gray, Assistant Leader.

Address inquiries to: Robert J. Kemp, Jr., Game and Fish Commission, Box 63, Marshall, Tex.

8. Fisheries Investigations and Surveys of the Waters of Region 6B. (FA: F-2-R)

A physical, chemical and biological inventory on portions of the Leon, Lampasas and Little Rivers which lie in Bell County; portions of the San Gabriel River and Brushy Creek within Williamson County; and Lake Travis in Travis and Burnet Counties; creel census on Lake Travis; pollution study to determine nature on project waters; and check on commercial catch of rough fishes in Lake Travis.

Began June 1953, planned for 3 years; $30,757; Billy D. Cooper, Assistant Leader.

Address inquiries to: Kenneth C. Jurgens, Game and Fish Commission, 1506 Ruth, Austin, Tex.

9. Fisheries Investigations and Surveys of the Waters of Region 7B (FA: F-9-R)

A physical, chemical and biological inventory on those portions of the Devil's River, excluding Devil's Lake and Lake Walk, within Val Verde County; on those portions of the Medina River, excluding Medina Lake, within Medina, Bandera and Bexar Counties; on Lake Medina within Medina and Bandera Counties; Woodlawn within Bexar County, and Devil's Lake within Val Verde County; creel census on Devil's Lake and Lake Medina; and pollution study to determine nature and influence on project waters.

Began June 1953, planned for 3 years; $31,176; E. M. C. Dietz, Assistant Leader.

Address inquiries to: William H. Brown, Game and Fish Commission, State Fish Hatchery Lab, San Marcos, Tex.

10. Fisheries Investigations and Surveys of the Waters of Region 8B (FA: F-6-R)

A physical, chemical and biological inventory on those portions of the Nueces River lying in Zavala, Dimmit, La Salle, McMullen, Live Oak, San Patricio and Nueces Counties; on those portions of the Frio River within Zavala, Frio, La Salle, McMullen and Live Oak Counties; on those portions of the Atascosa River within Atascosa and Live Oak Counties; on those portions of the Guadalupe and San Antonio Rivers, within Wilson, Karnes, Goliad, Victoria and Refugio Counties; on Lake Corpus Christi within San Patricio and Live Oak Counties, on Falcon Lake, a new reservoir built by the International Boundary Commission, on the Rio Grande River in Starr and Zapata Counties; and on Lakes Bentsen and Lake Del Orchard in Hidalgo County; creel census on Lake Corpus Christi; a check on the commercial catch of rough fishes from Lake Corpus Christi; pollution study to determine nature and influence on project waters; and experimental spraying of water hyacinths with 2,4-D to determine the best dosage to use on FA: F-1-D.

Began June 1953, planned for 3 years; $30,000; Luciano V. Guerra, Assistant Leader.

Address inquiries to: Alvin Flury, as in No. 2 above.

11. Development, Sheldon Reservoir, Management Area. (FA: FW-1-D)

Building dwelling for resident biologist, office, laboratory and service building; improvement of existing levee and spillway; construction of breaker levees and channels; vegetative planting to prevent erosion on west boundary levee, erection of signs and boundary markers; drilling well for headquarters; and appraisal of development of the Sheldon Reservoir for future fishery development.

Began June 1953; Dingell-Johnson share - $67,122.

Address inquiries to: Marion Toole, as in No. 1 above.

University of Texas

1. Studies on the Zoogeography and Ecology of Southwestern Fishes.

Objective of the project is to determine the distribution of the southwestern fishes, especially with relation to their ecology.

Game and Fish Commission cooperating; Oklahoma, New Mexico, Texas, and Mexico; began November 1949, indefinite; $1,000; Clark Hubbs, Leader.

Address inquiries to: Dr. Clark Hubbs, Zoology Department, University of Texas, Austin, Tex.

2. Studies on the Life Histories of Southwestern Fresh-water Fishes.

Objectives of the project are to determine the breeding habits, rearing, and movements of the fishes. At the present, special emphasis is placed on the black tail (Notropis venustus) and red (Notropis lutrensis) shiners and the darters of the genus Etheostoma.

Hdqrs. Austin; began February 1951, indefinite; $1,000; Clark Hubbs, Leader.

Address inquiries to: Clark Hubbs, as in No. 1 above.

U. S. Fish and Wildlife Service, Branch of Fishery Biology

1. Biochemistry of the Gulf of Mexico.

As a means of delimiting potentially productive fishing areas, an effort is being made to establish the distributions and concentrations of nutrients and the relation between these nutrients and the distributions and concentrations of fishes.

Hdqrs. Fort Crockett, Galveston; began 1950, continuing.

Address inquiries to: Albert W. Collier, Jr., Chief, Gulf Fishery Investigations, Fort Crockett, Galveston, Tex.

2. Biological Inventory of the Gulf of Mexico.

The objective of this project is to define the identity, abundance, distribution, and interrelation, of the various plankton forms and the relation between the variations within these to the distribution, availability and fluctuation of the fishes.

Hdqrs. Fort Crockett, Galveston; began 1950, continuing; Edgar L. Arnold, Jr., Giles W. Mead, Jr., and Isaac Ginsburg, Leaders.

Address inquiries to: Albert W. Collier, Jr., as in No. 1 above.

3. Red Tide Investigation.

This is a study to determine the cause or causes that bring about over-growths of plankton in general, and of potential sources of Red Tide, especially of Gymnodinium brevis, in particular. A field station is in operation at Fort Myers, Florida.

Hdqrs. Fort Crockett, Galveston; began 1948, continuing; William B. Wilson, Joe O. Bell, Leaders.

Address inquiries to: Albert W. Collier, Jr., as in No. 1 above.

UTAH

Department of Fish and Game

1. An Inventory Survey of Utah's Fishing Waters. (FA: F-2-R)

Data concerning the following categories will be collected on the Price, Sevier, and Bear River drainages: Hydrology and alternate water uses; fish population present; growth information of dominant species present; brief chemical, physical and morphometric information; brief quantitative records on plankton and bottom fauna. From the data collected, all streams and lakes open to fishing by the public will be evaluated and classified. Management recommendations will be made when possible and problems for more intensive study will be outlined when they appear.

Statewide; began March 1, 1953, to close March 1, 1956; $23,600; William J. McConnell, Leader; reports available.

Address inquiries to: William J. McConnell, Utah State Department of Fish and Game, Federal Aid Division, 1596 West North Temple, Salt Lake City, Utah.

2. Investigations of Specific Problems of the Bear Lake Fishery. (FA: F-4-R)

The following are the categories under which data will be collected: Present annual yield of game fish by species; creel composition and fisherman success; return of marked fish to the creel; improvement of the yield of desirable species by improvement of fishing methods; migration of planted fish from Bear Lake into Bear River; vertical distribution of fish in relation to temperature.

Bear Lake, Rich County; began December 1953, to close December 1955; $10,000; William J. McConnell, Leader; reports available.

Address inquiries to: William J. McConnell, as in No. 1 above.

State Agricultural College

1. The Life History and Population Dynamics of the Fish and Their Food in Logan River.

Work is under way on the life history studies of all species above the dam at the mouth of Logan Canyon; on the determination of the creel composition; fisherman success per unit of effort and the success of the stocking program; on the study of the population dynamics with the aid of experimental gill nets and electric

shocking machines; and on investigations dealing with the limnology and general ecology of Logan River.

Northern Utah and Southern Idaho; began September 1947, planned for 10 years; $1,500.

Address inquiries to: Dr. William F. Sigler, Cooperative Wildlife Research Unit, State Agricultural College, Logan, Utah.

2. The Life History and Economic Status of the Carp in Utah.

The project undertakes to study intensively the age and rate of growth of the carp in one locality in Utah, and support this study with other extensive data from several areas; to determine the food and feeding habits of the carp in the same locality; to make both intensive and extensive observations on general carp ecology; to study carp reproduction; to continue to investigate annual and standing carp crops in small ponds or impoundments.

Agricultural Experiment Station cooperating; statewide; began July 1949, planned for 6 years; $1,000; reports available.

Address inquiries to: William F. Sigler, as in No. 1 above.

3. The Ecology of the Warm-Water Ponds.

The project is designed to study the life history of the fish present in the small natural warm-water ponds, study of the limnology of these ponds, and to determine what fish will reproduce naturally and produce a fishable population of game fish.

Northern Utah; began June 1948, planned for 10 years; $500; report available.

Address inquiries to: William F. Sigler, as in No. 1 above.

VERMONT

Fish and Game Service

1. Lake Champlain Fisheries Investigation. (FA: F-1-R)

Objectives of the project are to gather sufficient data to provide a basis for management recommendations. The problem is being approached through an intensive winter fishing census, a sampling of summer fishing, collection of data for a growth-rate study of walleyes, perch and other species, a summer population check with emphasis on associations of game, non-game and forage species including a check of relative success of spawning years of several species through sampling of typical nursery areas. The walleye study is designed to tag annually several thousand specimens seined during their spawning run, with subsequent collection of data on population status through tag returns.

New York Conservation Department cooperating; Vermont waters of Lake Champlain; began January 1952, continuing; $15,260; Leonard C. Halnon, Leader; reports available.

Address inquiries to: Leonard C. Halnon, Fish and Game Service, Bristol, Vt.

2. Connecticut River Watershed Fisheries Investigation. (FA: F-2-R)

The objectives of the project are to determine the distribution and relative abundance of fish in the watershed; to measure and evaluate the chemical and physical factors having an effect on fish life, especially trout and other game fish; to gather information on rate of growth and reproductive potential in the waters; and to determine the rate of recovery of stocked fish by the use of tagged trout in test waters.

The research findings are to be applied to management policies in order to utilize fully the fish resources in the watershed.

State Water Conservation Board, Norwich University Biology Department cooperating; Vermont tributaries of Connecticut River; began April 1952, to close March 1956; $9,981; James M. MacMartin, Leader; reports available.

Address inquiries to: James M. MacMartin, Fish and Game Service, Montpelier, Vt.

U. S. Fish and Wildlife Service, Branch of Game-fish and Hatcheries

1. Fisheries Survey of Green Mountain National Forest Waters.

Detailed population studies are under way to provide data upon which recommendations for stocking, stream and lake improvement, and regulations may be based.

U. S. Forest Service and Vermont Fish and Game Service cooperating; Green Mountain National Forest; began May 1952, continuing; John G. Appelget.

Address inquiries to: John G. Appelget, Fishery Management Biologist, Fish and Wildlife Service, 59 Temple Place, Boston, Mass.

2. Experimental Fertilization of a Small Trout Stream.

The objective of the project is to determine if the addition of an inorganic fertilizer to a trout stream will increase the growth rate of trout and production of bottom food organisms.

U. S. Forest Service cooperating; Ten Kiln Brook - Green Mountain National Forest; began May 1953, to close October 1958; John G. Appelget, Leader.

Address inquiries to: John G. Appelget, as in No. 1 above.

VIRGINIA

Commission of Game and Inland Fisheries

1. Game Fish Survey of the Impounded Public Fishing Waters of Virginia. (FA: F-1-R)

This survey is designed to yield information which will aid the formulation of management policies for the impounded waters of the State. Fish population studies involving the use of rotenone and conventional netting gear, and harvest studies are receiving preferred treatment in the execution of the project. Large reservoirs, State and municipally owned reservoirs, are receiving most of the attention.

Statewide; began July 1, 1951, to close June 30, 1954; $20,000; Robert G. Martin, Leader; reports available.

Address inquiries to: G. W. Buller, Chief, Division of Fish, Commission of Game and Inland Fisheries, P. O. Box 1642, Richmond 13, Va.

U. S. Fish and Wildlife Service, Branch of Fishery Biology

1. Trout Stream Ecology.

(See under Tennessee)

Department of Game

1. A Study of Bacterial Diseases in Game Fish. (FA: F-8-R)*

Objectives of the project are to study the bacterial diseases in hatchery trout and to determine the necessary treatments.

University of Washington cooperating; hdqrs. University of Washington; began October 1952; planned for 3 years; $2,616; Erling J. Ordal, Leader.

Address inquiries to: Clarence F. Pautzke, Department of Game, 509 Fairview Avenue North, Seattle, Wash.

2. Rehabilitation of Buffalo and McGinnes Lakes. (FA: F-10-D)*

Objectives of the project are to rehabilitate Buffalo and McGinnes Lakes through the use of rotenone, and to restock with trout.

Near Nespelem; began January 1953, to close December 1953; $16,406; Roy A. Banner, Leader.

Address inquiries to: Clarence F. Pautzke, as in No. 1 above.

3. Round Lake Development. (FA: F-12-D)*

The project objectives are to remove the existing fish population through use of rotenone, to restock with trout, and to construct a fish barrier dam to prevent reinfestation with undesirable species.

Grant County; began May 1953, to close June 1954; $9,159; Roy A. Banner, Leader.

Address inquiries to: Clarence F. Pautzke, as in No. 1 above.

4. Carlisle Lake Development. (FA: F-13-D)*

Objectives of the project are to improve this lake by removal of abandoned logging pier, to remove existing fish population and restock.

Lewis County; began June 1953, to close June 1954; $8,437; Roy A. Banner, Leader.

Address inquiries to: Clarence F. Pautzke, as in No. 1 above.

5. Statewide Purchase of Public Fishing Areas. (FA: F-14-L)*

Objectives of the project are to acquire access sites on various bodies of water to insure public fishing rights.

Statewide; began July 1953, indefinite; Roy A. Banner, Leader.

Address inquiries to: Clarence F. Pautzke, as in No. 1 above.

6. Lake Spanaway Screen. (FA: F-15-D)*

Objective of the project is to install two electrically driven revolving screens in the outlet structure of Lake Spanaway to prevent entrance of undesirable fish and escape of rainbow trout from the lake.

Pierce County; began July 1953, to close June 30, 1954; $8,216; Roy A. Banner, Leader.

Address inquiries to: Clarence F. Pautzke, as in No. 1 above.

7. Marshall Lake Travelling Screen. (FA: F-16-D)*

Objective of the project is to install a chain belt travelling screen in the outlet structure to prevent fish from leaving the lake. A short power line will be installed to provide power to rotate screen.

Pend Oreille County; began October 1953, to close September 1954; $16,445; Roy A. Banner, Leader.

Address inquiries to: Clarence F. Pautzke, as in No. 1 above.

8. Blue Lake Dike and Screen. (FA: F-17-D)*

Blue Lake was rehabilitated in November 1952. Trout stocked have been observed leaving the lake by way of the outlet which runs into Alkali Lake, a non-trout lake. The State is installing a revolving screen to prevent further loss. Some diking will be done, but the lake level will not be affected. A short power line is to be installed.

Near Coulee City; began November 1953, to close November 1954; $9,953; Roy A. Banner, Leader.

Address inquiries to: Clarence F. Pautzke, as in No. 1 above.

9. The Effects of Various Types of Fisheries on the Return of Marked Artificially Reared Downstream Migrant Steelhead.

Objective is to determine what percentage return may be obtained under varying conditions on hatchery reared steelhead fingerling. The information will be applicable to all coastal waters. The program is set up to determine the effect of sport fishing on downstream migrants and the effect of sports, commercial, and one or more dams on downstream and upstream migrant steelhead.

Columbia River and coastal waters of Washington; began 1947, indefinite; $21,000.

Address inquiries to: Clarence F. Pautzke, as in No. 1 above.

10. Growth Rates and Stocking Experiments on Spiny-rayed Fish.

A continuation of the life history work on various members of the spiny-rayed family, the rate of growth of perch, large and smallmouth bass, crappie, and bluegills in the different waters of the State. By using salvaged fish of the above species which have been tagged a determination is being made of the rate of growth of these transplanted fish plus their survival.

Statewide; began 1951, indefinite; $6,000.

Address inquiries to: Merrill H. Spence, Washington Department of Game, Route 3, Box 1026, Puyallup, Wash.

11. The Effect of Predatory Birds on Pure Trout Populations During the Winter Months.

The objective is to determine the degree of predation of merganser ducks on lowland lakes of western Washington during the winter months. Concentrations of over 2,000 of these birds have been observed on one body of water.

U. S. Fish and Wildlife Service cooperating; Lowland lakes of western Washington; began January 1, 1954, to close April 1954; $1,200.

Address inquiries to: Harry Senn, Washington Department of Game, 18046 Third Street Northeast, Seattle, Wash.

12. Returns of Trout Planted in Mixed-Species and One-Species Lakes.

The objective is to determine the returns of different sized trout planted into lakes inhabited by different species of warm-water fish and undesirable fish in comparison with trout planted into rehabilitated lakes.

Eastern Washington; began 1948, indefinite; $4,000.

Address inquiries to: Don Earnest, Washington Department of Game, North 520 Walnut Road, Dishman Branch, Spokane 63, Wash.

Department of Fisheries

1. Estimate of Sport Catch of Salmon.

The objective of the project is to obtain reasonable estimation of sport exploitation. Number of boats fishing daily is recorded. Average catch per day by species is recorded. The study was conducted between Megler, Washington, and

mouth of Columbia River during commercially closed period from August 26 to September 10, 1953.

Hdqrs. Pt. Ellice; began August 25, 1946; indefinite; $500; Wendell E. Smith, Leader; reports available.

Address inquiries to: Don Johnson, Supervisor of Research, State Fisheries Laboratory, Fisheries Center, University of Washington, Seattle, Wash.

2. Environmental Studies.

Objectives of the project are to determine and evaluate factors of the environment, both natural and man-made, controlling the survival and abundance of salmon. Natural salmon food studies in both fresh and salt water are in progress. The effects of pollution on both the salmon and its food in estuaries is being appraised. Effects of stream conditions on natural and hatchery salmon production is under study.

Puget Sound streams, Minter Creek stream, and Deception Pass Marine Research Station; began 1937; indefinite; $80,000; William A. Smoker, H. T. Heg, E. Salo, and Gil Holland, Leaders; reports available.

Address inquiries to: Don Johnson, as in No. 1 above.

3. Downstream Migration Mortalities at Power Dams.

The objective of the project is the determination of mortalities to young salmon that occur when they pass through power turbines or over high dam spillways on their downstream migrations to the sea.

Various hydroelectric dams in Washington; began 1952, indefinite; $50,000; Dale Schoeneman, Leader.

Address inquiries to: H. T. Heg, Department of Fisheries, 1308 Smith Tower, Seattle 4, Wash.

4. Salmon Sport Fishery Investigation.

Routine visits and checks are made at the 160 boathouses in Puget Sound and the Straits of Juan de Fuca. Fishing intensity and gear study data is compiled. Annual sport catch of salmon by species, by area, and by month is estimated from checks and boathouse reports. Other phases of the project include: Mark recoveries, catch sampling, and salmon derby checks.

Hdqrs. State Fisheries Laboratory; began 1938, continuing; $14,000; J. W. Fitzgerald, Leader; reports available.

Address inquiries to: J. W. Fitzgerald, State Fisheries Laboratory, Fisheries Center, University of Washington, Seattle 5, Wash.

5. An Investigation of the Effects of Pollution on Fish and Fish Food Organisms.

This project was undertaken in an attempt to determine the effects of both industrial and domestic wastes on downstream migrant salmon and fish food organisms. Waste from four pulp mills and untreated sewage from the City of Everett discharge in or in the vicinity of the Snohomish River, parent stream for a large stock of anadromous fish. Studies will include determinations for D.O., sulfite waste liquor, salinity, temperature, H_2S, etc. The field collections will include net hauls, bottom fauna, and fish, for population density and variety studies.

Washington Pollution Control Commission cooperating; Everett Harbor, Snohomis River, and Stillaguamish River; began January 18, 1954; to close October 1954; Donald Johnson, Leader; reports available.

Address inquiries to: State Department of Fisheries, Fish Hall No. 3, University of Washington, Seattle, Wash.

University of Washington

1. Nutrition of Salmonoid Fishes.

Objectives of the project include studies of the basic diet requirements of salmon and trout to aid in developing better hatchery diets; an evaluation of processing techniques for fish food products - drying, freezing, canning, etc.; and feeding experiments to develop efficient, cheap diets for hatchery use.

Hdqrs. Fisheries Center; began 1930, indefinite; $3,000; Lauren R. Donaldson, Leader; reports available.

Address inquiries to: Lauren R. Donaldson, 110 Fisheries Center, University of Washington, Seattle 5, Wash.

2. Study on the Response of Salmon to Physical Changes That May Influence Migration.

Salmon returning to the ponds at the Fisheries Center are "checked in" at their time of arrival. Records are maintained of the water temperature, air temperature, rainfall, illumination, barometric pressure, etc., and the correlation between the time of arrival and the physical conditions determined.

Hdqrs. Fisheries Center; began October 1953, to close January 1954; $2,000; Lauren R. Donaldson, Leader; reports available.

Address inquiries to: Lauren R. Donaldson, as in No. 1 above.

3. Selective Breeding of Rainbow and Cutthroat Brood Stock.

This project is a continuing one in which rainbow and cutthroat brood stocks capable of producing the best possible young fish for stocking lakes and streams in this region are being developed.

Selection is based on individually paired matings of the choice combinations. Maximum egg production, highest percent hatch, fastest rate of growth, best food utilization, resistance to disease, age at maturity, season of spawning, etc. are evaluated in making final selections.

Hdqrs. Fisheries Center; began March 1932, indefinite; $3,000; Lauren R. Donaldson, Leader; reports available.

Address inquiries to: Lauren R. Donaldson, as in No. 1 above.

4. Interracial Hybridization of Cutthroat Trout.

The practice and techniques of interracial hybridization used for many farm crops and in breeding farm animals are applied to cutthroat trout.

Two racially distinct stocks of cutthroat trout, one the select strain developed at the University of Washington, and the second a wild strain from Lake Whatcom, Washington, are cross-fertilized. The survival, rate of growth, and stocking qualities of the interracial hybrids are compared with the two original stocks.

Hdqrs. Fisheries Center; began January 1953, indefinite; $1,800; Lauren R. Donaldson, Leader; reports available.

Address inquiries to: Lauren R. Donaldson, as in No. 1 above.

5. Release of Marked Silver Salmon, of Transplanted Stock, at Two Locations in a Watershed.

This project is an attempt to evaluate the homing tendencies and survival rate of silver salmon fingerlings released at two locations in the same watershed.

Silver salmon fingerlings reared at the Soos Creek Hatchery of the State Department of Fisheries were transferred to the Issaquah Hatchery and to the Fisheries Center. After a period of retention of six weeks the fish were marked for identification and released from the two places on the same day. Most of the adults have returned and the data are being evaluated.

State Department of Fisheries cooperating; Fisheries Center and Issaquah Hatchery; began January 1952, to close February 1954; Lauren R. Donaldson, Leader; reports available.

Address inquiries to: Lauren R. Donaldson, as in No. 1 above.

6. Effects of Hatching and Rearing Silver Salmon in Columbia River Water and/or Columbia River Water That Has Passed Through the Hanford Works.

The eggs of silver salmon were hatched with some of the fish reared in waters pumped from the Columbia River at the Hanford Works, and some were reared in diluted effluent from the plant.

After incubation and rearing at the Aquatic Biology Building, Hanford Works, the young fish were trucked to the Fisheries Center, where they were held and reared until time for migration.

The returns from the commercial and sport fishery and those surviving to return to the holding ponds will be studied to evaluate the effects of the exposure to the effluent from the Hanford Works.

General Electric Company cooperating; Hanford Works and Fisheries Center; began October 1951, to close January 1955; $10,000; Lauren R. Donaldson, Leader.

Address inquiries to: Lauren R. Donaldson, as in No. 1 above.

7. Absorption of Trace Materials by Aquatic Organisms.

A study of the absorption of trace materials by aquatic flora and fauna has been carried on at laboratories at the University of Washington, on the Columbia River, and in the Marshall Islands (Pacific Ocean).

Methods have been developed for measuring the uptake of trace materials and following their transmission about an aquatic environment and in the biotic cycles.

United States Atomic Energy Commission cooperating; hdqrs. Applied Fisheries Lab; began August 1943, indefinite; $60,000; Lauren R. Donaldson, Leader; reports available.

Address inquiries to: Lauren R. Donaldson, as in No. 1 above.

8. Physiology and Morphology of the Eggs and Sperm of Salmonoid Fishes.

An electron microscope study of the details of the egg and sperm of salmonoid fishes is essential to progress in the knowledge of the genetics of these fishes.

This project, using the finest equipment yet developed, coupled with good techniques, has contributed greatly to a better understanding of the fertilization and early development of the salmonoids.

U. S. Atomic Energy Commission cooperating; hdqrs. Applied Fisheries Lab.; began 1951, to close 1955; $10,000; Frank G. Lowman, Leader; reports available.

Address inquiries to: Frank G. Lowman, 106 Fisheries Center, University of Washington, Seattle 5, Wash.

9. Study of the Effect of Temperature Upon the Early Development of Four Races of Chinook Salmon.

A comparative study of the effect of temperature upon the eggs and young of chinook salmon from the Sacramento River, Skagit River, Entiat River and Green River is nearing completion.

By hatching the eggs and rearing the young in waters of controlled temperatures an understanding of the temperature requirements of each of the four races is attained.

U. S. Atomic Energy Commission cooperating; hdqrs. Applied Fisheries Lab., began September 1953, to close March 1954; $10,000; Allyn H. Seymour, Leader; reports available.

Address inquiries to: Allyn H. Seymour, 106 Fisheries Center, University of Washington, Seattle 5, Wash.

10. Guiding of Young Salmon and Trout by Non-Electrical Means.

The objectives of the project are to determine the effects of various water velocities and current patterns; air bubbles and water jets; objects in water such as stakes, reflecting surfaces, and floats; and light, but not sound, on the behavior of young salmon and trout for possible use in guiding. Also, the project will attempt to determine the extent to which the above stimuli may be used in conjunction with eletricity.

U. S. Army Corps of Engineers cooperating; hdqrs. University of Washington; began July 1, 1953, to close June 30, 1955; $45,000; Leon A. Verhoeven, Leader.

Address inquiries to: R. Van Cleve, Director, School of Fisheries, University of Washington, Seattle 5, Wash.

11. Effects of Electricity on Salmon and Trout.

The project objectives are to determine the following in relation to the use of electricity in guiding young salmon and trout: Immediate or delayed mortality; cause and extent of non-fatal injuries; physiological factors causing orientation toward the anode in a D. C. field; response to A. C. of different frequencies in the high frequency range; changes in conductivity of young anadromous salmonoid fishes during fresh-water and downstream migrant stages; modification of behavior; the most efficient arrangements of field, electrodes, etc.

U. S. Army Corps of Engineers cooperating; hdqrs. University of Washington; began July 1, 1953, to close June 30, 1955; $39,000; Leon A. Verhoeven, Leader.

Address inquiries to: R. Van Cleve, Director, as in No. 10 above.

Pollution Control Commission

1. An Investigation of Pollution in Grays Harbor.

This project was undertaken to determine the effect upon fish and fish food organisms of all wastes which are discharged into Upper Grays Harbor. The large sulphite pulp mill at Hoquiam has been impounding waste sulphite liquor during periods of low flow in a 70-acre lagoon on Rennie Island. Other wastes from the Cities of Aberdeen and Hoquiam are discharged without treatment into the waters of Grays Harbor. The field collections included tow net hauls, bottom fauna, and fish for a population study.

U. S. Public Health Service and State Department of Fisheries cooperating; Aberdeen-Hoquiam area; began June 10, 1953, to close September 3, 1953; Donald R. Peterson, Leader; reports available.

Address inquiries to: Washington Pollution Control Commission, 408 Old Capitol Building, Olympia, Wash.

U. S. Fish and Wildlife Service, Branch of Game-fish and Hatcheries

1. Fishery Creation and Management on Nisqually Lake.

The objective is the creation and management of a suitable lake fishing area for military personnel.

State Department of Game, U. S. Army, Rod and Gun Club, Fort Lewis cooperating; Fort Lewis Military Reservation; began Spring 1953, indefinite; $750; Lewis R. Garlick, Leader.

Address inquiries to: Lewis R. Garlick, Regional Supervisor, Branch of Game-fish and Hatcheries, Fish and Wildlife Service, Swan Island, Portland 18, Ore.

2. A Method for the Introduction of Malachite Green Into Hatchery Water Supplies.

The objective is to develop a fast, easy method of treating an entire hatchery

simultaneously with malachite green for the control of fungus on eggs.

Spring Creek Fish-cultural Station, Underwood; began Fall 1953; to close 1954; $200; Harlan E. Johnson, Leader; reports available.

Address inquiries to: Lewis R. Garlick, as in No. 1 above.

U. S. Fish and Wildlife Service, Branch of Fishery Biology

1. The Nutritional Requirements of Chinook Salmon.

A study to determine the quantitative nutritional requirements of chinook salmon.

Hdqrs. University of Washington; began September 1951, continuing; Robert R. Rucker and John E. Halver, Leaders.

Address inquiries to: John E. Halver, Chief, Salmon Nutrition Laboratory, Willard (P.O. Cook), Wash.

2. Comparative Histo-Pathology of the Salmonids.

This project is to determine the normal histology of the organs and tissues of salmonids and to study the changes brought about under defined nutritional conditions and diseases, and to determine if well-defined histological differences exist between wild and hatchery reared salmonids which might indicate desirable or undesirable qualities of hatchery fish.

Hdqrs. Salmon Nutrition Laboratory; began August 1953, continuing; E. M. Wood, John E. Halver, Leaders.

Address inquiries to: John E. Halver, as in No. 1 above.

3. Disease Research.

Studies indicate that virus bacteria and parasites are the major etiologic agents responsible for several serious outbreaks of disease. This investigation proposes to study the diseases of fish, their effect on the fish, how infection is transmitted, determine source of infection, develop methods for identification and development of control measures.

Hdqrs. University of Washington; began September 1952, continuing.

Address inquiries to: Robert R. Rucker, Chief, Western Fish Disease Laboratory, University of Washington, Seattle, Wash.

4. Development of Better Practical Diets.

A survey to explore growth potential and nutritional adequacy of potential fish food products and to develop practical diets for salmon.

Hdqrs. Salmon-Cultural Lab., Entiat, Washington; began 1948, continuing.

Address inquiries to: R. E. Burrows, Chief, Salmon-Cultural Laboratory, Entiat, Wash.

5. Development of Hatchery Equipment.

The objective is to determine environmental factors affecting development of salmon reared under artificial conditions and to develop rearing ponds which will satisfy requirements for optimum environmental conditions and efficient operation. Model studies of raceway, Foster-Lucas, and circular ponds and correlation of pond characteristics with hydraulic conditions to be the first phase of investigation.

Hdqrs. Salmon-Cultural Lab., Entiat; began 1948, continuing.

Address inquiries to: R. E. Burrows, as in No. 4 above.

6. Migration and Mortality of Fingerlings at Bonneville Dam.

The objectives are to determine species, origin (hatchery or natural propagation), size, age and time of seaward migration of salmon and steelhead fingerlings.

The effect of turbines and spillways at the dam upon small downstream migrants will be evaluated.

Hdqrs. Seattle; began March 1945, planned for completion in 1957; $13,500, K. G. Weber, Leader.

Address inquiries to: Clinton E. Atkinson, Chief, Pacific Salmon Investigations, 2725 Montlake Boulevard, Seattle, Wash.

7. Temperature Regimen of the Columbia River System.

The original objective was to obtain records of water temperatures of Columbia River and its tributaries prior to construction of the dams. With many more reservoirs being created, the resulting temperature changes and their effect upon migrating fish are being studied.

Hdqrs. Seattle; began in 1945, continuing; $1,000; K. G. Weber, Leader.

Address inquiries to: Clinton E. Atkinson, as in No. 6 above.

8. Guiding of Fishes.

The objectives of these studies are to determine the most effective electrical conditions for controlling the movements of salmon fingerlings with pulsating direct current, the principles of orientation involved and the degree to which this method can be used to protect the fingerlings on their downstream migration. The efficiency of sonic vibrations, light waves and magnetism in guiding salmon into safe channels of migrations will be studied.

Hdqrs. Seattle; began in 1945, continuing; K. G. Weber and G. B. Collins, Leaders.

Address inquiries to: Clinton E. Atkinson, as in No. 6 above.

WEST VIRGINIA

Conservation Commission

1. Development and Management of Public Fishing Areas.

A progressive fish management program has continued in effect over all State parks and forests and other state-owned waters. This includes both warmwater and trout lakes and streams. Each area undergoes a periodic check to determine if, and what, measures are needed to bring about any improvement in fishing conditions. An effective creel census also helps to provide the basis as to the extent of management measures necessary.

Statewide; began 1949, indefinite; $4,000; Harry Van Meter, Leader.

Address inquiries to: Harry Van Meter, Assistant Chief, Division of Fish Management, Conservation Commission of West Virginia, Charleston, W. Va.

2. Fishing Areas Investigation for Development. (FA: F-2-R)

There is a great need of more available fishing waters for West Virginia anglers. This project concerns the mapping and survey of new lake sites, and the investigation into such other waters which now lie idle or are so inaccessible that anglers do not frequent them. Strip mine pools, beaver ponds and backwater areas are all taken into consideration for the improvement and development as additional fishing areas. All potential fishing areas of the State are being mapped and catalogued.

Hdqrs. Elkins; began October 1952, to close 1954; $13,640, Donald Peterson, Leader.

Address inquiries to: Harry Van Meter, as in No. 1 above.

3. National Forests Fishery Management Program.

Lake sites are being located and surveyed in conjunction with the general lake-building program now in progress. Construction of a 26-acre trout impoundment, known as Spruce Knob Lake, was completed and officially opened to public fishing in June of 1953.

Stream improvement also is under way on the National Forest areas in addition to establishing several trout-stocking methods for assuring higher angler success. A fishery biologist is in supervision of all of these above activities.

U. S. Forest Service cooperating; George Washington and Monongahela National Forests ; began 1952, indefinite; $5,000; Jack D. Larmoyeux, Leader; reports available.

Address inquiries to: Harry Van Meter, as in No. 1 above.

4. Population Manipulation and Creel Census of Two West Virginia Smallmouth Bass Streams. (FA: F-1-R)

Objectives of the study are to obtain a clear picture of the existing populations of fish in the streams under study by using electric shockers in designated areas. Several fish management techniques are being employed for altering the fish populations to note any increase in the productivity of angler-desired species. A creel census is in effect to estimate the extent to which various species of fish are being harvested.

Hardy County; began May 1952, to close 1955; $26,672; George D. Holton, Carl Sullivan, Leaders; reports available.

Address inquiries to: Harry Van Meter, as in No. 1 above.

5. Distribution of West Virginia Fishes.

Collections of fishes are being made on all the major streams and tributaries in the State in order to acquire knowledge of the different fish species present, their range of distribution and abundance in West Virginia waters. All collections are turned over to Dr. Edward Raney of Cornell University for positive identification. In conjunction with this project, scale samples and measurements of varied game fish species are being recorded for determining and establishing a standard growth pattern of these species.

Cornell University cooperating; hdqrs. Charleston; began 1951, to close 1956; $500.

Address inquiries to: Harry Van Meter, as in No. 1 above.

6. Small Impoundments Investigation and Research. (FA: F-3-R)

The project was originated to investigate various types of small fishing impoundments and to make an assay of pond conditions in respect to fish populations; to catalogue the many farm ponds and small impounded areas throughout the State; to conduct suitable experiments in hatchery ponds for the purpose of learning additional facts about managing fish populations under varying conditions; and to offer limited assistance through recommendation and suggestion to private pond owners throughout the State.

Hdqrs. Elizabeth; began May 1953, indefinite; $10,346; Curtis Simes, Leader.

Address inquiries to: Harry Van Meter, as in No. 1 above.

7. Elk River Investigational Project.

The study of a popular bass stream is being continued as a result of public controversy as to the reported decline in fishing success over recent years. Creel census, limited hatchery stockings, tagging, age and growth studies, pollution factors and a thorough check into the stream habitat is being compiled. The 128 miles of river entering into this investigation are divided into six areas, with each undergoing separate and detailed study.

Central West Virginia; began June 1952, to close 1956; $7,000; Paul L. Hooper, Leader.

Address inquiries to: Harry Van Meter, as in No. 1 above.

8. New Introduction of Game Fish Species in West Virginia Waters.

Several different game fish species have recently been stocked in an effort to either establish or re-establish these in West Virginia waters. The Kokanee salmon was introduced into five different impounded waters of the State in an effort to establish this species as an additional game fish for the angler's benefit. The walleye, although native to West Virginia streams, has now been stocked in several other impounded waters of the State in an attempt to provide an additional game fish catch. The white bass, also native to West Virginia streams, was experimentally stocked in another impoundment with the hope that it might become established.

Hdqrs. Charleston; began 1952, indefinite; $1,000; Harry Van Meter, Leader.

Address inquiries to: Harry Van Meter, as in No. 1 above.

9. Fish Hatchery Production, Expenditures and General Efficiency.

A detailed report has been published on the hatchery expenditures for the past year in relation to the total production of fishes from five state fish hatcheries. Included are the production records and general efficiency for each hatchery. Taken into consideration are such items as mortalities of fishes, conversion factors, feeding costs, distributions, and personnel expenses involved in carrying out the hatchery program. Three of these hatcheries rear trout only with another having facilities for rearing both trout and warm-water fishes and one producing warm-water fishes entirely.

Hdqrs. Charleston; began 1952, to close 1953; $100; Robert F. Stephens, Leader; reports available.

Address inquiries to: Harry Van Meter, as in No. 1 above.

10. Fishery Observations on Wheeling Creek.

An intensive summertime survey was made on Wheeling Creek, a popular smallmouth bass stream that is open to year-round fishing. This same stream is also subject to many diversified water usages, including industrial wastes, sewage deposits, car washings, irrigation, dredgings, silt loads, etc. The survey was conducted in order to delve into some of these factors and what influence they are having on fish and their habitat.

Big Wheeling Creek; began 1951, to close 1953; $500; E. A. Seaman, Leader; reports available.

Address inquiries to: Harry Van Meter, as in No. 1 above.

11. Creel Census Activities of West Virginia Waters.

There are several different forms of creel censuses being employed in West Virginia waters, including: (1) The standard or "permit system" of obtaining records from anglers frequenting state park and forest areas; (2) an aerial census of bass and trout waters on their respective opening dates, to gather additional data over the entire state as to the concentrations of anglers; (3) a "voluntary" census of anglers who are encouraged (by posters) to record their fishing information and deposit it in a special mail box near the area of fishing; (4) a selective creel census project composed of thirty select anglers who are known for their fishing ability. These men keep personal records of all their fishing trips throughout the State, thereby, providing information on the fishing potential of many waters not included under other creel census activities.

Statewide; began 1949, indefinite; $1,000; Harry Van Meter, Leader.

Address inquiries to: Harry Van Meter, as in No. 1 above.

West Virginia University

1. Limnological Investigation of Lake Lynn.

Objectives of the project are to make studies of temperature, dissolved oxygen, pH, alkalinity, sulfate, iron, etc. at regular intervals for one year at selected stations, with the hope of determining possible biological productivity and of establishing what steps may be required to increase the abundance of fish and other aquatic organisms.

Isaak Walton League, Morgantown Chapter, cooperating; Monongalia County; began September 1953, to close August 1954; $2,000; Leland H. Taylor, Leader.

Address inquiries to: Earl L. Core, Head, Department of Biology, West Virginia University, Morgantown, W. Va.

U. S. Fish and Wildlife Service, Branch of Fishery Biology

1. Etiology of Fish Diseases.

A study to determine which of the diseases are caused by pathogens and which have nutritional origin. Isolation and determination of the eventual pathogens is involved, and development of control measures.

Hdqrs. Leetown; began 1947, continuing; S. F. Snieszko, Leader.

Address inquiries to: S. F. Snieszko, Director, Microbiological Laboratory, Leetown, Kearneysville, W. Va.

2. A Study of the Toxicity of Various Chemical Compounds, Insecticides and Herbicides, on Warm- and Cold-Water Freshwater Fishes.

Objectives of the project are to screen the chemicals toxic to fish and to determine the mechanism of action of the most toxic substances, and make practical application of the results.

Hdqrs. Microbiological Laboratory, Kearneysville; began April 1952, to close June 1954; E. H. Hollis, Jr., and Robert E. Lennon, Leaders.

Address inquiries to: S. F. Snieszko, as in No. 1 above.

WISCONSIN

Conservation Department

1. Fish Ecology Studies, With Special Reference to Muskellunge and Panfish.

Muskellunge studies include determination of feeding habits of early stages of fry, factors influencing their survival in rearing ponds, and the practicality of artificial feeding; the suitability of marking by finclipping or tagging for future identification; survival of muskellunge of different sizes planted in natural lakes; and the effects of planted muskellunge on stunted panfish populations.

Panfish studies include the determination of population density, growth rates and condition of a stunted panfish population; and the effects of introduction of plantings of muskellunge fingerlings of different sizes on panfish populations.

Rearing ponds at Spooner and nearby lakes; began 1953, to close 1958; $10,000; Leon D. Johnson, Donald K. Dunham, Stanley Kmiotek, Leaders.

Address inquiries to: Conservation Department, Area I headquarters, Spooner, Wis.

2. Evaluation of Lake Trout Stocking in Lake Superior.

Eggs of lake trout are taken from adult spawners in Lake Superior. These are hatched and reared to fingerling and yearling sizes. Various lots are being finclipped and planted in Lake Superior to evaluate returns from plantings of this type.

Bayfield Hatchery and western Lake Superior; began 1949, indefinite, $25,000; Russell I. Daly, Clarence A. Wistrom, Willard Sieh, Leaders; reports available.

Address inquiries to: Conservation Department, as in No. 1 above.

3. Effects of Angling Restrictions on Available Fish Stocks of Warm-water Fishes in Lakes.

Population estimates and creel census have permitted some estimates of exploitation of game fishes under known levels of fishing pressure on five lakes in Vilas County, which have been open to year-round fishing with no size limits and no bag limits imposed. Principal game fish present include yellow walleyes, smallmouth bass, yellow perch, rock bass, northern pike, muskellunge and largemouth bass. Fishing is allowed by free permit only with accurate creel census possible.

Vilas County; began 1946, indefinite; $6,000; John H. Klingbiel and Arthur A. Oehmcke, Leaders; reports available.

Address inquiries to: Conservation Department, Area II Headquarters, Woodruff, Wis.

4. Experimental Management of Lake Eau Claire.

Lake Eau Claire, an 1,800-acre impoundment on the Eau Claire River, is being managed for warm-water species of sport fishes. The lake was drained with cooperation and financial assistance from county authorities to control carp populations and to remove stumps and debris from selected areas. These selected areas will be used in future carp seining operations. Management plans are based on biological inventories of fish populations present with review by local interested agencies.

Eau Claire County cooperating; Eau Claire County; began 1953, to close 1956; $6,500; John Brasch, Lyle Christenson, Leroy Small, Leaders.

Address inquiries to: Conservation Department, Area III Headquarters, Black River Falls, Wis.

5. Study of Lake Sturgeon Fishery in Fox River Watershed.

Population estimates are being made by a mark-and-recovery method. An estimate of the catch is obtained by a one-dollar tag required for each sturgeon caught. This makes possible an estimate of the rate of exploitation upon which to base proper regulation of the fishery. The age-composition of the catch is being determined by an analysis of pectoral fin bone sections. Gonads are being examined to determine time at first maturity and the reproductive potential.

Lakes Winnebago, Butte des Morts, Poygan, and Fox and Wolf Rivers; began 1953, to close 1958; $7,000; Robert T. Probst, Leader; reports available.

Address inquiries to: Conservation Department, Area IV Headquarters, Oshkosh, Wis.

6. Fish Ecology Studies, With Special Reference to Sheepshead, White Bass, and Yellow Walleye.

A program of removal of sheepshead from Lake Winnebago is aimed at reducing competition for the more favored sport fishes such as yellow walleye and white bass. The present study will evaluate the results of this removal program by an anlysis of the fishery statistics, growth and mortality rates of the sheepshead populations and accompanying changes in populations of yellow walleye and white bass.

Lake Winnebago; began 1953, to close 1958; $7,000; Thomas L. Wirth and Richard F. Harris, Leaders.

Address inquiries to: Conservation Department, as in No. 5 above.

7. Evaluation of Watershed Stabilization Procedures With Special Reference to Trout Populations. (FA: F-4-R)

Objectives of the project are to determine distribution, abundance and changes in the fish populations of portions of streams where watershed stabilization procedures are in operation; to determine distribution, abundance and changes in important food items of bottom organisms in these test streams; and to determine changes in water quality, degree of flooding and rate of siltation in watersheds studied.

Dane County; began December 1953, to close 1958; $25,000; Oscar M. Brynildson, Leader.

Address inquiries to: Conservation Department, Area V Headquarters, Nevin Hatchery, Madison, Wis.

8. Yellowstone Lake Development. (FA: FW-1-D)

A headwater drainage area of 42.87 square miles of the Yellowstone River will be used to furnish water for a 450-acre impoundment. The dam will be of concrete and earth-dike construction 1,300 feet in length with a head of approximately 15 feet. It will be completely drainable by appropriate concrete control structures.

The impoundment will be managed as a combination fish, game, and waterfowl project with considerable public use lands in the area. The impoundment is located in the "driftless" area of Wisconsin which has very few natural lakes.

Lafayette County; began 1952, to close March 1954; $340,000; Elmer F. Herman, Leader.

Address inquiries to: Conservation Department, as in No. 7 above.

9. Watershed Management. (FA: F-1-D in part)

Streams have been selected as demonstration areas in which proper land use and water stabilization is encouraged. Stream fencing and channel improvements are constructed to improve habitat for trout. Cooperative projects between landowners, associations, and public agencies are encouraged.

Statewide; began 1951, indefinite; $175,000; D. John O'Donnell, Leader; reports available.

Address inquiries to: Conservation Department, as in No. 7 above.

10. Fish Ecology Studies, With Special Reference to Carp and Largemouth Bass. (FA: F-3-R)

Delafield pond studies are to determine the inhibiting effects of carp upon the natural reproduction of largemouth bass, bluegills, and crappies, in ponds stocked with adults of each species in various combinations. Observations on spawning activity are made and the ponds are drained periodically.

The Brown's Lake study includes a creel census and a population estimate permitting an analysis of the rate of exploitation of largemouth bass in this lake. Scales are collected from angler-caught fish and fish taken by seining to allow a determination of sampling differences between the two methods concerning the size and growth rate of the fish.

Southeastern Wisconsin; began 1953, to close 1958; $20,000; Donald F. Mraz, Charles W. Threinen, Leaders; reports available.

Address inquiries to: Donald F. Mraz, Conservation Department, Delafield, Wis.

11. Lake Mapping. (FA: F-2-R)*

Objective of the project is to provide maps of lakes which are to be inventoried. Most of the mapping will be done during the period of the ice cover.

Statewide; began January 1953, indefinite; $10,500; Arthur Ensign, Leader.

Address inquiries to: Conservation Department, Madison 2, Wis.

University of Wisconsin

1. Studies on Movements and Concentrations of Fishes by Sonic Methods.

The project objectives are to study the movement and concentrations of fishes through the use of a modified echo sounder, a special oscilloscope attachment. Also, divers equipped with underwater lights and throat microphones aid in the observations.

Lake Mendota; began 1950, to close 1954; $4,600; Arthur D. Hasler, J. J. Tibbles, Leaders; reports available.

Address inquiries to: Dr. Arthur D. Hasler, Birge Hall, University of Wisconsin, Madison, Wis.

2. Introductory Study of the White Bass, Lepibema chrysops, in Lake Mendota.

The principal objectives are to obtain information concerning the growth rates, food habits, and schooling behavior of the white bass, primarily concentrating the effort in the Second Point and Picnic Point regions. Because the activities of white bass can be observed directly from a boat, distribution of white bass is followed by observation of surface schooling. Also echo-sounding from the launch O. N. R. Impulse indicated a possible source of information on sub-surface school movements of the white bass.

Lake Mendota; began 1953, to close 1955; $2,000; Arthur D. Hasler, Ross M. Horrall, Leaders.

Address inquiries to: Arthur D. Hasler, as in No. 1 above.

3. Orientation of Fishes to Odors.

On the hypothesis that salmon return to their home streams to which they have been previously conditioned by the odors inherent in that stream, work is continuing to determine the various aspects of the orientation of fishes to odors.

Hdqrs. University of Wisconsin; began 1948, continuing; $6,000; Arthur D. Hasler and W. J. Wisby, Leaders; reports available.

Address inquiries to: Arthur D. Hasler, as in No. 1 above.

4. Trout Production in Alkalized Bog Lakes.

Objective of the project is to determine production of trout in bog lakes where transparency has been improved by alkalization with lime; production is measured at varying levels of stocking. Standing crops of plankton and production of trout have been measured on these lakes in which one has been alkalized and one left in the natural state.

Vilas County; began 1952, to close 1955; $2,500; Arthur D. Hasler, W. E. Johnson, Leaders; reports available.

Address inquiries to: Arthur D. Hasler, as in No. 1 above.

5. Hastening Spawning in Cyprinid Fishes With Pituitary Hormones.

The objective of the project is to develop an assay method for measuring the minimum quantity of pituitary hormone necessary to induce spawning in cyprinid fishes. Particular attention is given to the refinement of techniques in the use of the hormone for producing spawning in freshwater pond fishes. This technique will be employed in India where, at the present time, the fish stocks are undependable due to the unreliability of the rains which induce spawning naturally.

Ford Foundation Cooperating; Hdqrs. University of Wisconsin; began 1953, to close 1954; $500; Arthur D. Hasler, L. S. Ramaswami, Leaders; reports available.

Address inquiries to: Arthur D. Hasler, as in No. 1 above.

6. The Competition of Panfish With Bass in a Vilas County Lake.

It is the object of this experiment to thin the competing panfish and measure the change in production of the lake for bass, also the rate of growth of the bass, under these less competitive conditions.

Vilas County; began 1952, to close 1956; $3,500; Arthur D. Hasler, R. A. Parker, Leaders.

Address inquiries to: Arthur D. Hasler, as in No. 1 above.

7. Selective Breeding of Trout and Studies of Behavior and Adaptation to Stress.

This study was started to determine the influence of heredity on rate of growth and to study the behavior and adaptation of the various progeny lots to physiological stress.

The procedure for this part of the study is identical with the procedure employed for the past 2 years except the density of fish in the containers is being held constant at a level fairly close to the optimum. This will allow the genetic make-up of the offspring to express its influence in their rate of growth. By use of a plan of statistical analysis similar to one used previously the investigators will be able to evaluate the heritability of growth rate.

Hdqrs. University of Wisconsin; began 1950, to close 1955; $2,000; Arthur D. Hasler, D. H. Hazelwood, Leaders.

Address inquiries to: Arthur D. Hasler, as in No. 1 above.

8. Competition of Trout and Bass Stocked in the Same Waters in Which All Other Species Have Been Removed.

The project objective is to determine the practicability of stocking bass simultaneously with trout in small lakes, where deep water is available for trout and shallow water for bass.

Chippewa County; $3,500; Arthur D. Hasler, W. R. Schmitz, Leaders.

Address inquiries to: Arthur D. Hasler, as in No. 1 above.

The Institute of Paper Chemistry

1. The Effect of Pulp and Paper Mill Wastes on Streams as Fish Habitats.

Objective of the project is an overall study of pulp and paper mill wastes on receiving waters, either fresh water streams or tidal estuaries. Particular emphasis is placed on possible toxic properties, oxygen depleting characteristics and on inert solids.

Hdqrs. Appleton; began July 1, 1942, continuing; Willis M. Van Horn, Leader.

Address inquiries to: Willis M. Van Horn, Institute of Paper Chemistry, Appleton, Wis.

Sulphite Pulp Manufacturers' Research League, Inc.

1. Chemical, Physical, and Biological Studies of the Effect of Spent Sulphite Liquor on Receiving Streams.

The objective of the project is to develop more information on the exact relationships and conditions developing as a result of the controlled disposal of spent sulphite liquor in receiving waters and the aquatic biota thereof.

The Institute of Paper Chemistry cooperating; One or more watersheds affected by disposal of S. S. L. in the States of Wisconsin and Michigan; began February 1, 1954, to close December 31, 1954; $25,000; Averill J. Wiley and Willis Van Horn, Leaders.

Address inquiries to: Averill J. Wiley, Technical Director, Sulphite Pulp Manufacturers' Research League, Inc., 1101 E. S. River Street, Appelton, Wis.

U. S. Forest Service, Forest Products Laboratory

1. Pulp Paper Waste Pollution Abatement.

Objective of the project is to develop a satisfactory chemical recovery method for the spent liquor from the cold soda semichemical pulping process and the neutral sulfite semichemical pulping process. The development of an efficient and economical recovery process would measurably reduce the pollutional characteristics of the mill effluent.

Began July 1950, continuing; $5,000; P. K. Baird, Leader; reports available.

Address inquiries to: Director, U. S. Forest Products Laboratory, Madison, Wis.

U. S. Fish and Wildlife Service, Branch of Fishery Biology

1. Fluctuations, Interrelationships and Movements of Fish Populations.

The objective of this project is to follow the fluctuations in the age, growth, size, and abundance of the different species, commercial and non-commercial; and to ascertain through marking experiments and morphological studies whether local races and stocks exist, and the extent of movements and intermingling of different segments of the populations.

Lakes Huron, Superior, and Michigan; hdqrs. Sturgeon Bay; began 1947, continuing; Leonard S. Joeris, Leader.

Address inquiries to: James W. Moffett, Chief, Great Lakes Fisheries Investigations, 1220 East Washington Street, Ann Arbor, Mich.

2. Limnology of Green Bay.

The objective of this project is to make a limnological reconnaissance with special reference to physical conditions--seiches, temperatures, currents--in the hydrographically complex control region in relation to the distribution and movements of fish.

Hdqrs. Sturgeon Bay; began May 1950, continuing; Leonard S. Joeris, Leader.

Address inquiries to: James W. Moffett, as in No. 1 above.

WYOMING

Game and Fish Commission

1. Lake and Stream Surveys and Inventories.

A card file is kept on all lakes and streams in the State with reference to their physical and chemical conditions, their planting records, their census records and other pertinent information. Surveys at regular intervals thus furnish a means of making comparisons upon which management plans can be based. Such surveys and inventories also include newly developed waters and waters on which there has previously been insufficient information.

Statewide; began January 1, 1951, continuing.

Address inquiries to: A. F. C. Greene, State Fish Warden, P. O. Box 378, Cheyenne, Wyo.

2. Lake Rehabilitation, Reclamation and Rough Fish Control.

Objectives of the project are to eradicate all fish species in certain lakes where a complete new start is indicated as the best management procedure; to reduce by seining or rotenoning rough fish populations in lakes and reservoirs from which they cannot be completely removed; and to carry on a seining program through commercial seiners for further rough fish control. Complete eradication

was made in one large lake after partial draining and in a number of small lakes and reservoirs. Bays of two large reservoirs were rotenoned during periods of rough fish concentrations.

Statewide; began July 1950, continuing.

Address inquiries to: A. F. C. Greene, as in No. 1 above.

3. Fish Salvage and Transplanting.

The objective is to salvage game fish species from waters suffering drought conditions or otherwise becoming unsuitable as fish habitat and transplanting to suitable waters where they will be available to the State's anglers. Over-population may also be reduced at times with part of their numbers being transplanted to waters better able to maintain them. In some instances forage fish and other aquatic life may be transplanted to bolster existing natural fish feeds, and fish are removed from unscreened irrigation diversions when stranded.

Statewide; began January 1951, continuing.

Address inquiries to: A. F. C. Greene, as in No. 1 above.

4. Development of Farm Ponds, Small Reservoirs and Lakes.

The project objectives are to investigate and develop fishing waters in areas not presently adequately supplied and to carry on subsequent follow-up management procedures.

Statewide; began 1950, continuing.

Address inquiries to: A. F. C. Greene, as in No. 1 above.

5. Lake DeSmet Project.

The objective of this project is to secure detailed information relative to the conditions and fish populations of this lake which can be applied in returning this lake to its original condition of an excellent fishery.

Johnson County; began winter 1950, to close spring 1955; Louis S. Pechacek, Leader.

Address inquiries to: A. F. C. Greene, as in No. 1 above.

6. Sand Creek Trout Population Studies.

The objective of the project is to make a concerted study of this creek for information which can be used not only for the management of the creek itself but also as a means of comparative study with other streams of known types.

Crook County; began July 1950, to close January 1954; Fred M. Eiserman, Leader.

Address inquiries to: A. F. C. Greene, as in No. 1 above.

7. Life History and Management Study of Rocky Mountain Whitefish in Wyoming.

The objectives of the project are to determine the competition of this species, if any, with trout; to determine the seasonal movements of the species; and to study its life history as pertains to its habitat in Wyoming, from this information to establish a management program and enhance its position in the State's fisheries.

Lincoln, Park, Sheridan, Sublette and Teton Counties; began January 1952, to close January 1955.

Address inquiries to: A. F. C. Greene, as in No. 1 above.

8. Experimental Hybridization of Brook and Mackinaw Trout.

Objectives of the project are to cross the two species (male Mackinaw x female brook and female Mackinaw x male brook); to propagate the hybrids for taxonomic studies; to experimentally breed the hybrids by artificial reproduction; to stock the hybrids in a virgin lake to determine their survival and practical management values.

Dome Lake, Sheridan County and State Fish Hatchery, Story; began October 1952, indefinite; Charles L. Sowards, Leader.

Address inquiries to: A. F. C. Greene, as in No. 1 above.

9. Experimental Hybridization of Brook and Brown Trout.

Objectives of the project are to cross brook and brown trout so that survival past the egg stage can be determined; to rear a small number for taxonomic study; and to stock a suitable farm pond with hybrids; if possible to check their growth rates, survival and temperature tolerance.

State Fish Hatchery, Story; began November 1953, to close November 1955, Charles L. Sowards, Leader.

Address inquiries to: A. F. C. Greene, as in No. 1 above.

10. Trout Fisheries Investigations. (FA: F-1-R)

Objectives of the project are to determine the effectiveness and practicability of stream improvement structures installed in two types of Wyoming streams; to determine the approximate total catch and the catch per unit of effort, and to establish the age, growth, and natural reproduction of the game fish in the experimental section of Clear Creek; to determine the approximate percentage survival to the fisherman's creel, of hatchery reared fish of various sizes; and to arrive at an estimate of the mortality of these same fish during stipulated time periods.

Johnson, Teton, Sweetwater and Albany Counties; began January 1952, to close December 1954; $21,500; Fred M. Eiserman, Jack J. Kanaly, John Mueller, Leaders; reports available.

Address inquiries to: Floyd M. Blunt, Coordinator, Wyoming Game and Fish Commission, Box 378, Cheyenne, Wyo.

11. Aerial Survey of Lakes and Ponds. (FA: F-2-R)

Objectives of the project are to map, by means of aerial reconnaissance, all ponds, lakes and reservoirs in areas of the State other than forests and mountains; to indicate on such maps the most expeditious means of reaching these impoundments on the ground from known roads or highways; to indicate for each impoundment its apparent possibilities for sustaining aquatic life on a continuous basis. This will include notes on comparative depth, aquatic vegetation, comparative turbidity, presence of springs, etc., and to list all impoundments, in order of their apparent fisheries potentials, for investigation on the ground and subsequent stocking with game fishes.

Statewide; began July 1953, to close December 1953; $5,200; Jack J. Kanaly, Fred M. Eiserman, Grant O. Hagen, Leaders; reports available.

Address inquiries to: Floyd M. Blunt, as in No. 10 above.

12. Game and Fish Laboratory Research. (FA: FW-3-R)

The project objectives are the diagnosis of diseases in fish; and a comparison of several trout diets to determine which is most efficient and economical.

Disease Research Laboratory, University of Wyoming, Laramie; began July 1953, to close June 1956; $11,560; George Post, Leader; reports available.

Address inquiries to: Floyd M. Blunt, as in No. 10 above.

13. Ocean Lake Fish and Wildlife Management Unit Development. (FA: FW-2-D)*

Objectives of the project are to construct a floating boat dock, a concrete launching ramp, and to construct roads and fence on an important public fishing area.

Ocean Lake, Wind River Indian Reservation; began August 1953, to close December 1953; $5,920; George Frome, Leader.

Address inquiries to: Floyd M. Blunt, as in No. 10 above.

14. Sinks Canyon Game and Fish Area. (FA: FW-4-L)*

The project is for the purchase of 155 acres in Fremont County including a half mile of a good trout stream (Popo Agie River). This area joins another state-owned area.

Fremont County; began June 1953, indefinite.

Address inquiries to: Floyd M. Blunt, as in No. 10 above.

U. S. Fish and Wildlife Service, Branch of Fishery Biology

1. Vital Statistics of the Yellowstone Lake Fishery.

The objective is to determine the numbers of fish and the sizes of fish to be expected at Yellowstone Lake at different levels of fishing pressure and hatchery activity.

Hdqrs. Logan, Utah; began June 1950, planned for 5 years; Oliver B. Cope, Leader.

Address inquiries to: Oliver B. Cope, Chief, Rocky Mountain Fishery Investigations, Utah State Agricultural College, Logan, Utah.

2. Stocking Policies for Yellowstone Park Streams.

The project is to determine the maximum potential harvest in Yellowstone streams, and to recommend the optimum combination of natural reproduction and stocking to achieve this harvest.

National Park Service cooperating; hdqrs. Logan, Utah; began 1953, to close 1955; Oliver B. Cope, Leader.

Address inquiries to: Oliver B. Cope, as in No. 1 above.

3. Grayling in Grebe Lake.

The project objective is to determine the relationships between rainbow trout and grayling in these waters, especially as they pertain to the regulation of the fishery and the populations.

National Park Service, cooperating; hdqrs. Logan, Utah; began 1953, to close 1954; Oliver B. Cope, Leader.

Address inquiries to: Oliver B. Cope, as in No. 1 above.

ALASKA

Game Commission

1. Game Fish Investigations of Alaska. (FA: F-1-R)

Objectives of the project are: Reconnaissance surveys of sport fishing pressure to determine extent of fishing, species of fish, and relative pressure on individual waters in Fairbanks area; surveys of waters presumed to be barren but suitable for stocking and introduction of sport fish; standard lake and stream surveys of important accessible waters to determine factors affecting production; population composition and productivity investigations of selected waters in Kenai-Susitna areas to determine age-growth and weight-length relationships for management purposes; grayling studies - growth rates, spawning habits, food habits, movements and migrations; and the determination of the significance of the salmon sport fishery in the Ketchikan Derby area and prepare preliminary plans for study to determine needed conservation measures.

Chiefly in Southeastern Alaska, Anchorage, Fairbanks, and Kodiak areas; began October 1, 1951, to close 1955; $71,000; Urban C. Nelson, Leader.

Address inquiries to: Regional Director, Fish and Wildlife Service, P. O. Box 2021, Juneau, Alaska.

2. Stocking of Game Fish in Alaska Waters. (FA: F-3-D)

Objective of the project is the introduction of native rainbow trout in barren waters, depleted waters or waters with unfavorable fish balances for the purpose of creating new fishing waters or improving existing waters.

Hdqrs. Juneau; began July 1953, to close 1955; $12,000; Urban C. Nelson, Leader.

Address inquiries to: Regional Director, as in No. 1 above.

3. Development of Restoration Facilities. (FA: F-2-D)

The object of the project is to spread fishing pressure and develop fishing in remote waters by providing access for fishermen and by improving the management of such waters. Work involves the construction of facilities such as simple shelters, foot trails, and mooring buoys for use by fishermen and personnel engaged in investigations, stocking, and law enforcement work.

U. S. Forest Service cooperating; Territory-wide; began July 1951, to close 1955; $14,000; Urban C. Nelson, Leader.

Address inquiries to: Regional Director, as in No. 1 above.

U. S. Forest Service, Alaska Forest Research Center

1. Effect of Logging on Salmon Streams.

Objectives of the project are to determine the effect of logging, particularly pulp timber logging, on the physical aspects of two salmon streams before and after logging and compared with two others not logged. Factors measured are stream height and rate of flow, rainfall, water and air temperature, stream bed condition and changes in bed and banks.

U. S. Fish and Wildlife Service, Fisheries Research Institute, and U. S. Geological Survey cooperating; Twelve Mile Arm, Kassaan Bay; began April 1949, indefinite; $15,000; H. E. Andersen, Leader.

Address inquiries to: Forester in Charge, Alaska Forest Research Center, Box 740, Juneau, Alaska.

U. S. Public Health Service, Arctic Health Research Center

1. A Plankton Survey of the Lakes on Kenai Peninsula and Central Alaska.

A limnological survey of some of the more readily accessible lakes between Anchorage and Fairbanks, Alaska, is being made. In conjunction with this program, a survey is being made to determine the abundance of plankton in the Alaskan lakes at different times of the year. This information can be used in evaluating the food productivity of lakes and help in determining the feasibility of a trout stocking program.

U. S. Fish and Wildlife Service cooperating; The lakes of the Kenai Peninsula and all the larger lakes adjacent to the Glenn and Richardson highways; began 1952, indefinite; $2,500; Douglas Keith Hilliard, Leader; reports available.

Address inquiries to: Douglas Keith Hilliard, Arctic Health Research Center, P. O. Box 960, Anchorage, Alaska.

2. Water Pollution Studies.

Objectives of the project are to determine the physical, chemical and biological characteristics of waters in the Ward Cove area and the probable effect of discharge of wastes from a large pulp mill into these waters.

Alaska Department of Health cooperating; Ward Cove, near Ketchikan; began 1951, to close 1955; $5,000; E. K. Day, Leader; reports available.

Address inquiries to: E. K. Day, Chief, Environmental Sanitation Branch, Arctic Health Research Center, P. O. Box 960, Anchorage, Alaska.

3. Water Pollution Studies.

Objectives of the project are to determine the physical, chemical and biological characteristics of the Chena River and their seasonal variations; the quantity and strength of sewage and other wastes which it receives and the effect of these wastes on the stream.

Chena River; began 1952, to close 1955; $3,500; E. K. Day, Leader.

Address inquiries to: E. K. Day, as in No. 2 above.

Stanford University and Office of Naval Research

1. A Survey of the Fishes of Arctic Alaska.

(See same title under California)

2. Fish Population Study on Ikroavik Lake.

(See same title under California)

HAWAII

Division of Fish and Game

1. Biology of the Aku or Skipjack (Katsuwonus pelamis).

The aku or skipjack plays a small but important part in the Hawaiian troll sport fishery and this study is undertaken to better understand the seasonal occurrence of aku in Hawaiian waters and the variations in abundance from one season to the next. Detailed information on fishing effort and locality of catch is obtained through interviews with captains of fishing vessels and information on size composition of catch is obtained through length-frequency samples of fish processed through the cannery and fresh fish markets.

U. S. Fish and Wildlife Service cooperating; hdqrs. Honolulu; began January 1954, continuing; $2,000; Vernon E. Brock, Leader; reports available.

Address inquiries to: Vernon E. Brock, P. O. Box 5425, Pawaa Sub-Station, Honolulu, T. H.

2. Fishery and Biology of Opelu or Mackeral Scad.

The objectives of the project are to obtain information on the fishery and biology of the mackeral scad to form the basis of sound conservation measures. The present laws regulating the fishery are based primarily on tradition and not on sound biological information.

Hawaii Marine Laboratory, University of Hawaii, cooperating; hdqrs. Oahu; began February 1949, to close March 1954; $400; Yoshio Yamaguchi, Leader.

Address inquiries to: Vernon E. Brock, as in No. 1 above.

3. Studies of Trolling Lure Efficiency.

The object of this project is to determine the relative efficiencies of various trolling lures commonly used in Hawaiian waters. Comparisons will be made between lures in regard to effectiveness in catching various pelagic game fishes. Considerations will be given to color, size, shape and action of the various lures when comparing effectiveness. Trolling will be conducted only when vessel is operating for other purposes and will be secondary to the vessel's other uses.

Territory-wide; began January 1954, continuing; $200; Carl Nemoto and Georges Gilbert, Leaders.

Address inquiries to: Vernon E. Brock, as in No. 1 above.

4. Biology of Akule or Big-Eye Scad.

The principle objectives of this project are to find the reasons for the apparent decline in the fishery for akule or big-eye scad and obtain information for the formulation of effective management measures. Studies will include examination of catch statistics for changes in fishing effort and availability, sampling of commercial catch for studies of reproduction, food and feeding habits, raciation, growth rate, size and age composition and tagging of fish on fishing grounds for information on various aspects of the biology and vital statistics of this species.

Hdqrs. Honolulu; began January 1954, continuing; $4,000; Yoshio Yamaguchi, Leader.

Address inquiries to: Vernon E. Brock, as in No. 1 above.

5. Study of Biology of Tilapia mossambica.

The immediate object is to determine the feasibility of using Tilapia mossambica as a baitfish in the livebait tuna fishery. Determinations include growth rate, time of spawning, fecundity, maturation, food and feeding habits and reaction of Tilapia when chummed into a school of tuna. One essential quality of good tuna livebait fish is surfacing and gathering about the fishing vessel for protection when chummed into a school of tuna and in this regard, nothing is known about the species. Tilapia mossambica offers some possibility as a pan fish and a forage fish for bass in lakes and reservoirs. Its salinity tolerance ranges from fresh to sea water.

Industrial Research Advisory Council cooperating; hdqrs. Honolulu; began November 1953, to close October 1954; $3,500; Michio Takata, Leader.

Address inquiries to: Vernon E. Brock, as in No. 1 above.

6. Manual of Hawaiian Fishes.

There is a need for a convenient yet accurate means of identifying Hawaiian fishes by fishermen, workers in marine biology, and others interested in fishes. In addition it is desirable to stabilize common names so that fisheries statistics which are collected on the basis of common names, will be more accurate and reliable.

University of Hawaii cooperating; hdqrs. Honolulu; began 1950, to close 1955; $700; Vernon E. Brock and W. A. Gosline, Leaders.

Address inquiries to: Vernon E. Brock, as in No. 1 above.

7. Field Operation of Experimental Longline Fishing Gear.

The research vessel, M. V. Makua, of the Division of Fish and Game, is used in a joint project with P. O. F. I. in testing various experimental long lines for tuna fishing.

U. S. Fish and Wildlife Service cooperating; hdqrs. Honolulu; began March 1954, to close February 1955; $900; Georges Gilbert, Leader.

Address inquiries to: Vernon E. Brock, as in No. 1 above.

8. Freshwater Game Fish Management Research. (FA: F-4-R)

This project is presently being conducted in three phases: (a) The life history study of the goby; (b) experimental introduction of game fishes; and (c) the development of a fish shipping method. As part of the goby study, efforts are being made to trap, tag and mark fish for migration and growth studies; also underwater observation of fish in streams to determine population densities and periodic sampling in the field for studies of reproduction and other aspects of the life history of the fish. Fish kept in laboratory tanks are used for experimental tagging and marking experiments as well as observed for spawning habits. Fish

under experimental introduction as possible game fish include peacock-eye cichlid, smallmouth bass and channel catfish. Efforts on the development of fish shipping method include use of oxygen, sodium amytol, and activated carbon in the form of charcoal in plastic bags. This shipping method will be used to introduce desirable exotics from other parts of the world as well as shipping fish to various islands of the Territory for stocking.

Islands of Kauai and Oahu; began November 1951, continuing; $11,707; K. Ego, Yoshio Yamaguchi, Carl Nemoto, Leaders.

Address inquiries to: Vernon E. Brock, as in No. 1 above.

9. Reef and Inshore Game Fish Management Research. (FA: F-5-R)

This study is concerned with the ecology of reef fishes in Hawaiian waters. Objectives are being accomplished by means of creel census and interviews with shore casters and reef fishermen, underwater transects of selected areas with self-contained diving gear and examination of stomachs and gonads of fish collected by poisoning selected areas and spearing. Various species of fish observed in underwater transects are being related to bottom types, current conditions, locality and general areas to obtain some insight as to why the fish are in certain areas and not in others and ultimately as to the productivity of certain reef and inshore areas.

Territory-wide; began January 1952, continuing; $10,000; Vernon E. Brock, Leader.

Address inquiries to: Vernon E. Brock, as in No. 1 above.

University of Hawaii

1. Spawning and Early Life History of the Maomao (Abudefduf abdominalis).

The maomao is caught among the reefs by local sportsmen. Nothing is known of its life history. An immediate objective is to discover its spawning habits and to identify its eggs and larvae.

Hdqrs. Hawaii Marine Laboratory, Oahu; began July 1953, to close June 1955; $500; A. L. Tester and Philip Helfrich, Leaders; reports available.

Address inquiries to: Dr. A. L. Tester, University of Hawaii, Honolulu 14, T. H.

2. Response of Tuna to Stimuli.

Objectives of the project are the continuation of a study to find a substance chemically and/or visually attractive to tuna; and to conduct sea tests with attractive substances and artificial lures to see if tuna can be attracted to the stern of a fishing boat without the use of livebait.

U. S. Fish and Wildlife Service cooperating; hdqrs. Hawaii Marine Laboratory, Oahu; began June 1953, to close May 1954; $10,000; A. L. Tester, Leader.

Address inquiries to: A. L. Tester, as in No. 1 above.

U. S. Fish and Wildlife Service, Branch of Fishery Biology

1. Investigation of the Hawaiian Skipjack Fishery.

The objective is to extend the season and area of fishing around the Hawaiian Islands by determining the distribution and abundance of skipjack in relation to environmental conditions.

Hdqrs. Honolulu; began 1950, continuing; W. F. Royce, Leader.

Address inquiries to: O. E. Sette, Director, Pacific Oceanic Fishery Investigations, Honolulu, T. H.

2. Life History and Biology of Tunas.

In order to better understand the occurrence, distribution and abundance of tunas of various sizes, this is a study of the spawning, maturation, early life history, and age and growth of the tunas found in the equatorial Pacific.

Hdqrs. Honolulu; began 1948, continuing; D. J. McKernan, Leader.

Address inquiries to: O. E. Sette, as in No. 1 above.

PUERTO RICO

Division of Forests, Fisheries and Wildlife

1. Fish Survey and Investigations. (FA: F-1-R)

Objectives of the project are to obtain basic information on lake fish populations, trends and rate of harvest on which to base a comprehensive fish management program to insure to the public the greatest possible returns in recreational and food values, consistent with a sustained yield. Every other 15 days, for a period of a year, fish census personnel stationed at Lakes Dos Bocas, Caonillas and Guajataca contact fishermen and sportsmen visiting those waters and take records of the catch, number of hours fished, type of bait and fishing methods employed.

Using rotenone, periodic fish population samples are taken in selected coves on Lakes Dos Bocas, Guajataca and Caonillas. Fish collected are sorted by species and size groups; and proportion of forage to game fish determined. Fish stomachs are examined to determine food preferences of the different fish species.

Lakes Dos Bocas, Guajataca and Caonillas; began October 1952, to close June 1954; $11,989; Luis A. Costas Grana, Leader; reports available.

Address inquiries to: B. Quinones Chacon, Department of Agriculture and Commerce, P. O. Box 488, Rio Piedras, Puerto Rico.

2. Puerto Rico Fish Survey and Investigations.

The objective of the project is to develop good fishing, in quality and quantity, in the new impoundments constructed on the Island. Since the native stream fish fauna does not thrive well in impounded waters and practically all the species spawn in the sea, it is necessary to stock these lakes with fresh warm-water exotics as bass and bluegill which have proved so successful in other lakes of the Island. Lakes Luchetti and Loiza with a surface area of 1,198 acres were recently completed and stocked with bass and bluegill fingerlings produced at the Maricao Fish Hatchery. Field observations are being made to determine survival of fingerlings, rate of growth, and reproduction. Creel censuses will be conducted to ascertain rate of harvest and the composition and structure of the catch.

Lakes Loiza, Luchetti, Guayo, Loco, Yahuecas and Prieto; began August 1953, indefinite; $7,000; Felix Inigo, Leader.

Address inquiries to: B. Quinones Chacon, as in No. 1 above.

3. Water Hyacinth Control on Dos Bocas Lake and Cano Tiburones. (FA: FW-1-D)*

Objective of the project is to eradicate the water hyacinth from 500 acres of water in Cano Tiburones, and to eliminate the large floating mats now existing on Dos Bocas, through spraying with 2,4-D.

Began August 1953, indefinite; $4,582; Luis A. Costas Grana, Leader.

Address inquiries to: B. Quinones Chacon, as in No. 1 above.

Government of the Virgin Islands

1. Investigation of Sport Fishing Potential. (FA: F-1-R).

The fresh water resources as well as the marine fishery are being investigated. Small inland impoundments on St. Croix, constructed by other agencies, are being stocked and placed under a management program by the project. Exploratory marine fishing is being carried out to learn the recreational possibilities of the fishery resource about the Islands.

Began August 1952, continuing; $10,000.

Address inquiries to: William Miller, Project Leader, Government House, Charlotte Amalie, St. Thomas, V. I.

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