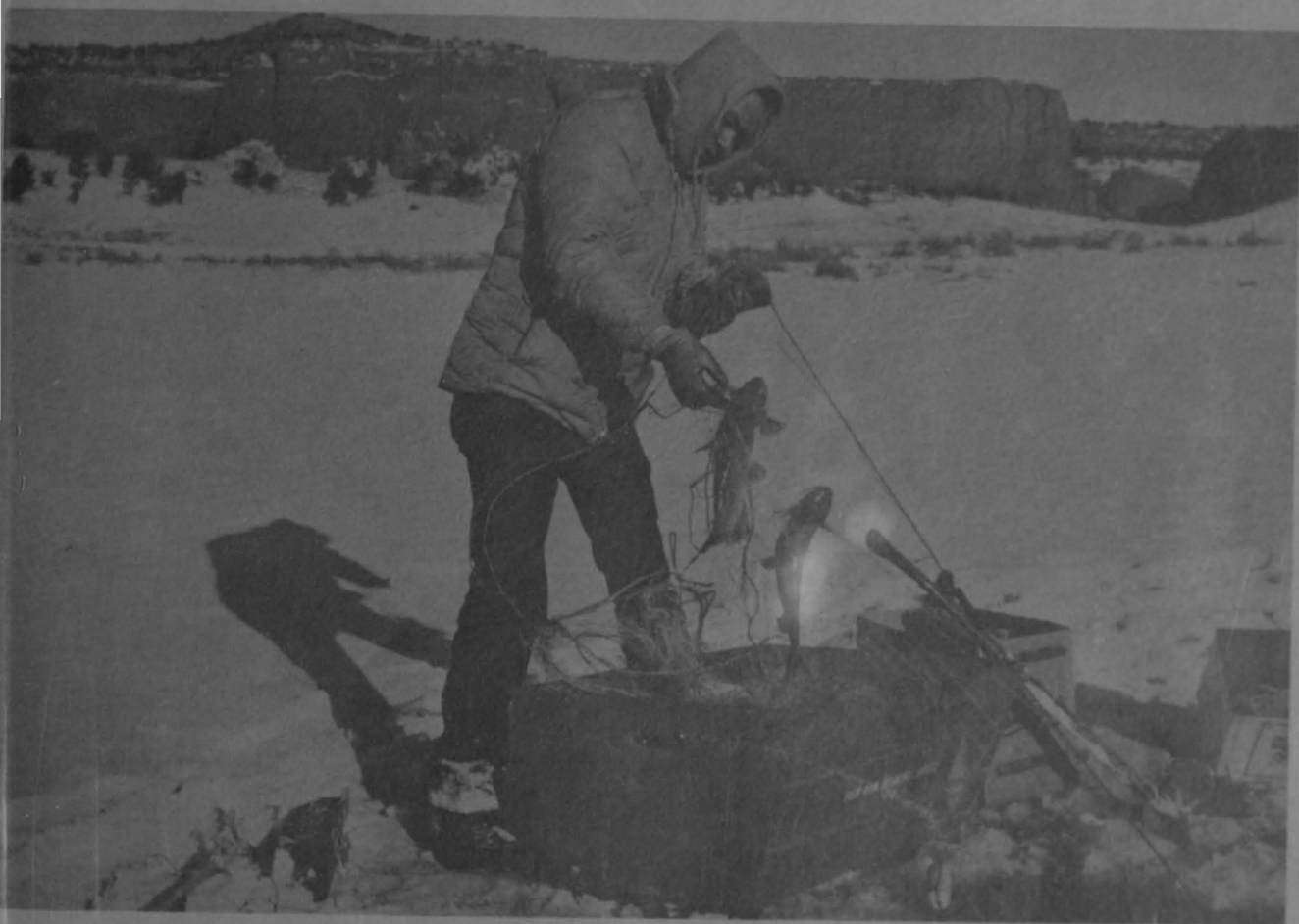


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# FISHERY MANAGEMENT SERVICES ANNUAL REPORT FOR 1963



UNITED STATES DEPARTMENT OF THE INTERIOR  
FISH AND WILDLIFE SERVICE  
BUREAU OF SPORT FISHERIES AND WILDLIFE  
Circular 194

Created by Act of Congress in 1849, the Department of the Interior is responsible for a wide variety of programs concerned with the management, conservation, and wise development of America's natural resources. For this reason it often is described as the "Department of Natural Resources."

Through a score of bureaus and offices the Department has responsibility for the use and management of millions of acres of Federally owned lands; administers mining and mineral leasing on a sizeable area of additional lands; irrigates reclaimed lands in the West; manages giant hydroelectric power systems; administers grazing and forestry programs on Federally owned range and commercial forest lands; protects fish and wildlife resources; provides for conservation and development of outdoor recreation opportunities on a nationwide scale; conserves hundreds of vital scenic, historic, and park areas; conducts geologic research and surveys; encourages mineral exploration and conducts mineral research; promotes mine safety; conducts saline water research; administers oil import programs; operates helium plants and the Alaska Railroad; is responsible for the welfare of many thousands of people in the Territories of the United States; and exercises trusteeship for the well-being of additional hundreds of thousands of Indians, Aleuts, and Eskimos, as well as being charged with resource management of millions of acres of Indian-owned lands.

In its assigned function as the Nation's principal natural resource agency, the Department of the Interior bears a special obligation to assure that our expendable resources are conserved, that renewable resources are managed to produce optimum yields, and that all resources contribute their full measure to the progress, prosperity, and security of America, now and in the future.

Cover.--Tribal Ranger assisting in fish population sampling at Red Lake, Navajo Indian Reservation, Arizona and New Mexico.

UNITED STATES DEPARTMENT OF THE INTERIOR  
STEWART L. UDALL, *SECRETARY*

Frank P. Briggs, *Assistant Secretary for Fish and Wildlife*  
Fish and Wildlife Service, Clarence F. Pautzke, *Commissioner*  
Bureau of Sport Fisheries and Wildlife, Daniel H. Janzen, *Director*

ANNUAL REPORT FOR

1963

DIVISION OF FISHERY MANAGEMENT SERVICES

Willis King, Chief



Prepared by

Edward C. Kinney, Staff Specialist

Bureau Circular 194

Washington

July 1964

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## TABLE OF CONTENTS

Summary of 1963 Accomplishments.....	5
Fishery Management Programs on Federal Areas and Indian Reservations.....	5
Department of Defense Areas.....	5
Cheatham Annex, Williamsburg, Virginia.....	6
Fort Gordon, Georgia.....	8
Eglin Air Force Base, Florida.....	10
Indian Reservations.....	12
Quinault, Washington.....	14
Warm Springs, Oregon.....	15
Colorado River, Arizona and California.....	18
Navajo and Hopi, Arizona, New Mexico and Utah.....	19
Pine Ridge, South Dakota.....	20
Red Lake, Minnesota.....	21
National Forests.....	23
National Parks.....	24
National Wildlife Refuges.....	25
Veterans Administration.....	27
Other Federal Areas.....	27
Cooperation with Other Divisions of the Bureau of Sport Fisheries and Wildlife.....	27
Cooperation with the States.....	29
Striped Bass Spawning Study.....	29
Kentucky Trout Stream Survey.....	29
River Investigations.....	29
Acid Mine Pollution Studies.....	30
Fishery Management Programs on Other Waters.....	32
Training and Extension Activities.....	33
Cooperative Fishery Units.....	34

## Tables and Figures

Figure 1.--Location of Regional Offices and Field Stations.....	iii
Table 1.--Number of Areas with Active Management Programs, 1963.....	3
Table 2.--Comparison of Number of Visits to Federal Areas and Indian Reservations and Number of Reports Submitted in 1963 and 1962.....	3
Table 3.--Estimates of Recreational Fishing Afforded on Federal Areas and Indian Reservations by Cooperative Management Programs, 1963.....	4
Table 4.--Comparison of 1957 and 1963 Data on Fishery Management Programs on Department of Defense Areas.....	5
Table 5.--Comparison of 1957 and 1963 Data on Fishery Management Programs on Indian Reservations.....	13
Table 6.--Potential Fish and Wildlife Water Deleteriously Affected by Acid Mine Pollution.....	31
Summary of Fishery Management Services, 1963	
Table 7.--Air Force Bases.....	37
Table 8.--Army Installations.....	38
Table 9.--Navy and Marine Installations.....	39
Table 10.--Veterans Administration Areas.....	40
Table 11.--National Forests.....	41
Table 12.--National Parks.....	42
Table 13.--National Wildlife Refuges.....	43
Table 14.--Miscellaneous Federal Areas.....	44
Table 15.--Indian Reservations.....	45
Table 16.--Summary of Fish Habitats Served and Management Accomplishments, 1963.....	46

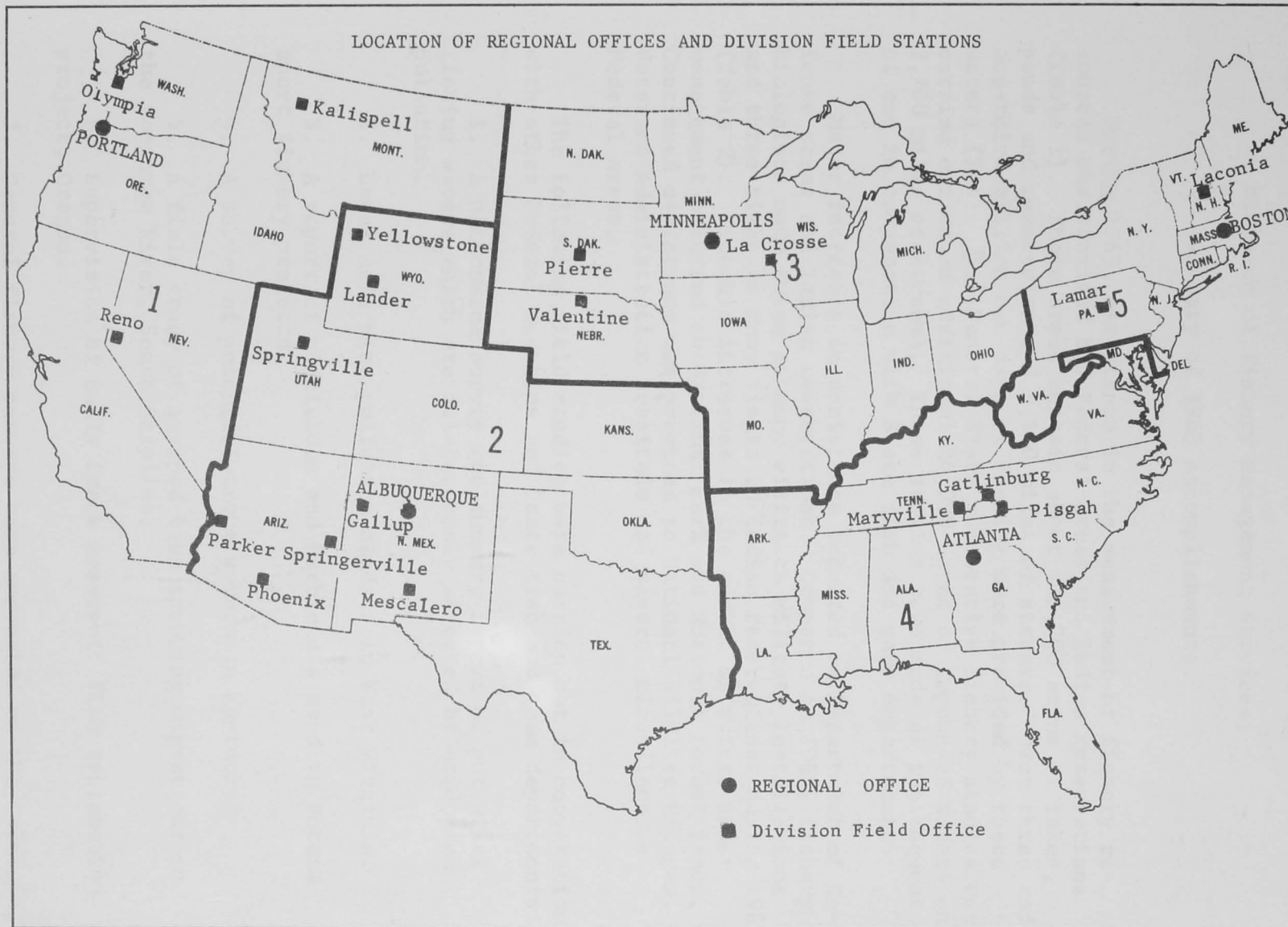


Figure 1.--Location of Regional Offices, Bureau of Sport Fisheries and Wildlife, and Division of Fishery Management Services Field Stations.

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## Division of Fishery Management Services

### Summary of 1963 Accomplishments

During 1963, assistance in the management of fishery resources was provided 300 Federal areas and Indian reservations (Table 1). These areas contain about 415,000 acres of lakes, ponds and reservoirs and 5,400 miles of streams. Over three and one-third million man-days of fishing were provided by these waters (Table 3). Federal-State cooperative fishery studies were carried out on an additional 84,000 acres of impounded waters and 2,700 miles of streams. These studies were made at the request of and in cooperation with State fish and game departments.

Major increases in assistance occurred on Department of Defense areas and Indian reservations. Compared to 1962, fishery biologists made twice as many visits to military installations and three times as many visits to Indian reservations during 1963 (Table 2). Sizeable increases in the amount of waters under management occurred on National Park and National Forest lands. Continued assistance was provided to National Wildlife Refuges, Veterans Administration hospitals and several miscellaneous Federal areas.

The following field studies were carried out in cooperation with other Federal agencies and State fish and game departments:

1. A nationwide survey and summary report of potential fishing waters which are deleteriously affected by acid mine pollution.
2. Local acid mine pollution studies in West Virginia.
3. A report of piscicides and herbicides used in Bureau sport fishery projects.
4. A survey of potential trout waters in Kentucky.
5. A field study of striped bass spawning migrations in the Congaree River, South Carolina.
6. Supervision of Bully Creek Reservoir fish reclamation project, Oregon.
7. General fishery surveys were conducted on the Colorado, Delaware, Mississippi Rivers.



By the close of the calendar year 1963 eleven Cooperative Fishery Units were in operation. During the year new Units were activated at Colorado State University, Cornell University, Louisiana State University, Montana State College, North Carolina State College, The Pennsylvania State University, University of Georgia, University of Massachusetts and the University of Missouri. Units at the University of Maine and Utah State University began their second year of operation during 1963.



The Division of Fishery Management Services held its first conference of Regional Supervisors and Washington Office personnel at Gatlinburg, Tennessee on October 27 to September 2, 1963. (Photo at left). The purpose of the conference was to review

the fishery management programs in each region; to exchange ideas on administration and management; to develop uniform reporting procedures; to examine the Division's role in the use of chemicals in fishery management; and to discuss cooperative working relationships involving other agencies and other Bureau Divisions.



Army warden checking fishermen at Fort Devens, Massachusetts. Creel census is an important measure of fishing success. U. S. Army photograph.

Table 1.--Number of Areas With Active Management Programs, 1963.

	R E G I O N					Totals
	1	2	3	4	5	
<u>Department of Defense</u>	11	15	27	83	24	160
Air Force	5	5	10	20	8	48
Army	2	9	15	40	11	77
Navy and Marine	4	1	2	23	5	35
<u>Other Federal Areas</u>						
Veterans Administration	--	1	8	2	7	18
National Forests	--	--	1	7	4	12
National Parks	3	2	--	3	--	8
Wildlife Refuges	7	4	24	17	1	53
Miscellaneous	1	1	1	1	1	5
<u>Indian Reservations</u>	11	22	9	2	--	44
TOTALS	33	45	70	115	37	300

Table 2.--Comparison of Number of Visits to Federal Areas and Indian Reservations and Number of Reports Submitted in 1963 and 1962.

	<u>Area Visits</u>		<u>Reports Submitted</u>	
	<u>1963</u>	<u>1962</u>	<u>1963</u>	<u>1962</u>
<u>Department of Defense</u>	313	157	245	139
Air Force	78	40	51	30
Army	142	72	109	59
Navy & Marine Corps	93	45	85	50
<u>Other Federal Areas</u>				
Veterans Administration	10	12	7	8
National Forests	14	20	8	27
National Parks	20	12	11	6
Wildlife Refuges	61	41	22	42
Miscellaneous	12	18	7	10
<u>Indian Reservations</u>	91	34	42	34
Totals	521	294	342	266

Table 3.--Estimates of Recreational Fishing Afforded on Federal Areas and Indian Reservations by Cooperative Management Programs, 1963.

	Man-Days of Fishing, by Region					Totals
	1	2	3	4	5	
<u>Department of Defense</u>	76,500	44,600	32,200	458,800	105,200	717,300
Air Force	11,300	27,400	10,000	156,800	23,600	229,100
Army	44,400	17,200	17,400	250,900	73,900	403,800
Navy & Marine Corps	20,800	--	4,800	51,100	7,700	84,400
<u>Other Federal Areas</u>						
Veterans Administration	--	1,300	5,100	5,600	6,800	18,800
National Forests	--	--	257,000	90,300	231,000	578,300
National Parks	83,800	493,900	--	15,500	--	593,200
Wildlife Refuges	15,300	270,400	408,500	186,200	62,000	942,400
Miscellaneous Areas	500	2,000	--	5,500	1,100	9,100
<u>Indian Reservations</u>	114,000	355,600	17,200	14,300	--	501,100
Totals, 1963	290,100	1,167,800	720,000	776,200	406,100	3,360,200
Totals, 1962	81,500	650,400	722,100	1,070,900	401,200	2,926,100

## FISHERY MANAGEMENT PROGRAMS ON DEPARTMENT OF DEFENSE AREAS

During 1963, the number of Department of Defense military areas with active fishery management programs increased 27 percent over 1962. The number of visits by fishery biologists to military installations was double the 1962 figure, and technical assistance was provided to 160 areas. Agreements under Public Law 86-797, the "Sikes Act", were signed with an additional 49 military installations for the execution of cooperative plans for the development, maintenance, and coordination of fish and wildlife programs. The growth of scientific fishery management and recreational fishing on Department of Defense areas is illustrated in Table 4.

Table 4.--Comparison of 1957 and 1963 Data on Fishery Management Programs on Department of Defense Areas.

<u>Item</u>	<u>1957</u>	<u>1963</u>
Area Visits	93	313
Reports submitted	106	245
Waters under management:		
Acres of reservoirs, lakes and ponds	9,208	15,151
Miles of streams	108	164
Man-days of fishing	148,700	717,200

Since 1957, about 8,200 acres of lakes and ponds have been reclaimed and 1,515 acres of new fishing lakes have been constructed. Evidence of improved fishing is indicated by the 380 percent increase in man-days of fishing with only a 65 percent increase in the amount of fishing waters.

The following are brief accounts of the programs, problems, and progress on a few military areas on which assistance has been provided for the past ten years. More than half of the military areas included in the cooperative programs are located in the Southeast. Hence most of the examples of work carried out are from that region.

Cheatham Annex, Williamsburg, Virginia,  
of the U. S. Naval Supply Center, Norfolk

The Cheatham Annex of the Norfolk U. S. Naval Supply received the 1963 General White Conservation Award for their outstanding conservation program. An excellent fishery management program has been developed under the direction of conservation officers of the Base who have worked closely with our fishery biologists since 1954 in the cooperative program.

Excerpts of the recent cooperative plan and agreement for game and fish management at Cheatham Annex are presented to illustrate the roles of the various agencies.

"The Bureau of Sport Fisheries and Wildlife will furnish Biological Assistance on Fish and Lake Management and will furnish fish for stocking as required.

"The Virginia Commission of Game and Inland Fisheries will furnish Biological Assistance on Game Management and will furnish game for re-stocking as required.

"Cheatham Annex will furnish labor and material for fish and lake management including fertilizer and weed control chemicals, also labor and material for wildlife food patches.

"Access to Cheatham Annex for recreational purposes shall be for military and civilian alike on the principle of first come, first served."

The Annex contains impoundments of 108, 43, 40 and 4 acres. The three larger lakes have been successfully managed for the past ten or more years. The 4-acre pond was completed in 1963 and is being managed for a channel catfish fishery. The other lakes contain largemouth bass, crappie, bluegill and redear sunfish.

The 43-acre Penneman Lake has remained in excellent condition during the period of assistance. This lake is fertilized from the run-off from lawn and other grassy areas.

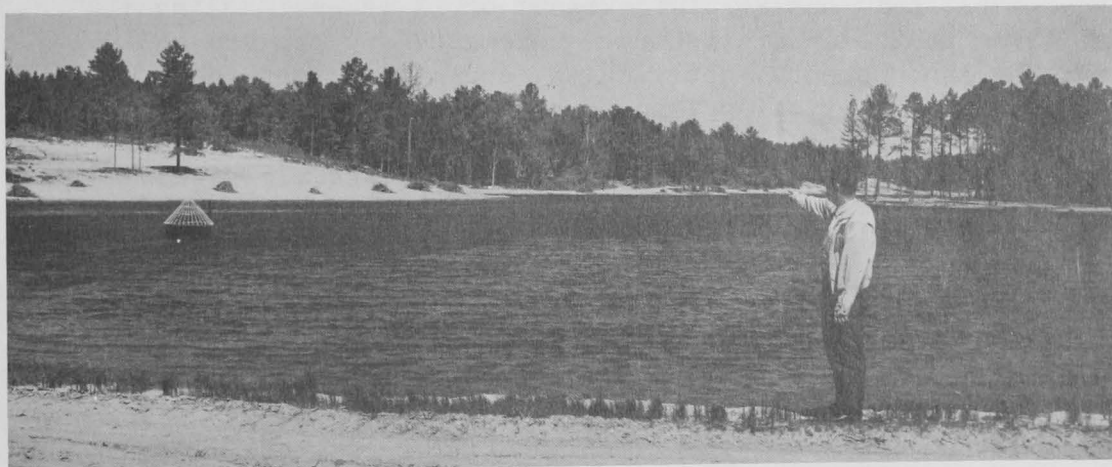
Jones Pond is a 40-acre water supply reservoir and is not fertilized. Algae is controlled by treatment with copper sulphate. The angling has been consistently good since 1956 when the pond was first opened to fishing.



Considerable difficulty with weed control was encountered in the 108-acre Cheatham Lake. In 1954 the lake was choked with Potamogeton and Ceratophyllum. In 1956 sodium arsenite was applied with excellent results. A fertilization program was initiated in an effort to control the vegetation. Good control was obtained until 1958 when fertilization was interrupted. By 1959, the lake was again weedy and large numbers of golden shiners were in evidence. Fertilization was resumed and some control was obtained. Chemical treatment of vegetation was necessary in 1961. The lake was again free of vegetation in 1962 and 1963. Seine samples showed that adult golden shiners were present but no young shiners were taken. Cheatham Lake is known throughout the Southeast as an outstanding fishing area.



Pond Number 2, Shaw Air Force Base, South Carolina. Following renovation, restocking and fertilization, this pond has been supplying good fishing since 1960. U. S. Air Force Photograph.



Newly constructed Upper Leitner Lake, Fort Gordon, Georgia. This is one of five fishing impoundments constructed on the military reservation since 1961. U. S. Army Photograph.

## Fort Gordon, Georgia

Prior to World War II, the land now occupied by Fort Gordon, a Department of the Army installation, consisted of cotton plantations, pecan groves and pine forest. Numerous mill ponds were located on the major creeks. These ponds contained largemouth bass, bluegill, warmouth, bullheads, suckers, green sunfish, and pickerel. One pond contained carp. The water quality was not favorable for good fish production. The water was soft, acid, and low in calcium. Most ponds contained some aquatic vegetation and some were completely weed-choked. Prior to the establishment of the military reservation fishing pressure was light on the ponds and production was sufficient to provide good fishing for the local residents. Fishing pressure was also light during World War II. Many of the dams were not maintained and considerable erosion occurred in the watersheds as a result of military training with heavy equipment.

Early postwar efforts to manage the fisheries in these ponds were most discouraging. Some ponds were highly turbid. The clear ponds contained dense stands of vegetation. Bass and bluegill production was poor. Most of the old ponds were located on large watersheds and considerable water flowed through them. The control of rough fish, weeds, and silt have been major problems. Funds for lake construction and building by-passes on old mill ponds were limited.

Early in 1961, the Assistant Post Engineer was appointed Lake Commissioner with the responsibility for developing and maintaining impoundments and enhancing the sport fishing program. Until 1961, only one 9-acre lake out of 13 lakes totaling 144 acres was suitable for fishery management. By the end of 1961, four new impoundments, totaling 113 acres, had been constructed and 70 acres of existing impoundments had been renovated.

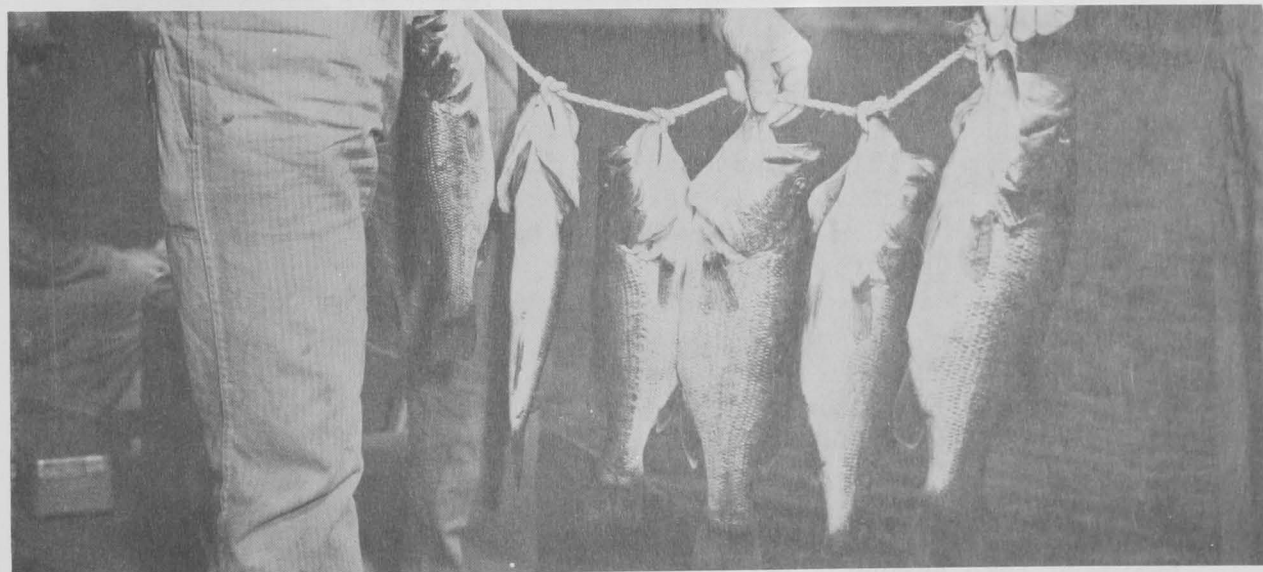
By 1963, Fort Gordon had 12 ponds totaling 174 acres under intensive fishery management. This includes one channel catfish pond; one white catfish pond; one trout pond; and nine bass, bluegill, and redear sunfish ponds. One 5-acre channel catfish pond, wherein the fish were fed, yielded over 5,000 catfish weighing 10,100 pounds during two seasons of fishing. In addition, over 2,000 pounds of bass and brown bullheads were caught. At the end of the second fishing season, the pond was drained and 6,594 pounds of channel catfish were recovered. This amounted to a harvest of 1,200 pounds per acre per year and a production of 1,860 pounds per acre per year.

The ponds under intensive management are in excellent condition and are supplying good fishing. Aquatic vegetation is under control. Five other lakes are managed on a non-fertilized basis. They supply a fair amount of fishing but production is much lower than in the fertilized waters.

In addition to the work of the Assistant Post Engineer, much credit for carrying out the progressive fishery program at Fort Gordon is due the members of the Fort Gordon Fish and Wildlife Association.



Chemical control of aquatic vegetation is carried out by Army personnel at Fort Lewis, Washington to improve the fishery.



Bass catch from Kepner Pond, Eglin Air Force Base, Florida. This pond remained in balance for 10 years following renovation in 1952. Because of an overabundance of suckers, warmouth and small bluegill, the pond was treated with rotenone in 1963.

## Eglin Air Force Base, Florida

The Eglin Air Force Base Reservation occupies land which prior to 1940 was the Choctawhatchee National Forest. Fishery management services were provided by the Bureau of Sport Fisheries and Wildlife beginning early in 1949.

During the next 15 years fishery management biologists have averaged two trips per year to the area. Investigations, during the first few years following 1949, found that very few of the ponds were providing good fishing. Trout were stocked in Live Oak Creek and smallmouth bass were stocked in several streams. None of these stream stockings were successful.

Recommendations were made by the biologists to Eglin Base officials for the correction of deficiencies. Weed control, liming and fertilization schedules were carried out by Base personnel; access was improved; and catch records were maintained on important waters. The highly successful fishing provided by a few new fish ponds stimulated a pond construction program. Not all of the management problems were solved overnight. Difficulties were encountered in obtaining suitable algae blooms in some acid ponds. It was found that in a few instances it was more economical to construct new ponds than to repair old ones.

By 1963, the Base had 28 artificial fish ponds and six natural lakes totaling 283 acres. Three ponds are managed for channel catfish. One small acre and a half pond provides a very popular rainbow trout fishery. The other lakes and ponds are managed for largemouth bass and bluegill. Problems with wild fish, overabundance of intermediate size bluegills and aquatic vegetation are still encountered but fishing has improved considerably during the past 15 years. During the past six years, the number of man-days fishing on the Base has increased from 20,000 to 57,000 days. In 1963, the Eglin Air Force Base won the Secretary of Defense Conservation Award for its "continuing superior natural resources program."

## Barksdale Air Force Base, Louisiana

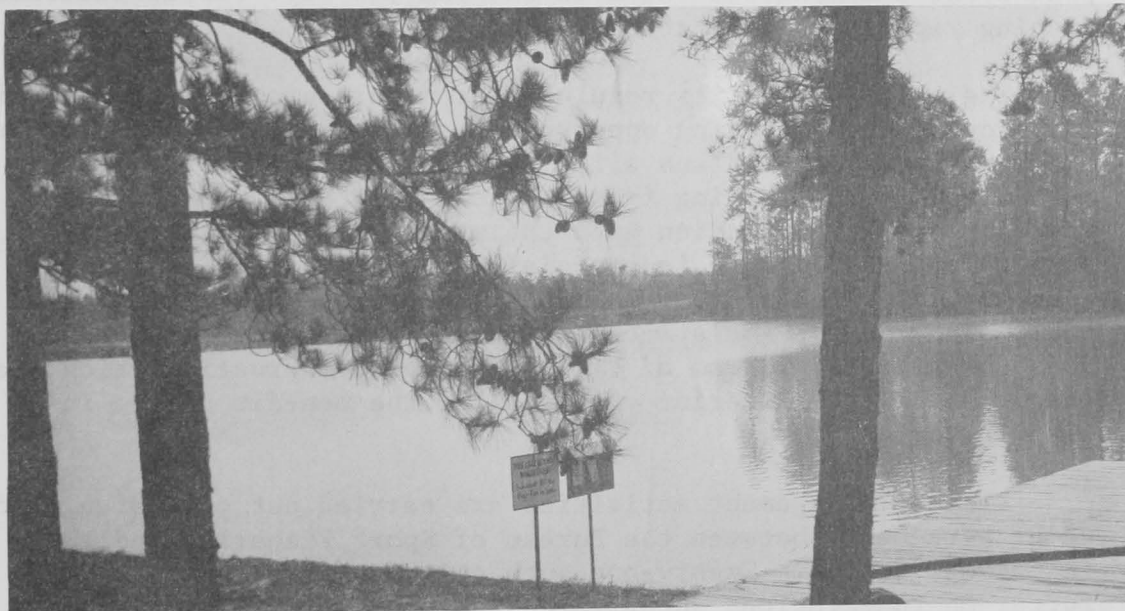
The cooperative fishery management program on the waters of Barksdale Air Force Base was initiated in 1952 by a preliminary lake survey. The 600-acre Flag Lake was completely choked with aquatic vegetation. Moon Lake (48 acres) was found to also be infested with aquatic vegetation and an abundance of gar, bowfin and gizzard shad. Clear Lake (7 acres) was free of

vegetation due to the dark colored water, and contained an abundance of rough fish. The history of the program is typical of that on many military areas.

During 1953 a comprehensive fishery management plan was completed for Flag Lake. The plan included lake draining, chemical treatment of the vegetation, rotenoning the fish population, clearing and cleaning part of the lake bed, restocking and fertilizing. Only a limited part of the plan was carried out. Flag Lake was renovated during 1958 and 1959, and the shallow edges cleared and deepened. The lake was opened to fishing in 1960. Bass, bluegill and crappie fishing was excellent. Population samples taken in 1961 showed the presence of gizzard shad, golden shiners, warmouth and green sunfish. In 1962 the spillway was raised to prevent the entry of fish from below the lake. Gizzard shad made up about 90 percent of the fish population. During 1963, the lake was treated with 0.1 p.p.m. of five percent rotenone. Tons of gizzard shad were killed. The bass fishing has been excellent since the selective treatment.

Similar management plans were carried out on the other two lakes. In addition, Lake Harman (50 acres) which was constructed in 1957, has been managed for bass, bluegill and redear sunfish.

Since 1959, the waters at Barksdale Air Force Base have been supplying from 12,000 to 19,000 man-days fishing annually.



Marchman Lake, Atlanta Army Depot, Georgia, is managed for bass, bluegill and redear sunfish. U. S. Army Photograph.



## FISHERY MANAGEMENT PROGRAMS ON INDIAN RESERVATIONS

One of the most productive segments of the Division program is the guidance given to the Indian Tribes and the Bureau of Indian Affairs in sport fishery management. Plans developed by the Bureau of Sport Fisheries and Wildlife are carried out by the local offices of the Bureau of Indian Affairs and the Tribes. The 55,000,000 acres of land encompassed by the reservations contain many unspoiled and undeveloped waters of high recreational value. Although assistance has been given a few Tribes for as long as ten years, the greatest impetus to the program came with appropriations for this specific purpose in 1962. In 1963, contacts were made with 44 Indian Reservations. In order to provide more intensive fishery management services to the Indians, new field offices were activated in Arizona, Montana, Nevada, New Mexico, South Dakota, Washington, and Wyoming (Figure 1). Staffs at the Portland, Albuquerque and Minneapolis Regional Offices were augmented for cooperative work with the Tribes. Biologists from these new offices have initiated intensive fishery management programs on 28 large Indian Reservations. During the year, 632 acres of new waters were developed under plans which featured recreational fishing. Also, 417 acres of ponds and lakes, and 68 miles of stream were improved as fish habitats under the instruction of the fishery management biologists. The results of past efforts are demonstrated in the 500,000 days of recreational fishing reported by the reservations for 1963.

The primary benefits resulting from this program are two-fold: (1) provide sport fishing opportunities for visitors from off the reservation and to Indians alike, and (2) aid the Indian Tribes economically from fishing fees and jobs for their members. The Federal role in connection with the management of fishery resources on Indian lands is especially significant since in most instances the States are not authorized or are unable to work on the Indian lands. Assistance in sport fishery management is one phase of a broad program of land and water conservation which the Department of the Interior provides for the benefit of the Indian Tribes.

Fishery management activities are carried out on Indian lands under agreements between the Bureau of Sport Fisheries and the individual Tribes. Twenty-one such agreements are presently in force, on reservations where intensive work is underway. A typical agreement includes the following:

"Whereas the waters of the (named) Indian Reservation provide a potential for the development and maintenance of sport fishery resources;

"Whereas the development and maintenance of sport fishery resources will provide recreation to Tribal members and the public;

"Whereas the sport fishery resources are a source of economic return to the Tribe and its members through the providing of goods and services to the public who will enjoy this resource;

"It is agreed that:

"The Bureau of Sport Fisheries and Wildlife will provide technical assistance in the management of sport fishery resources of reservation waters.

"The Bureau will provide game fish for stocking reservation waters. The numbers, size, and species will be determined by Bureau biologists. Stocking programs will be based upon biological requirements, fishing pressure, and availability of fish.

"The Tribe will provide the necessary law enforcement including the passing of regulations, patrol of streams, and issuance of permits to fishermen. The Tribe also will collect desired information on fisherman-use and the catch of fish."

Table 5 illustrates the growth of fishery management programs and fishing on Indian Reservations.

Table 5.-- Comparison of 1957 and 1963 Data on Fishery Management Programs on Indian Reservations

<u>Item</u>	<u>1957</u>	<u>1963</u>
Area visits	13	91
Reports submitted	21	42
Waters under management		
Acres of reservoirs, lakes and ponds	12,207	143,467
Miles of streams	1,788	3,261
Man-days fishing	184,000	501,000

During the period from 1957 through 1963, 4,302 acres of new reservoirs, lakes and ponds were constructed. A total of 3,410 acres of impoundments and 141 miles of streams were reclaimed and improved.



Inspection of Embom Lake, Jicarilla Apache Indian Reservation, New Mexico, by members of the Tribal Long Range Planning Committee.

#### Quinault Indian Reservation, Washington

The Quinault Indian Reservation, which borders on the coast of Washington, covers more than 145,000 acres. The reservation has several rivers and one large lake, Lake Quinault, which sustain runs of sockeye, silver, chinook and chum salmon, as well as steelhead trout. The salmon fishery is a most important item in the economy of the Tribe. During the past 50 years, the salmon runs have gradually decreased. Various reasons have been expressed for the causes of the decline; however, no detailed studies had been made on the Tribal fisheries.

At the request of the Bureau of Indian Affairs, fishery surveys were initiated late in 1962 by fishery management biologists. Assistance was provided by the Bureau of Indian Affairs, Tribal members and biologists of the Washington Department of Game and the Department of Fisheries. Early in 1963, a comprehensive study plan was completed which includes a review of historical data, studies of fish populations, surveys of spawning grounds, determination of hatchery feasibility, and a study of the effects of fishing regulations on the fishery. Considerable progress was made during 1963. One obvious difficulty was the large driftwood jams in the Moclips River. Jams, which resulted from timbering operations about 20 years ago, served to block spawning migrations of silver and chum salmon. The stream clearance and improvement operations were carried out by the Tribe under the Accelerated Public Works Program.

Fishery Management personnel participated in the examination of five potential hatchery sites. A Denil-type fish ladder was installed at the Smith Lumber Mill dam. The cost for the fishway was shared jointly by the mill owners and the Washington Department of Fisheries. The Tribal Council adopted a resolution restricting the removal of gravel from the Moclips River.

Data were gathered on water temperatures, flows and quality, stream ecology, and fish migrations and spawning. The Moclips River was stocked with 200,000 silver salmon fingerlings from State and National fish hatcheries in June. The fishery management program on the Quinault Indian Reservation is the result of excellent cooperation among the various interested agencies.

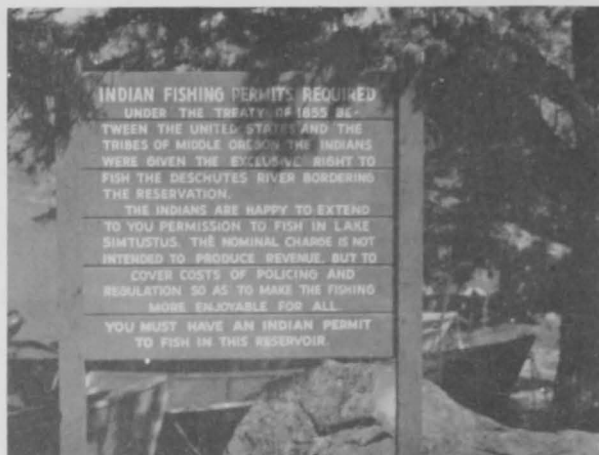
#### Warm Springs Indian Reservation, Oregon

The 564,000-acre Warm Springs Indian Reservation is located in north central Oregon between the Deschutes River and the crest of the Cascade Range. Two types of fisheries exist in reservation waters. Anadromous fish migrations by chinook and blue-back salmon and steelhead trout occur in many of the streams. Resident fishes include rainbow trout, brook trout, Dolly Varden, and mountain whitefish. Seven scenic natural lakes, varying in size from 25 to 50 surface acres, and two reservoirs are open to public fishing. A nominal fee is charged for fishing. The fees are used to defray part of the expenses involved in the employment of two tribal conservation officers. Creel census data have been collected by the Conservation officers since 1958.

Matters concerning anadromous fishes are coordinated with the Oregon Fish Commission, Oregon Game Commission, Portland

General Electric Company, Tribal Fish Committee, Bureau of Indian Affairs, and the Bureau of Commercial Fisheries.

The seven natural lakes (245 acres) and Lake Simitustus (613 acres) provide from 15,000 to 25,000 man-days of fishing annually. The fishery in the natural lakes is maintained by natural reproduction. In 1963, Lake Simitustus was stocked with 78,000 adult rainbow trout from National fish hatcheries.



Boat dock and launching facilities aid fishermen at Lake Simitustus, Warm Springs Indian Reservation, Oregon.



Hawley Lake, Fort Apache Indian Reservation, Arizona. Cottage sites on this beautiful 250-acre lake are leased to non-tribal members.





Cooperative planning and operations in the stream clearance project on the Moclips River, Quinault Indian Reservation, Washington.



Before and after views of log-jam removal in an upper section of the East Fork of the Moclips River, Quinault Indian Reservation, Washington.

## Colorado River Indian Reservation, Arizona and California

The Colorado River Indian Reservation consisting of 264,000 acres of land is located in Arizona and California below the Parker Dam. The reservation contains about 55 miles of the Colorado River and several hundred miles of Canals and drainage ditches. In 1962 an agreement was made between the Colorado River Indian Tribes and the Bureau of Sport Fisheries and Wildlife providing for technical assistance by the Bureau in the management and development of sport fishery resources on the reservation, including furnishing fish for stocking. The California Fish and Game Commission and the Arizona Game and Fish Department are co-operating in the program. The plan includes physical, chemical and biological surveys of all waters.

The channel catfish population in the Colorado River has declined during recent years. The presence of very few small channel catfish prompted the stocking of 404,000 fingerlings in 1962. Large catches of small catfish were made during 1963. In order to study the movement of the catfish, 6,000 marked fish were stocked above and below Headgate Rock Dam. No specific conclusions can be drawn from the 34 recoveries obtained to date. Both upstream and downstream movements were made.

Creel census revealed that three-fourths of the anglers fish in an area within two miles of Squaw Dam. Total angler use was 26,500 man-days in 1963.

## Fort Apache Indian Reservation, Arizona

Among the outstanding fishery management programs is that on the 1,664,000 acre Fort Apache Indian Reservation in central eastern Arizona. Angler utilization on the Fort Apache Reservation increased from 80,000 man-days of fishing in 1957 to 204,000 man-days during 1963. The reservation has an ample supply of good quality water and an abundance of lake sites. The number of lakes and ponds increased from 12 totaling 129 acres in 1957 to 20 totaling 556 acres in 1963. The area contains over 300 miles of fishing streams.

Non-tribal fishermen are required to have a reservation fishing permit in addition to a State fishing license. The permit rates are 60 cents for the first day and 30 cents for each additional day or \$3.00 for a 10-day permit. Fees are used to maintain and improve the area. Some 700 individual camping sites and picnic areas have been constructed. Access roads are maintained in excellent condition. New lakes are under construction or are being surveyed. Elevations on the reservation vary from 2,700 to 11,459 feet. Most of the newer impoundments are at elevations above 8,000 feet and support trout year around.

Navajo and Hopi Indian Reservations,  
Arizona, New Mexico, and Utah

The Navajo and Hopi Indian Reservations occupy about 16,000,000 acres in the heart of some of the most scenic areas in America. Much of the land lies above 5,000 feet in elevation with peak elevations of over 10,000 feet. The vegetation varies from desert type to mountain forest. The paucity of precipitation and the high rates of evaporation are the major climatic elements which affect fishery developments. The average annual precipitation on the Hopi Reservation, which lies near the center of the Navajo lands, is about 10 inches. Some of the higher areas receive about three times this amount of precipitation. The reservation is located southwest of the famous four corners formed by the boundaries of Arizona, Colorado, New Mexico and Utah.

The Colorado, Little Colorado and San Juan Rivers, Tsaile and Whiskey Creeks border or flow within the reservation. There are 32 reservoirs, lakes, ponds and charcos under fishery management. These total from 3,400 to 4,400 acres depending on the season, precipitation and water use. About 300 miles of newly impounded Lake Powell will border on the reservation. The acreage of impounded water, excluding Lake Powell, has doubled since 1958. Additional lake sites have been surveyed including 10 sites on the west slope of the Chuska Mountains which would add about 2,865 surface acres of water.

Some of the fishery management problems which have been encountered during the past 10 years are siltation, shallowness, excess aquatic vegetation, wild fish such as carp and green sunfish, poor access, leakage through impoundments and severe water fluctuations. Where possible, many of these conditions have been corrected.

Man-days of fishing have increased from 5,000 days in 1958 to 17,750 days in 1962 and 27,575 days in 1963. Phenomenal increases are anticipated resulting from the Lake Powell fishery, new water developments and intensified fishery management.

Mescalero Apache Indian Reservation, New Mexico

The 465,000-acre Mescalero Apache Indian Reservation is located in south central New Mexico. Elevations range from 4,300 feet to 12,000 feet atop Sierra Blanca Mountain. Precipitation varies from about 10 inches in the western area at the lower

elevation to 20 inches on lands at 6,500 feet elevation to 25 inches at the 8,650 feet elevations. There are several small, spring-fed trout streams on the reservation. Small water retention and erosion control impoundments have been constructed in suitable areas. During 1963, 13 impoundments containing 32 surface acres were completed. Engineering surveys have been completed on larger impoundments. The area is blessed with numerous permanent springs. Roads and access facilities have been improved, and additional recreational facilities are planned.

The trout fishing has been excellent, and the fishing pressure has doubled during the past five years. During 1963, 20,000 man-days of fishing were recorded. The average catch was 0.79 fish per hour's fishing, while the average time fished was about three hours. It is anticipated that angler use will greatly increase during the next five years. This progressive program will benefit both the tribe and the non-tribal sportsmen.

#### Pine Ridge Indian Reservation, South Dakota

The Pine Ridge Indian Reservation occupies about two and a half million acres of land in southwestern South Dakota. The Reservation contains 11 reservoirs, totaling about 1,000 acres, numerous stock ponds and one trout stream. Trout are stocked in three of the reservoirs. Fishery management services have been provided since 1953.

Fish control programs have been carried out since 1954. Graded areas have been vegetated, bank plantings of willow have been made and the cattle have been fenced out of areas subject to damage. Dams were repaired and the levels were raised on two reservoirs. New species of fishes which have been stocked include channel catfish and northern pike. Since 1958 the fishing pressure increased from 2,500 man-days to about 5,000 man-days in 1963.

#### Cheyenne River Indian Reservation, South Dakota

The Cheyenne River Indian Reservation, located in West Central South Dakota, covers some 4,400 square miles. About 60 miles of the eastern boundary adjoins the 313,000-acre Oahe Reservoir on the Missouri River. The Cheyenne River forms the southern boundary and the Moreau River parallels the northern boundary. There are seven reservoirs totaling 375 acres on the Reservation.

A fishery management program has been carried out since 1954. Some of the problems encountered are heavy siltation,

winterkill, excessive aquatic vegetation and large carp populations. Impoundments are being managed for largemouth bass, bluegill, northern pike, yellow perch, crappie and channel catfish.

#### Red Lake Indian Reservation, Minnesota

The Red Lake Indian Reservation, which contains 407,000 acres of forest and lake area in north central Minnesota, was established in 1889. Water covers over half of the reservation. In addition to Upper and Lower Red Lakes which have about 451 square miles of surface area, the reservation has approximately 100 lakes varying in size from 10 to 300 acres. There are also 36 miles of good trout streams.

In 1962 the Tribal Council of the Red Lake Band of Chippewa Indians voted to permit, for the first time, limited sport fishing access to the reservation. In October, 1962 the Bureau of Sport Fisheries and Wildlife was requested by the Tribe to perform a survey of the marsh and lake areas of the reservation for the improvement of fish and wildlife habitat.

During 1963, fishery surveys were made on 18 lakes totaling 1,152 acres. They have been fished very little. No previous surveys had been made on most of the lakes. Access to these lakes is from fair to good and is being improved. Very few of the lakes have boat launching sites and docks. Water quality is favorable for good fish production. Aquatic vegetation is abundant in some areas. Most of the lakes contain good fish populations. Common species are: northern pike, rock bass, largemouth bass, yellow perch, walleye, brown bullheads, and cisco. One lake contained no fish. It was stocked with 10,000 rainbow trout. Another lake containing only minnows will be stocked with bass and bluegill. Contour maps of all lakes were prepared by the Bureau of Indian Affairs.

It was estimated that the 18 lakes can support from 8,000 to 10,000 man-days fishing annually.

#### Cherokee Indian Reservation, North Carolina

During 1963 fishery surveys were continued on the Cherokee Indian Reservation in western North Carolina, which contains some 56 miles of trout streams. The Division of Fishery Management Services in cooperation with the Bureau of Indian Affairs and the Fish and Game Committee of the Tribal Council presented a fishery management program to the Tribal Council. The program



was approved on December 2, 1963. The Cherokee Chamber of Commerce reported that 4.5 million people visited the reservation during 1963. This tremendous figure illustrates the opportunity which exists for the Cherokee Tribe in the development of a fishery program as an economic asset.



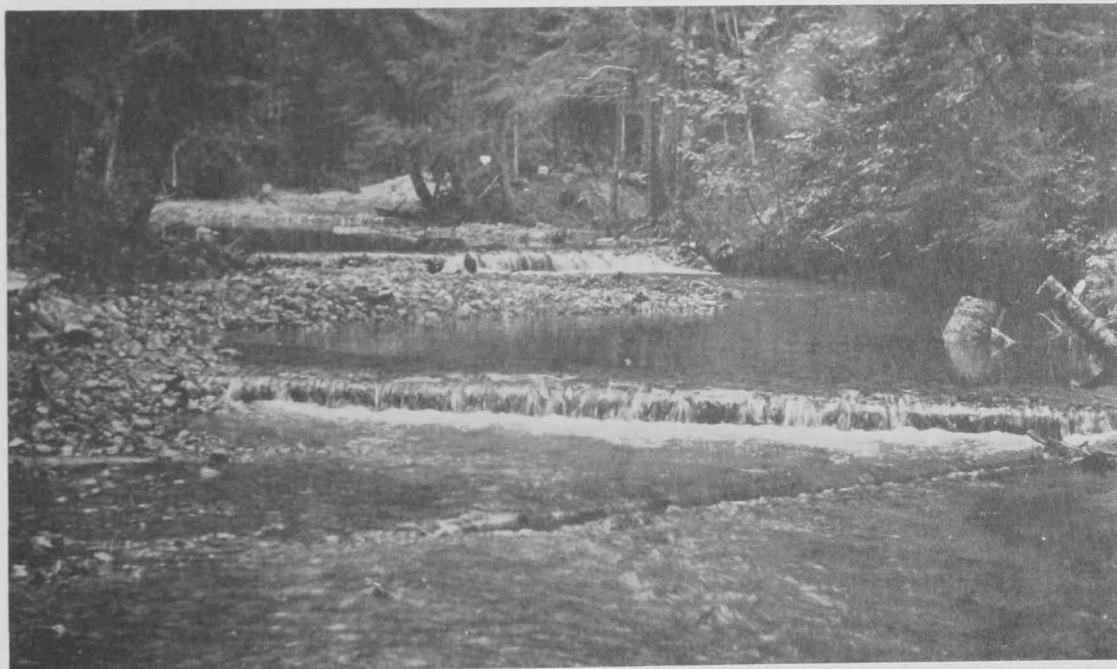
Lake construction on the Mescalero Apache Indian Reservation, New Mexico. These impoundments, Cienga Lake (upper) and Firman Lake (lower) are 2 of the 13 lakes constructed on the reservation during 1963. Bureau of Indian Affairs Photographs.

## FISHERY MANAGEMENT PROGRAMS ON NATIONAL FORESTS

Fishery Management programs on the National Forests are carried out in cooperation with the U. S. Forest Service and the respective State fishery agencies. Cooperative programs are carried out on the Black Hills National Forest in South Dakota and on 11 Forests in the eastern United States. Trout management is the principal fishery management effort on most of the forests. During 1963 the acreage of impounded waters under management increased about 50 percent and the mileage of streams increased about 23 percent. The poundage of trout stocked from National fish hatcheries on the 12 forests increased about 75 percent over 1962.

Management work consists of conducting fishery surveys on lakes and streams, collecting creel census data, improving streams and controlling non-game fish. Trout stocking rates are based on the fishing pressure, amount of water and the suitability for trout.

In the northeastern forests 231,000 man-days of fishing were provided on 2,000 acres of impoundments and 680 miles of streams. (Table 11). In the southeast, management assistance was increased during 1963.



Stream improvement structures on the Swift River, White Mountain National Forest, New Hampshire provide attractive fishing waters.

## FISHERY MANAGEMENT PROGRAMS ON NATIONAL PARKS

The Division of Fishery Management Services provides technical guidance to the National Park Service in regard to fishery management programs on park waters. Fishery work is carried out in accordance with Park Service policies and in cooperation with park personnel (Table 12).

The most extensive cooperative program is at Yellowstone National Park, where an agreement between the two agencies specifies the objectives and parts to be played by each cooperator.

The waters of Yellowstone National Park supported an estimated 400,860 man-days of fishing during 1963. Included in this figure are 192,332 man-days for 88,000-acre Yellowstone Lake. The lake catch was 321,523 cutthroat trout. The catch averaged 1.7 fish per angler day and 0.77 fish per hour of fishing effort.

Included in the 1963 program on Yellowstone National Park were creel census, water analyses, population studies, and the installation of new counting weirs by the National Park Service on three of the major spawning streams entering Yellowstone Lake.

Work on some of the other National Parks included the following:

Rocky Mountain National Park, Colorado - Surveys were completed on four highland lakes on the east slope and three on the west slope. Difficulties were encountered in stocking some of the alpine glacial lakes. The stocking by aerial plants is limited by inclement weather conditions. Stocking by packing into these remote areas is time consuming and some mortalities in eggs and fry have occurred.

Glacier National Park, Montana - Fishery surveys were completed on five areas on the east side of the Continental Divide in the Missouri River and Hudson Bay drainages.

Mount Rainier and Olympic National Parks, Washington - Activities were concerned with creel census and the evaluation of aerial stockings in high mountain lakes.

Blue Ridge Parkway, North Carolina and Virginia - The work during 1963 consisted of routine examination of impounded waters. Excellent trout and warm-water fishing are provided by many of these waters.

Great Smoky Mountains National Park, Tennessee and North Carolina - Although plans were made to continue the fishery management work on this park, a fishery biologist was not obtained until late in the year. Work will be resumed on the fishery management program in 1964.

## FISHERY MANAGEMENT PROGRAMS ON NATIONAL WILDLIFE REFUGES

The number of National Wildlife Refuges receiving Division assistance decreased from 73 in 1962 to 53 in 1963. Resident wildlife biologists carry out many of the fishery management activities on the refuges, and management assistance is also provided in some instances by the States. Some of the refuges, such as the Okefenokee Refuge in Georgia and the upper Mississippi National Wildlife Refuge, provide excellent fishing with very little management required.

The two major problems on many shallow refuge impoundments are competition from non-game fish and excessive aquatic vegetation. These conditions are often contrary to good waterfowl management, which is generally the primary objective of the refuge.

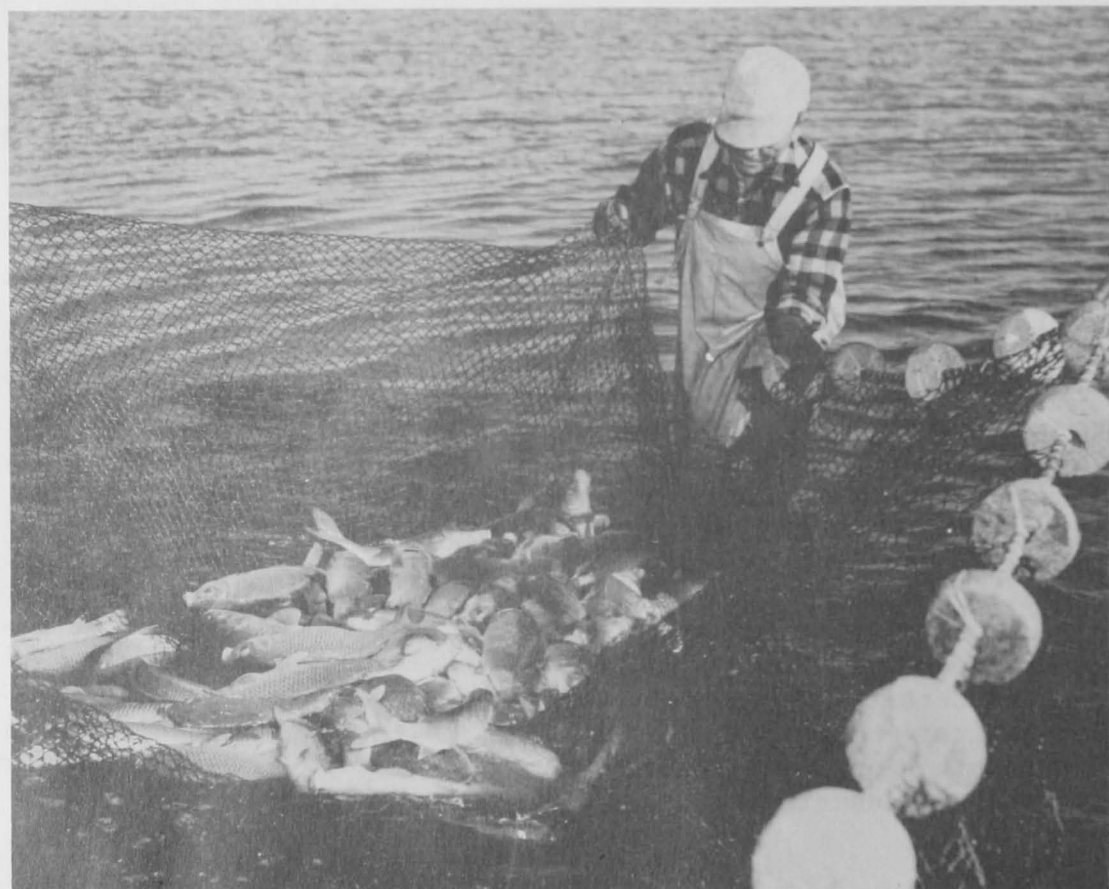
Early in 1959, it was determined that the fish population in the 1,500 acre Buffalo Lake on the Buffalo Lake Refuge in Texas was about 95 percent rough fish. Carp made up about 83 percent of the population. The lake was treated with toxaphene in May, 1959, and an estimated 400 tons of carp were killed. The lake was stocked with largemouth bass, channel catfish, crappie and minnows. The fishing improved following the removal of the carp. The lake provided 180,000 man-days of fishing during 1963. However, carp are again becoming abundant. About 50 tons of adult carp were removed by netting during the 1963 spawning period.

On Lake Mattamuskeet, a 30,000-acre lake on the Mattamuskeet Refuge in North Carolina, carp and other rough fish have been removed by commercial fishing during the past 20 or so years. The peak year for carp removal was 1951 when 373 tons were taken. Weirs were installed at the canal gates to prevent carp entry. Very little bass reproduction was found until 1958. In 1963, the fishing for bass, crappie and white perch was excellent.

Usually when the carp populations are reduced, the water becomes clearer and aquatic vegetation appears in the shallower areas. Certain types of aquatic plants provide waterfowl food and habitat. Overabundant vegetation interferes with the fishing and is often unfavorable for waterfowl habitat. Considered effort is required annually for aquatic weed control.



New fish traps were constructed by the National Park Service on three tributaries of Yellowstone Lake to serve as counting weirs. Photo: Ron Cotten.



Commercial fish catch from Lake Mattamuskeet National Wildlife Refuge, North Carolina. Most of the catch is carp.



## FISHERY MANAGEMENT PROGRAMS ON VETERANS ADMINISTRATION AREAS

Fishery management services are provided to 18 Veterans Administration hospital areas. During 1963 there were 134 acres of lakes and ponds and 5 miles of stream under management. Most of the ponds range in size from one-half to five acres. The 77-acre Whitford-Lawler Lake at the Battle Creek, Michigan Hospital has been managed since 1959. During the summer of 1963 patients fishing on Whitford-Lawler Lake averaged three fish per trip while the ice fishing yielded almost four fish per trip.

The fishing areas are well maintained in park-like atmospheres. Special ramps have been constructed for wheel patients. Fishing at Veterans Administration hospital areas is a popular patient activity and assistance in these programs is a rewarding task.

## FISHERY MANAGEMENT PROGRAMS ON OTHER FEDERAL AREAS

Other Federal areas served by the Division include one Public Health Service hospital, one General Service Administration supply depot, and three Federal penal institutions. Most of these areas have one or two lakes or ponds which are managed for fishing.

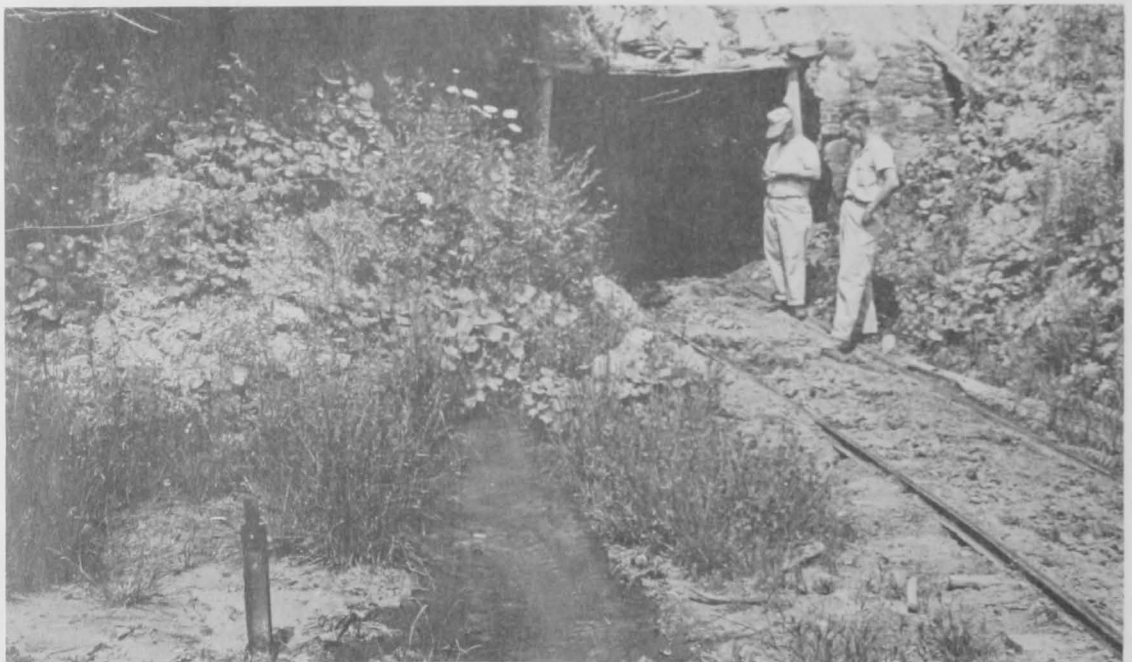
## COOPERATION WITH OTHER DIVISIONS OF THE BUREAU OF SPORT FISHERIES AND WILDLIFE

Division biologists work closely with personnel of the Division of Fish Hatcheries. The objectives of this relationship are to assure that fish produced at National fish hatcheries are stocked in such a manner as to provide maximum fishing to the angler and that hatchery production is geared to meet future stocking requirements. Office, laboratory and storage space are provided our personnel at several of the hatcheries. Availability of hatchery fish where required to provide recreational fishing is a major factor contributing to the success of the program.

Work with the Division of River Basin Studies included conducting special studies, supplying background data on some projects, reviewing reports and acting as liaison with the Indian Tribes.



Patients enjoying fishing at the Fort Meade Veterans Administration Hospital, South Dakota. Veterans Administration Photograph.



Acid mine pollution survey, Harrison County, West Virginia. Personnel are water quality and mining experts from the Department of the Interior.

## COOPERATION WITH THE STATES

Many of the cooperative activities with the States have already been discussed. These activities include coordinating fish stocking programs, conducting joint surveys, carrying out fish control programs, operating Cooperative Fishery Units and managing sport fisheries on certain Federal lands. Mutual assistance between State and Federal personnel is essential to the success of much of our program.

Following are brief descriptions of some of the major cooperative activities.

### Striped Bass Spawning Study

During 1962 and 1963, a cooperative study with the South Carolina Wildlife Resources Department was conducted on the striped bass spawning on the Congaree River. This study was carried out to determine the effects of proposed navigational structures on the spawning success. As a result of these studies, modifications were proposed to favor the spawning grounds and access thereto.

### Kentucky Trout Stream Survey

During the summer of 1963, personnel of the Division of Fishery Management Services and the Division of Fish Hatcheries, at the request of and in cooperation with the Kentucky Department of Fish and Wildlife Resources, surveyed 102 Kentucky streams and five reservoir tailwaters. Data on water temperatures, chemical characteristics, flows and public access were obtained. These studies were made to identify the mileage of streams which would support a trout fishery.

### River Investigations

Delaware River - Division biologists, in cooperation with the Division of River Basin Studies and the States of Delaware, New Jersey, New York and Pennsylvania assisted in the Delaware River Basin fishery studies. A summary of the fishery survey data collected from 1959 through 1962 was provided.

Susquehanna River - The Division provided a representative for the Susquehanna River Basin Technical Committee. The purpose of the Susquehanna River study is to determine the feasibility of restoring anadromous fish runs above the present dams. Cooperating in these studies are private power companies, States of Pennsylvania, Maryland and New York, the Bureau of Commercial Fisheries and the Bureau of Sport Fisheries and Wildlife.

Colorado River - This includes cooperative studies with the States of Arizona, California and Nevada of 395 miles of the Colorado River from Lake Powell to Blythe, California. Ecological studies of the Green River, including Dinosaur National Monument were continued. Cooperators include the States of Utah and Colorado and the National Park Service.

Upper Mississippi River - The purpose of the Upper Mississippi Conservation Committee is "to provide for the carrying on of Cooperative surveys and studies of conditions of National and interstate concern affecting conservation, wildlife, and recreational interests in the Upper Mississippi River." The committee is composed of members of the State conservation agencies of Illinois, Iowa, Minnesota, Missouri and Wisconsin and representatives of the Bureau of Commercial Fisheries and Bureau of Sport Fisheries and Wildlife. Federal agencies cooperating in the studies are the U. S. Army Corps of Engineers and the U. S. Public Health Service.

A Division Fishery Biologist, working out of the LaCrosse, Wisconsin Field Office, is Coordinator of the Committee activities. Activities include the collection of commercial and sport fishery statistics, fish tagging and population studies, fish life history studies, pollution investigations and pollution abatement progress reporting. During a census of a 200-mile stretch of the river during 1963 it was found that about 350,000 fishermen caught 1,500,000 fish weighing almost 1,000,000 pounds.

#### Acid Mine Pollution Studies

During the first half of 1963, representatives of the Bureau of Mines, Bureau of Sport Fisheries and Wildlife, and the Geological Survey held several meetings to discuss acid mine pollution problems. One of the objectives of these meetings was to establish several pilot pollution abatement programs in the Appalachian Region.

During August, representatives of the above-mentioned Department of the Interior agencies, in cooperation with State personnel, reconnoitered several watersheds in Harrison and Randolph Counties, West Virginia. Studies were made on acid flowing tributaries of the West Fork and Tygart Rivers. These two streams join at Fairmont, West Virginia, and form the Monongahela River. The average annual acid load just below the junction of these rivers is around 45,000 tons. Aquatic life is sparse in these once productive waters. Studies by State biologists during 1959 and 1960 of the 1750-acre Tygart Reservoir in Taylor County indicated that the waters support only a few ounces of fish per acre. The pH, throughout the year, varies only a few tenths from 5.0.

Based on the preliminary studies, plans were made to include fish and wildlife interests in cooperative acid pollution abatement programs in West Virginia. Also included was a proposal for a nationwide study of the effects of acid mine pollution on fish and wildlife. Preliminary data were obtained from the States reporting the acid waters which have a potential for fish and wildlife development, if the acid loads are sufficiently reduced. It was found that 5,890 miles of streams and 14,967 acres of impoundments in 20 States were deleteriously affected. About 97 percent of the acid mine pollution reported for streams and 93 percent of that reported for impoundments resulted from coal mining operations. Pennsylvania and West Virginia contain over two-thirds of the stream mileage and 90 percent of the impounded acreage affected. The results of this preliminary survey are summarized in Table 6.

Table 6.--Potential fish and wildlife waters deleteriously affected by acid mine pollution:

<u>State</u>	<u>Miles of streams</u>	<u>Acres of impoundments</u>	<u>Minerals mined</u>
Pennsylvania	2,906	10,100	Coal
West Virginia	1,150	3,533	Coal
Kentucky	580		Coal
Ohio	278	192	Coal
Illinois	222	80	Coal
Missouri	208		Coal
Tennessee	125		Coal, Cu, P
Maryland	83		Coal
California	54	1,000	Cu, Zn
Kansas	62		Coal
Indiana	58		Coal
Montana	48		Coal, Cu, Vm
Arkansas	35		Al, Ba
South Dakota	34		Bog iron
Iowa	20		Coal
Colorado	10		Pb, Zn
Maine		62	Cu, Pb, Zn
Virginia	10		Cu, Zn
New Hampshire	4		Cu, Pb, Zn, Ag
Wyoming	3		Cu
Total	<u>5,890</u>	<u>14,967</u>	

Symbols used: Ag-Silver; Al-Aluminum; Ba-Barium; Cu-Copper; P-Phosphorous; Vm-Vermiculite; Zn-Zinc



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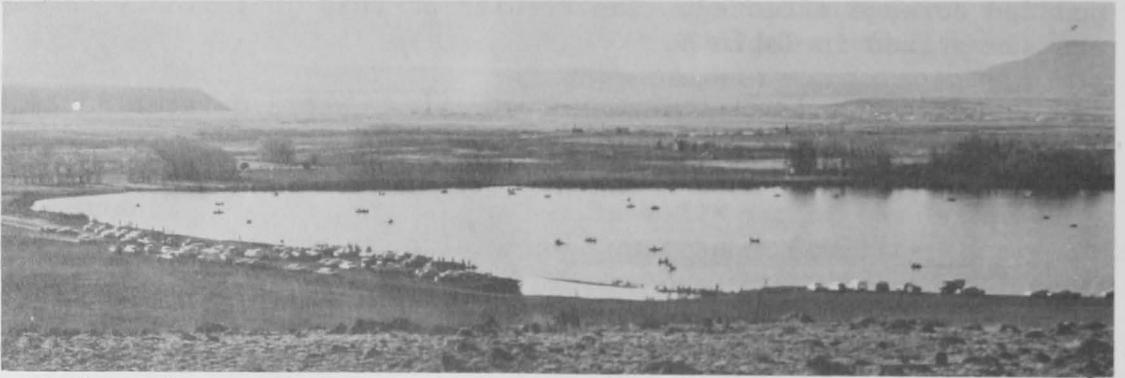
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Maryland	83		Coal
California	54	1,000	Cu, Zn
Kansas	62		Coal
Indiana	58		Coal
Montana	48		Coal, Cu, Vm
Arkansas	35		Al, Ba
South Dakota	34		Bog iron
Iowa	20		Coal
Colorado	10		Pb, Zn
Maine		62	Cu, Pb, Zn
Virginia	10		Cu, Zn
New Hampshire	4		Cu, Pb, Zn, Ag
Wyoming	3		Cu
<b>Total</b>	<b>5,890</b>	<b>14,967</b>	

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## FISHERY MANAGEMENT PROGRAMS ON OTHER WATERS

The purpose of many fishery investigations is to determine the need for stocking and the suitability of the waters for the kinds of fish requested. Most of these activities are cooperative efforts with the States. Waters checked include State and local government public lakes, Boy Scout and Y.M.C.A. impoundments, civic developments to provide fishing for the physically handicapped, privately owned lakes which are open to the public, and farm ponds. Over 400 lakes and ponds and 50 streams were examined during 1963.



Privately owned Becker Lake, near Springerville, Arizona, is open to public fishing without charge.



High school students seining a pond at the Bear Brook Conservation Camp, New Hampshire, as part of their instruction in fishery management methods.

## TRAINING AND EXTENSION ACTIVITIES

Division personnel participate in fishery management training programs both as students and instructors. Two outstanding sessions attended during 1963 were the Farm Pond Management Conference at Auburn University, Auburn, Alabama, and the Lake Management tour sponsored by the Alabama Department of Conservation. Training sessions were held on various military areas and Indian reservations to assist resident personnel in carrying out fishery management activities. Included in the programs were instruction on methods of creel census, aquatic weed and rough fish control, stream improvement, fish population sampling, stocking and water analyses.

Extension activities included work with the U. S. Soil Conservation Service and County Agricultural Agents in connection with the U. S. Department of Agriculture's farm pond and small watershed programs. Instruction and demonstrations were provided for youth camps and teacher conservation training programs.



Division personnel participating with State and University fishery biologists in an inspection tour of Alabama State lakes. Upper: Fish population sampling by seining; Lower: Discussion of the results. 33

## COOPERATIVE FISHERY UNITS

Authority for the establishment of Cooperative Fishery Units is contained in Public Law 86-686, approved by Congress on September 2, 1960. The purpose, as stated in the Act, is "to facilitate cooperation between the Federal Government, colleges and universities, the States, and private organizations for cooperative unit programs of research and education relating to fish and wildlife and for other purposes."

Each fishery unit is a cooperative venture involving the Bureau of Sport Fisheries and Wildlife, a university, and usually a State fish and game department. A coordinating committee, representing the participating agencies, provides general guidance to each unit.

The Cooperative Fishery Units train fishery biologists, conduct research, provide extension-type services, and participate in fishery management projects.

Details of Unit activities are contained in a separate report.

The following are brief summaries of activities of the Units during 1963.

### Colorado Cooperative Fishery Unit, Colorado State University, Fort Collins

The Colorado Unit was staffed during March of 1963. Subjects of program emphasis include stream ecology, taxonomy and ecology of cutthroat and Gila trout, trout diseases and controls, and watershed studies.

### Georgia Cooperative Fishery Unit, University of Georgia, Athens

The Georgia Unit was partially staffed during March of 1963. During the year, studies were made on separate races of bluegill, life history of the striped bass, effects of dynamite explosions on fish, bottom fauna in limed ponds, food habits of channel catfish, and estuary and reservoir tailwater ecology.

### Louisiana Cooperative Fishery Unit, Louisiana State University, Baton Rouge

The Louisiana Unit was partially staffed in June of 1963. Studies included the biology of the brown shrimp in impoundments and fishery investigations in the Mississippi River. A fishery management program was initiated for Lake Johansen, located at the U. S. Public Health Service Hospital at Carville, Louisiana.



Maine Cooperative Fishery Unit, University of Maine, Orono

The Maine Unit was staffed in November of 1962. Subjects of program emphasis include estuarine and sport fishery studies on striped bass, sea-run brook trout and Atlantic salmon, studies of fish mortalities and biological investigations of Penobscot Estuary.

Massachusetts Cooperative Fishery Unit, University of Massachusetts, Amherst

Although the Massachusetts Unit was first staffed late in 1963, the program was not developed in 1963.

Missouri Cooperative Fishery Unit, University of Missouri, Columbia

The Missouri Unit was staffed in February of 1963. Subjects of program emphasis include fish production and population dynamics, ecology of strip mine ponds, and life history studies of the bowfin, spotted gar, channel and flathead catfishes.

Montana Cooperative Fishery Unit, Montana State College, Bozeman

The Montana Unit was staffed in September of 1963. The program was not firmly established during 1963, but will include ecological studies of trout streams affected by channel alterations, de-watering and pollution.

New York Cooperative Fishery Unit, Cornell University, Ithaca

The Cornell Unit was staffed in December of 1963. The area of program emphasis was not formulated, awaiting meeting of the Coordination Committee.

North Carolina Cooperative Fishery Unit, North Carolina State College, Raleigh

The North Carolina Unit was staffed in April of 1963. The subject of program emphasis is the reproduction, growth and heredity of warm-water fishes. Studies during 1963 included the effects of light and temperature in the control of spawning of sunfishes, artificial culture of sunfish, preservation of fish semen, hybridization of centrarchids, inheritance of rapid growth in the bluegill, variation in the growth of largemouth bass and food consumption and conversion in black crappie at various temperature and photoperiod combinations.

Pennsylvania Cooperative Fishery Unit, The Pennsylvania State University, University Park

The Pennsylvania Unit was first staffed in November of 1963. The program will include studies on stream and reservoir ecology, effects of various types of pollution on fish production.

Utah Cooperative Fishery Unit, Utah State University, Logan

The Utah Unit was staffed in 1962. Subjects of program emphasis include reservoir and tailwater studies and the ability of hatchery trout of varying genetic and environmental backgrounds to survive in natural waters. During 1963 fish and bottom fauna studies were continued in the upper Colorado River drainage. A transportable limnological research vessel for use in reservoir and lake work was completed. Graduate studies included the importance of fishing in the recreational use-pattern in a new reservoir, the life history of the bonytail chub, Colorado squawfish and the bluehead sucker in the Green River following the closure of Flaming Gorge Dam, the influence of environmental factors on aquatic invertebrates in the Green River and the development of a behavior-based criterion of the fitness of hatchery trout.



The Flaming Gorge Storage Unit, part of the Bureau of Reclamation's project in the Upper Colorado River Basin extends 91 miles up the Green River in Utah and Wyoming.

During 1963, the 6 older Units had 31 graduate students working on advanced degrees in fishery biology. Formal course work offered during the year included Fishery Management, Fish Zoogeography, Theory of Fish Populations and Special Fishery Problems.

Table 7.--Summary of Fishery Management Services on Air Force Bases, 1963.

Item	R E G I O N					Totals
	1	2	3	4	5	
Waters under Management						
Acres of Lakes & Ponds	256	50	257	1,828	1,364	3,755
Miles of Stream	20	3	2	--	15	40
Acres of Fish Habitat						
Reclaimed or Improved	4	9	160	776	--	949
Miles of Stream Reclaimed						
or Improved	1	--	--	--	--	1
Acres of New Waters						
Developed	--	14	--	17	2	33
Man-Days of Fishing on Areas						
Receiving Branch Assistance	11,300	27,400	10,000	156,800	23,600	229,100
Pounds of Hatchery Fish Al-						
lotted Through Branch						
Activities	6,951	12,493	3,333	2,550	5,609	30,936
Number of Hatchery Fish Al-						
lotted Through Branch						
Activities	35,100	39,442	50,620	178,590	21,445	325,197

Table 8.--Summary of Fishery Management Services on Army Installations, 1963.

Item	R E G I O N					Totals
	1	2	3	4	5	
Waters under Management						
Acres of Lakes & Ponds	1,386	469	501	4,370	775	7,501
Miles of Stream	45	--	31	15	22	113
Acres of Fish Habitat						
Reclaimed or Improved	--	48	24	999	--	1,071
Miles of Stream Reclaimed or Improved	--	3	--	--	--	3
Acres of New Waters Developed	--	40	15	5	--	60
Man-Days of Fishing on Areas Receiving Branch Assistance	44,400	17,200	17,400	250,900	73,900	403,800
Pounds of Hatchery Fish Allotted Through Branch Activities	9,300	10,750	9,660	3,665	16,167	49,542
Number of Hatchery Fish Allotted Through Branch Activities	46,500	44,102	107,000	294,525	76,500	568,627

Table 9.--Summary of Fishery Management Services on Navy and Marine Installations, 1963.

Item	R E G I O N					Totals
	1	2	3	4	5	
Waters under Management						
Acres of Lakes & Ponds	288	800	890	1,894	23	3,895
Miles of Stream	5	--	--	6	--	11
Acres of Fish Habitat						
Reclaimed or Improved	--	--	--	66	--	66
Miles of Stream Reclaimed						
or Improved	--	--	--	--	--	--
39 Acres of New Waters						
Developed	--	--	70	2	--	72
Man-Days of Fishing on Areas						
Receiving Branch Assistance	20,800	--	4,800	51,100	7,700	84,400
Pounds of Hatchery Fish Allotted						
Through Branch Activities	4,500	--	27	1,070	999	6,596
Number of Hatchery Fish Allotted						
Through Branch Activities	28,500	--	26,000	29,825	3,460	87,785



Table 10.--Summary of Fishery Management Services on Veterans Administration Areas, 1963.

	R E G I O N					Totals
	1	2	3	4	5	
Waters under Management						
Acres of Lakes & Ponds	--	7	89	9	29	134
Miles of Stream	--	2	2	--	1	5
Acres of Fish Habitat						
Reclaimed or Improved	--	--	--	--	--	--
Miles of Stream Reclaimed						
or Improved	--	--	--	--	--	--
Acres of New Waters						
Developed	--	5	--	--	--	5
Man-Days of Fishing on Areas						
Receiving Branch Assistance	--	1,300	5,100	5,600	6,800	18,800
Pounds of Hatchery Fish Allotted						
Through Branch Activities	--	1,054	2,120	10	1,034	4,218
Number of Hatchery Fish Allotted						
Through Branch Activities	--	1,265	8,300	400	3,675	13,640

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Table 11.--Summary of Fishery Management Services on National Forests, 1963.

Item	R E G I O N					Totals
	1	2	3	4	5	
Waters under Management						
Acres of Lakes & Ponds	15	--	1,665	213	1,187	3,080
Miles of Stream	--	--	168	440	680	1,288
Acres of Fish Habitat						
Reclaimed or Improved	--	--	--	10	16	26
Miles of Stream Reclaimed						
or Improved	--	--	--	35	1	36
Acres of New Waters						
Developed	--	--	--	--	--	--
Man-Days of Fishing on Areas						
Receiving Branch Assistance	--	--	257,000	90,300	231,000	578,300
Pounds of Hatchery Fish Allotted						
Through Branch Activities	3,000	--	94,055	232,500	131,541	461,096
Number of Hatchery Fish Allotted						
Through Branch Activities	15,000	--	817,800	781,450	572,973	2,187,223

Table 12.--Summary of Fishery Management Services on National Parks, 1963.

Item	R E G I O N					Totals
	1	2	3	4	5	
Waters under Management						
Acres of Lakes & Ponds	19,169	91,561	--	78	--	110,808
Miles of Stream	37	417	--	29	--	483
Acres of Fish Habitat						
Reclaimed or Improved	--	--	--	--	--	--
Miles of Stream Reclaimed	--	--	--	--	--	--
or Improved						
Acres of New Waters						
Developed	--	33	--	--	--	33
Man-Days of Fishing on Areas						
Receiving Branch Assistance	83,800	493,900	--	15,500	--	593,200
Pounds of Hatchery Fish Allotted						
Through Branch Activities	24,607	15	--	6,233	--	30,855
Number of Hatchery Fish Allotted						
Through Branch Activities	519,200	34,500	--	61,650	--	615,350

Table 13.--Summary of Fishery Management Services on National Wildlife Refuges, 1963.

Item	R E G I O N					Totals
	1	2	3	4	5	
Waters under Management						
Acres of Lakes & Ponds	5,131	1,200	73,610	62,045	478	142,464
Miles of Stream	96	24	--	--	35	155
Acres of Fish Habitat						
Reclaimed or Improved	260	--	800	795	--	1,855
Miles of Stream Reclaimed						
or Improved	6	--	--	--	--	6
Acres of New Waters						
Developed	--	--	--	--	--	--
Man-Days of Fishing on Areas						
Receiving Branch Assistance	15,300	270,400	408,500	186,200	62,000	942,400
Pounds of Hatchery Fish Allotted						
Through Branch Activities	3,600	--	3,700	436	1,020	8,756
Number of Hatchery Fish Allotted						
Through Branch Activities	18,000	--	4,969,700	435,800	4,700	5,428,200

Table 14.--Summary of Fishery Management Services on Miscellaneous Federal Areas, 1963.

Item	R E G I O N					Totals
	1	2	3	4	5	
Waters under Management						
Acres of Lakes & Ponds	--	30	--	20	22	72
Miles of Stream	--	--	--	--	--	--
Acres of Fish Habitat						
Reclaimed or Improved	--	--	--	20	--	20
Miles of Stream Reclaimed						
or Improved	--	--	--	--	--	--
Acres of New Waters						
Developed	--	--	--	--	--	--
Man-Days of Fishing on Areas						
Receiving Branch Assistance	500	2,000	--	5,500	1,100	9,100
Pounds of Hatchery Fish Allotted						
Through Branch Activities	500	440	--	380	1,125	2,445
Number of Hatchery Fish Allotted						
Through Branch Activities	2,500	1,540	--	2,250	4,250	10,540



Table 15.--Summary of Fishery Management Services on Indian Reservations, 1963.

Item	R E G I O N					Totals
	1	2	3	4	5	
Waters under Management						
Acres of Lakes & Ponds	126,031	13,841	3,595	--	--	143,467
Miles of Stream	794	2,374	37	56	--	3,261
Acres of Fish Habitat						
Reclaimed or Improved	9	398	10	--	--	417
Miles of Stream Reclaimed or Improved	49	--	13	6	--	68
Acres of New Waters Developed	118	464	50	--	--	632
Man-Days of Fishing on Areas Receiving Branch Assistance	114,000	355,600	17,200	14,300	--	501,100
Pounds of Hatchery Fish Allotted Through Branch Activities	64,165	206,396	8,620	8,500	--	287,681
Number of Hatchery Fish Allotted Through Branch Activities	741,000	1,900,397	237,550	25,400	--	2,904,347

Table 16.--Summary of Fish Habitats Served and Management Accomplishments, 1963.

	<u>Waters Under Management</u>		<u>Habitat Reclaimed or Improved</u>		Acres of New Waters Developed	Man-Days of Fishing Provided	<u>Hatchery Fish Allotted</u>	
	Acres of Lakes and Ponds	Miles of Streams	Acres of Lakes and Ponds	Miles of Streams			Pounds	Numbers
Dept. of Defense	15,151	164	2,086	4	165	717,300	87,074	981,609
Vets. Administration	134	5	--	--	5	18,800	4,218	13,640
National Forests	3,080	1,288	26	36	--	578,300	461,096	2,187,223
National Parks	110,808	483	--	--	33	593,200	30,855	615,350
Wildlife Refuges	142,464	155	1,855	6	--	942,400	8,756	5,428,200
Indian Reservations	143,467	3,261	417	68	632	501,100	287,681	2,904,347
Misc. Federal Areas	72	--	20	--	--	9,100	2,445	10,540
<b>Totals Federal Areas and Indian Reservations</b>	<b>415,176</b>	<b>5,356</b>	<b>4,404</b>	<b>114</b>	<b>835</b>	<b>3,360,200</b>	<b>882,125</b>	<b>12,140,909</b>
Federal-State Coop Project	84,106	2,722	3,000	393	40,100	767,500	492,390	2,401,404
Other Waters	1,299	211	108	--	23	103,900	24,444	369,132
<b>Grand Totals</b>	<b>500,581</b>	<b>8,289</b>	<b>7,512</b>	<b>507</b>	<b>40,958</b>	<b>4,231,600</b>	<b>1,398,959</b>	<b>14,911,445</b>