MONTANA DEPARTMENT OF FISH AND GAME
FISHERIES DIVISION

JOB PROGRESS REPORT

State: Montana

Project No.: F-5-R-22 Title: Central Montana Fisheries Study

Job No.: I-a Title: Inventory of Waters of the Project Area

Period Covered: June 1, 1972 to June 30, 1973

ABSTRACT

Growth and survival of kokanee introductions in Bynum Reservoir was determined while Tiber Reservoir was surveyed for survival of walleye introductions. Fifteen irrigation storage reservoirs were test netted to moniter fish populations. Spot creel checks were conducted at several lakes during the winter. A wind-driven "Pond-master" was experimented with in Dickens Lake. Rough fish were chemically removed from 6 small reservoirs. Approximately 30 small lakes and farm ponds were surveyed.

A total of 42 streams were surveyed to determine status of brook trout populations, to obtain cutthroat specimens for collection purposes and for general inventory. Information is given on an oil seep into Haywood Creek, originating from an exploratory well.

OBJECTIVES

To obtain physical, chemical and biological information which will aid in developing fishery management plans for waters in the study area.

To conduct follow-up surveys where additional information is needed to evaluate management practices.

PROCEDURES

Fish were sampled with floating and sinking gill nets, 6-foot by 125-foot graduated mesh (3/4-inch to 2-inch); 3-foot by 4-foot frame net traps ($\frac{1}{4}$-inch mesh); 4-foot by 6-foot frame net traps

(½-inch and 1-inch mesh); a 300-volt D.C. electrofish shocker and by hook and line. Lake rehabilitation was carried out using rotenone (Pro Noxfish). Measurements taken were total length to the nearest tenth of an inch and weights to the nearest hundredth of a pound.

FINDINGS

Large Lakes and Reservoirs

Bynum Reservoir - This large irrigation reservoir was sampled to determine survival of kokanee introductions as well as to moniter trends in rainbow trout populations. Three frame nets captured 155 adult and 115 yearling white sucker; 1 rainbow trout; 1 sculpin, sp.; and 2 longnose dace. A total of six kokanee were collected in two floating gill nets and these represent fish from the 1971 introduction (Table 1). Rainbow trout were picked up in good numbers but growth rates continue below average when compared to surrounding waters. Considerable amounts of silt were deposited in the lake from a flood that occurred in 1964 and presumably has hindered insect productivity that trout are dependent upon. If this reservoir is to be managed with trout, stocking rates should be adjusted to the available food supply.

Eureka Reservoir - One sinking gill net in Eureka Reservoir produced 6.7 percent game fish to 93.3 percent suckers (Table 1). This data would suggest that a rehabilitation project is necessary. However, spot checks of fishermen revealed good catches of trout and few or no suckers. Winter fishing was very good with many fishermen reporting limit catches. Rehabilitation is not recommended until trout growth or harvest decreases appreciably. Three frame nets picked up an additional 17 rainbow trout, 16 white sucker and several hundred fathead minnow.

Nilan Reservoir - This reservoir was sampled with floating gill nets to provide data on growth patterns of rainbow trout (Table 1). Growth is comparable with surrounding irrigation impoundments but Nilan Reservoir also contains a large sucker population. Fisherman success was very good throughout the report period.

Priest Butte Lake - Gill nets were fished in Priest Butte Lake on April 29 and August 10, 1972 (Table 1). Three apparent year classes of rainbow trout were collected. Periodic checks were also made during August concerning summerkill of trout. Mortality due to summerkill was quite low when compared to 1971 (see Job Progress Report F-5-R-21, Job I-a).

Priest Butte Lake is open to fishing from January 1 through March. Fishing pressure has been very light because fishermen feel the trout flesh is inedible. This is contrary to information from people contacted, 75 percent of whom said the flesh was good. Due to unpopularity as a trout lake, Priest Butte Lake should be removed from the planting program.

Tiber Reservoir - Attempts were made to sample walleye introduced in 1971 but results were negative. One floating gill net produced no fish while one sinking gill net collected yellow perch, burbot and white sucker (Table 1). Three frame nets captured 71 yellow perch, 13 burbot, 1 rainbow trout, 41 white sucker, 10 carp, 162 emerald shiner and 5 fathead minnow.

Walleye fry were planted again in 1972 and will be planted in 1973 and 1974. Further stocking after 1974 will be curtailed since natural reproduction should occur in 1975.

Willow Creek Reservoir - A total of 22 rainbow trout were taken in two floating gill nets (Table 1). Numerous white sucker are also found in the lake but were not taken in the floating nets. Fishermen experienced good catches throughout the winter at Willow Creek Reservoir.

Table 2 gives additional information for some of the lakes mentioned. Creels of winter fishermen were checked and this data is used as an index to fishing success and harvest as well as size of fish taken.

Ackley Lake - Ackley Lake is a 247-surface acre reservoir of the Water Resource Division in Judith Basin County. It is an important recreation area, being used for fishing, boating, camping, swimming and picnicing by local residents as well as many people from Great Falls. The reservoir was rehabilitated in 1966 because of the large sucker population. Fishing improved for a few years and has gradually declined since. Any rehabilitation can be considered only temporary, as rough fish enter the reservoir with the water drawn from the Judith River.

A gill net survey was made of the lake in the spring of 1972 as has been done almost annually for several years. Three gill nets were set overnight in the reservoir on May 2. The catch was 42 kokanee, 15 rainbow trout, 1 brown trout, 156 white sucker and 121 longnose sucker. The number of rainbow is considered very low and the sport catch reflected this apparent low abundance. The number of kokanee, on the other hand, was above average. This population produced good angling throughout the summer and very good snagging in the fall and early winter. Furthermore, the good abundance of kokanee from the 1970 plant produced excellent fish during the latter part of the winter.

Table 1. Sampling results of reservoirs and lakes, 1972.

Area (Date Sampled)	Surface Acres	No. of Nets*	Species**	No. of Fish	Length Range (Average)	Weight Range (Average)
Choteau Area:						
Bynum Res. (June 27)	4,120	2F	KOK	6	(7.8) 7.0- 8.6	(0.17)0.13-0.20
			Rb	45	(13.9)12.0-15.5	(0.89)0.65-1.05
			CSu	3	--	--
Eureka Res. (Sept. 13)	408	1S	LL	1	(20.8)	(3.52)
			Rb	5	(13.8)12.8-15.6	(0.92)0.75-1.16
			CSu	40	(7.0) 6.6-15.1	(0.26)0.12-1.60
			FSu	43	(10.4) 6.8-12.9	(0.47)0.11-0.82
Nilan Res. (June 21)	520	2F	Rb	40	(11.9) 9.9-13.6	(0.67)0.35-0.91
			CSu	79	--	--
Priest Butte L. (Apr.29, Aug.10)	299	1S,1F	Rb	1	(8.7)	(0.25)
			Rb	12	(13.6)12.3-14.7	(1.08)0.67-1.43
			Rb	6	(17.9)15.2-19.7	(2.39)1.72-3.08
Tiber Res. (Sept. 14)	15,900	1S	YP	46	(7.3) 7.0-10.9	(0.13)0.11-0.48
			Burbot	1	(18.7)	(1.34)
			CSu	23	(10.3) 9.5-13.7	(0.44)0.33-0.98
Willow Cr. Res. (June 20)	1,530	2F	Rb	22	(12.1)10.8-15.7	(0.68)0.51-1.42
Lewistown Area:						
Ackley Lake	247	3H	LL	1	(15.5)	(1.20)
			KOK	20	(8.8) 6.7-10.9	(0.25)0.09-0.42
			KOK	22	(14.0)11.0-15.3	(0.96)0.42-1.27
			Rb	5	(8.0) 7.3- 8.6	(0.16)0.11-0.19
			Rb	8	(13.9)11.8-15.9	(1.02)0.67-1.52
			Rb	2	(16.3)16.2-16.4	(1.78)1.71-1.84
			CSu	156	--	--
			FSu	121	--	--
Bair Reservoir	272	1H	Rb	9	(12.6)11.8-14.2	(0.88)0.60-1.28
			Eb	2	(10.9)10.6-11.3	(0.63)0.57-0.69
Crystal Lake	40	1H	Rb	20	(15.3)10.4-16.6	(1.53)0.31-2.17
Forest Lake	23	1	Ct(Y)	51	(9.7) 6.9-13.2	(0.34)0.10-0.80

Table 1. Continued

Area (Date Sampled)	Surface Acres	No. of Nets*	Species**	No. of Fish	Length Range (Average)	Weight Range (Average)
Martinsdale Res.	985	3	Rb	4	(16.2)14.8-17.6	(1.71)1.42-1.97
			CSu			
			FSu			
		3	Rb	5	(16.8)16.0-17.7	(1.90)1.56-2.18
			Rb	2	(10.2) 9.8-10.6	(0.49)0.43-0.55
			YP	2	(11.0)10.8-11.3	(0.86)0.84-0.88
			LL	2	(19.7)16.9-22.5	(3.20)2.07-4.32
			CSu	57	--	--
			FSu	24	--	--
Petrolia Res.	515	2Fr	WE	18	(14.3) 8.4-24.0	(1.21)0.16-5.25
		4	WE	2	(20.8)20.7-21.0	(2.93)2.86-3.00
Sutherlin Res.	324	2H	Rb	15	(13.4)11.2-15.2	(0.72)0.52-1.11
			CSu	271	--	--
			FSu	61	--	--
			WF	1	(12.8)	(0.72)
War Horse Res.	925	H&L	LMB	35	(8.6) 4.8-12.5	(0.38)0.03-1.18
Yellow Water L.	474	2H	Rb	37	(11.5) 8.2-12.3	(0.63)0.28-0.80
			CSu	236	--	--
		1H	BH	17	(11.2)10.0-12.9	(0.88)0.64-1.37

* Types of nets used: F-floating gill; S-sinking gill net; H-hoop net; FR-frame net; H&L-hook & line.

** Species abbreviations: KOK-kokanee; Rb-rainbow trout; LL-brown trout; YP-yellow perch; CSu-white sucker; FSu-longnose sucker; Ct(Y)-Yellowstone cutthroat trout; BH-bullhead; WE-walleye; LMB-largemouth bass; Wf-whitefish.

Bair Reservoir - This reservoir, belonging to the Water Resources Division, is located on the North Fork of the Musselshell River and is 272-surface acres in area. It is an important fishing area because of its proximity to White Sulphur Springs and a relatively short drive from Helena. It was rehabilitated during the fall of 1971 and restocked the following spring with rainbow trout. A gill net was fished overnight on May 17, 1973 to check on the growth of this plant. Nine rainbow trout and 2 brook trout

were the only fish taken. The rainbow had shown much improved growth with the removal of the previously large sucker population and averaged 12.6 inches long and 0.88 pounds. The 2 brook trout had entered the reservoir from the inlet stream and averaged 10.9 inches in length and 0.63 pounds.

This reservoir should be monitered periodically to determine the success of the rehabilitation. An attempt was made to treat all known rough fish sources in the tributaries.

Table 2. Winter Creel Checks of Various Lakes.

Area (Date)	Species	No. of Fish	Length Range Average	Weight Range Average
Eureka Res. (Jan. 13, 1973)	Rb	9	(11.7) 9.2-14.8	0.64)0.27-1.20
Fitzpatrick L. (Jan. 21, 1973)	Rb	41	(12.7)10.9-14.7	(0.95)0.62-1.43
	Rb	6	(17.1)15.3-18.5	(2.13)1.65-2.34
Nilan Res. (Jan 14, 1973)	Rb	47	(12.7) 9.1-14.8	(0.76)0.29-1.04
Willow Cr. Res. (Jan. 14, 1973)	Rb	14	(12.5) 9.8-13.7	(0.70)0.36-0.95

Rb-rainbow trout

Crystal Lake - Crystal Lake is a winter-kill lake in the Snowy Mountains that is popular for recreation because of its beauty and facilities provided by the U. S. Forest Service. Public pressure to force the Forest Service to allow development of a ski area above the lake reached a peak during the year. This now appears to be thwarted at least temporarily by an unfavorable cost and benefit ratio determined by an intensive study. Any development would likely be destructive of the beauty and value of this shallow lake.

Gill nets were fished to determine the growth rate of the planted rainbow trout. Twenty trout taken averaged 15.2 inches long and weighed an average of 1.53 pounds.

Developments in the continuing effort by local interests to increase recreational facilities in the watershed should be followed. Any development should recognize that the lake is the key feature of the area and should be allowed to proceed with only the utmost concern for the lakes protection.

Forest Lake - Forest Lake is a natural lake situated on Cottonwood Creek in the Crazy Mountains. It has become increasingly popular for fishing and camping in recent years. It contains a self-sustaining population of upper Missouri cutthroat trout. A gill net survey during July seems to indicate that the population has held up well under this increased pressure, but average size is well under that of a few years previous. Forty-eight trout caught averaged 9.7 inches and 0.34 pounds, similar to the size observed in 1970.

The cutthroat population should be watched for signs of overfishing and regulations altered if this is observed.

Martinsdale Reservoir - Martinsdale Reservoir is a popular fishing area in Meagher County. The 985-acre reservoir belongs to the Water Resources Division and is used extensively for irrigation. Three gill nets were left overnight on August 9 and again on August 15. The total catch was 9 rainbow from the 1971 plant and 2 from the 1972 plant, 2 yellow perch, 2 brown trout, 133 white sucker and 37 longnose sucker. The poor fishing experienced during the season was thus reflected in the gill net catches. The brown trout enter the reservoir with the water drawn from the South Fork of the Musselshell and occasionally provide an angling bonus. The yellow perch have apparently been introduced by a thoughtless angler within the past few years. The development of this population should be followed and its effect on the trout fishery determined.

Petrolia Reservoir - Petrolia Reservoir is a 515-acre Water Resources Division reservoir in Petroleum County. A small walleye population represents the only game fish present and they provide only limited fishing opportunity. Two trap nets were fished from May 4 to 14, 1972 and 18 walleye were taken. They averaged 14.3 inches long and 1.21 pounds. Numerous carp and white sucker were also captured. Four gill nets fished overnight on June 19, 1972 took only 2 walleye, both were about three pounds.

A negative environmental impact declaration was written and submitted for introducing burbot into Petrolia Reservoir. During April, 1973, 280 adult burbot were trapped in Tiber Reservoir and planted in Petrolia. The success of this introduction and its effect on the walleye population should be monitered.

Sutherlin Reservoir - Sutherlin Reservoir is a 327-surface acre impoundment on the North Fork of Smith River near White Sulphur Springs in Meagher County. This reservoir, belonging to the Water Resources Division, is used for irrigation and experiences large annual drawdowns. This, combined with a large sucker population, has resulted in poor growth of planted rainbow trout. Two gill nets were set overnight in the reservoir during August of 1972. Twenty-five rainbow trout, 234 white sucker and 141 longnose sucker were taken. Trout were noticeably thin and in poor condition. Despite the poor condition of the fish, this reservoir receives moderately heavy use because of its proximity to White Sulphur Springs and Helena. Sutherlin Reservoir should be considered for rehabilitation in the near future or managed for some species other than rainbow trout.

War Horse Lake - War Horse Lake is a 925-surface acre reservoir of the Water Resource Division in Petroleum County. It is shallow throughout its entirety and has dense growth of vegetation during the latter part of the summer. The reservoir receives a moderate amount of fishing pressure in the spring for black bullheads and especially largemouth bass. The bass are very numerous but most are fairly small, averaging less than half a pound in weight. A sample of fishermen's catches on July 8, 1972 produced measurements of 35 bass. These averaged 8.6 inches and 0.38 pounds. Based on scale samples, average length in inches at the end of each year of life is about 3 (1 year), 5 (2 years), 8 (3 years), 10 (4 years) and 12 (5 years) in War Horse. Two trap nets fished for 3 days in early September confirmed that carp, white sucker and longnose sucker are also very abundant in the reservoir.

During the winter it was decided to plant the reservoir with northern pike. It is hoped that this will serve the purpose of keeping the bass population in control so that growth is improved and central Montana residents will have the opportunity to catch desirable-size fish of this species. On May 4, 1973, a total of 146 adult northern pike were trapped from Lake Frances and planted in the reservoir. The success of this stocking should be followed closely and the spawning success evaluated during the summer of 1973.

On July 8, 1972, a sample of 35 largemouth bass taken by rod and reel was weighed and measured. The fish averaged 8.6 inches in length (range 4.8 to 12.6) and 0.38 pounds (range 0.03 to 1.18).

The Water Resources Division has announced plans to divest itself of control of this reservoir as it is not used for irrigation and does not appear to be suited to this use. The C. M. Russell Game Range of the Bureau of Sport Fisheries and Wildlife has asked

that they be given the reservoir to manage as a waterfowl production and hunting area. This use would be compatible with future fishery values. A group of ranchers has also asked for control for irrigation purposes. Because of the shallow depth of the reservoir, any irrigation would destroy the ability to support fish.

Yellow Water Lake - Yellow Water Lake is a 474-surface acre reservoir in Petroleum County belonging to the Water Resources Division of the State Department of Natural Resources. It is an important fishing reservoir in this area and attracts many fishermen from as far away as Billings. Trout and black bullhead are the two fish commonly sought but the lake also contains a large population of white sucker. Two gill nets were set in the reservoir the night of April 4. The trout catch reflected the doubling of the stocking rate in 1971 vis-a-vis prior years, as 37 rainbow were taken, all from the 1971 plant. For comparison, a similar gill net survey in 1971 took only 16 rainbow trout. One outstanding feature of the catch was the absence of fish from plants prior to 1971. In past years these older fish have represented a significant portion of the catch. The reason for this is not clear. In addition to the trout, a total of 2 black bullhead and 236 white sucker were taken.

During May of 1973, we were asked for an opinion on a request by a commercial fisherman for permission to net the lake for bullheads as had been done in prior years. The main criterion for deciding to allow fishing in the past has been the size of bullheads, with fishing being allowed when size, inversely related to population density, was at a low level. A trap net was fished for three days in early June and 17 bullhead were taken. These averaged 11.2 inches in total length and 0.88 pounds. On the basis of the large average size observed, a negative report was submitted regarding a commercial fishing operation.

Small Lakes and Farm Ponds

Dickens Lake - One sinking gill net produced 11 rainbow trout in Dickens Lake on the Sun River Game Range (Table 3). Attempts were made to prevent annual winterkill by installing a "Pondmaster". This device is wind-driven and is designed to keep an area free of ice. The Pondmaster was installed on October 19, 1972, prior to freeze-up, and was removed March 7, 1973. The windmill kept an open hole ranging in size from 15 feet in diameter to 150 feet by 100 feet in oval shape. During extremely calm conditions the hole would freeze over but would re-open when the wind commenced. Oxygen readings were taken throughout the winter and decreased progressively to a low of 0.8 ppm during January. Dickens Lake is too marginal for a trout fishery, experiences annual winterkill and should be removed from the management program.

Table 3. Gill net summary of small lakes and farm ponds, 1972.

Area (Date Sampled)	Surface Acres	No. of Nets*	Species**	No. of Fish	Length Range (Average)	Weight Range (Average)
Dickens Lake (Oct. 19)	5	1S	Rb	11	(13.3)10.5-14.9	(1.20)0.52-1.56
Fey Reservoir (May 18)	31	1S	Rb	3	(11.5)10.7-12.5	(0.49)0.38-0.58
			CSu	47	--	--
Henry Res. (June 20)	5	1S	Rb	6	(12.7)11.1-13.3	(0.83)0.52-0.96
Stewart Res. #1 (June 20)	3	1S	Rb	6	(6.3) 5.1- 7.0	(0.11)0.06-0.15
			Rb	14	(12.1) 9.3-13.3	(0.62)0.29-0.79
Stewart Res. #2 (June 20)	12	1S	Rb	20	(8.4) 6.4- 9.2	(0.33)0.13-0.46
Stewart Res. #3 (June 20)	11	1S	Rb	55	(7.9) 5.8- 8.8	(0.25)0.06-0.38
Tunnel Lake (May 3)	16	1S	YCT	11	(8.2) 7.2- 8.7	(0.19)0.16-0.24
			YCT	3	(12.4)12.0-12.8	(0.63)0.59-0.67
Barta		1	Rb	17	(9.3) 6.7-13.4	(0.27)0.10-0.80
			Eb	2	(8.4) 7.7-9 .2	(0.21)0.14-0.27
Benes #2		1 Frame	BC	11	(9.5) 4.4-12.3	(0.73)0.03-1.12
Box Elder		1	Rb	9	(10.4) 9.9-11.2	(0.52)0.41-0.68
Brook #1		1	Eb	10	(15.2)12.3-17.5	(1.62)0.94-2.49
Brook #2		1	Eb	10	(8.9) 6.9-11.3	(0.32)0.14-0.59
C-1		1	--	0	--	--
Carter (Upper)		1	Rb	16	(12.6)11.0-16.3	(0.85)0.62-1.81
Carter (Upper)		1	Rb	12	(15.0)13.8-17.0	(1.74)1.25-2.53
Clark		1	Rb	7	(12.4)10.5-15.3	(0.73)0.41-1.18
Drag Creek		1	Rb	6	(14.4)12.9-15.8	(1.22)0.94-1.52
Holgate		1	Eb	14	(7.9) 6.7-14.1	(0.25)0.12-1.28
			Rb	7	(10.2) 8.8-11.5	(0.43)0.28-0.62
Jakes Dam		1 Frame	--	0	--	--

Table 3. Continued.

Date (Date Sampled)	Surface Acres	No. of Nets*	Species**	No. of Fish	Length Range (Average)	Weight Range (Average)
Johnson		1	Rb	3	(10.2) 9.8-10.2	(0.43)0.39-0.49
Kingsbury		1	Rb	0	--	--
Komarek		1	Rb	1	(10.0)	(0.36)
Kovacich		1	Rb	16	(12.2)10.2-14.3	(0.72)0.46-1.16
Martin		1	Rb	1	(12.7)	(1.48)
Norman #1		1B Seine	Gs	Many	--	--
Norman #2		1	Rb	2	(15.9)15.7-16.2	(1.90)1.86-1.94
Peterson		2	Rb	100	(15.4) 6.0-19.3	(1.78)0.11-3.79
Peterson		1	--	0	--	--
Rindel		2	Rb	53	(12.1)10.3-15.6	(0.77)0.42-1.56
Urs		1	Rb	21	(11.6)10.1-14.8	(0.65)0.29-1.30
Volf		1	Rb	10	(11.1) 7.0-14.6	(0.58)0.42-1.02

* Type of net used: F-floating; S-sinking;Fr-frame net; BS-Beach seine.

** Species abbreviations: Rb-rainbow trout; YCT-yellowstone cutthroat; Gs-golden shiner; BC-black crappie; CSu-white sucker.

Fey Reservoir - White sucker outnumbered rainbow trout in one sinking gill net (Table 3). An additional 150 white sucker, 50 flathead chub, 38 rainbow trout and 5 longnose dace were taken in one frame net. The last stocking of rainbow trout was in June of 1970 as three-inch fingerlings. Due to poor growth of rainbow trout and excessive numbers of rough fish, Fey Reservoir was chemically rehabilitated with 72 gallons of rotenone on August 24, 1972. A total of 24 rainbow trout were weighed and measured at the time of chemical treatment and they averaged 11.0 inches total length (range 9.7-12.9) and 0.36 pounds (0.20-0.60).

Fitzpatrick Lake - Netting surveys were not conducted on Fitzpatrick Lake during 1972. However, fisherman creels were checked January 21, 1973 (Table 2). Summerkill did not occur in 1972 as was experienced in 1971.

Henry Reservoir and Stewart Reservoirs - Four farm ponds, Henry Reservoir and Stewart Reservoirs #1, #2 and #3 were stocked with rainbow trout in 1971. Gill net surveys in June 1972 revealed winterkill of the 1971 plant in Stewart Reservoirs #2 and #3 (Table 3). These ponds should be removed from the planting program.

Tunnel Lake - Growth of yellowstone cutthroat trout was checked in Tunnel Lake in May, 1972 (Table 3). Growth rates appear below average and the stocking rate for 1972 was lowered accordingly.

Other Farm Ponds

Twenty-nine farm ponds were sampled during the year of 1972 to determine growth rate and abundance of fish species present (Table 3). Management recommendations were made for many of these, based on findings. Additionally, several private ponds were netted at the owners request. Two public and three private ponds were rehabilitated. Seven farm ponds were checked and found to be either dry or too marginal for trout. These ponds include Loch, Steil, Stephens #1 and #2, and Lame. Some of these could be managed in the future if sufficient water depth is achieved.

Streams

A total of 34 streams were surveyed in one or more places for various purposes including general inventory, determining presence of cutthroat trout[1/], determining location of barriers and taking colored slides of same, securing cutthroat specimens for collection and checking reported decline of brook trout populations. Survey cards were completed and all pertinent data is on file in the Choteau and Lewistown field offices.

Dupuyer Creek - Dupuyer Creek was electrofished at four locations in August to determine status of brook trout populations. Brook trout were found at all locations and ranged from 4.6 to 13.2 inches. Other species taken include rainbow trout (2.9-12.0 inches) and mountain whitefish (5.9-13.8 inches).

Individuals interested in the status of brook trout populations accompanied the shocking crew on Dupuyer Creek as well as Sheep Creek and Haywood Creek.

1/ Unless otherwise specified, all cutthroat in this report are upper Missouri River strain.

Cutthroat Collections - Cutthroat specimens from five streams were captured in August and forwarded to Dr. Robert Behnke, Colorado State University, for purposes of adding to a comprehensive fish collection of the native species of the Rocky Mountain region. Specimens were taken by electrofishing in Haywood Creek, Sheep Creek, South Fork of Dupuyer Creek, North Fork of Dupuyer Creek and North Fork of Little Badger Creek. The cutthroat obtained ranged from 5.6 to 10.8 inches in total length. Fish taken from the North Fork of Little Badger Creek are thought to be yellowstone cutthroat since this species is present in Kiyo Lake which is a tributary to the stream mentioned. Brook trout up to 9.4 inches were also taken during surveys of Sheep Creek and the North Fork of Dupuyer Creek.

Haywood Creek Oil Seep - Between October 1971 and January 1972, Humble Oil Company drilled an exploratory well approximately 100 yards from the east bank of Haywood Creek in Pondera County. An oil emulsion mud was used to facilitate drilling and some of this mud accumulated in a reserve pit. After drilling operations were completed, all pumpable liquids in the pit were to be injected into the well (which was 7,095 feet in total depth). Adverse weather conditions set in and the pit was not emptied.

Early spring runoff occurred in March 1972 and the pit overflowed into Haywood Creek. Haywood Creek is a tributary to the North Fork of Birch Creek, which is one of the main tributaries of Swift Reservoir. Humble Oil estimated 5-10 barrels of oil reached Swift Reservoir and this oil was recovered by burning and with 3M brand sorbent pads. Corrective actions at Haywood Creek included flushing oil with water through fractures in the bank adjacent to the creek, and this oil was recovered with 3M sorbent.

Oil seepage of a small magnitude occurred throughout the summer. In September 1972, Humble Oil again flushed the adjacent creek bank with water and collected the oil with sorbent pads. In addition, sand and 3M sorbent material were placed on the rock face of the creek bank to seal the oil seep. Rock was then placed on top of the sand to guard against erosion.

Observations at the site after the final cleanup indicate oil continues to seep very slowly and probably will for some time. Insect populations are nearly absent in Haywood Creek from the origin of the seep to the mouth, but numerous organisms can be found above the site. Cutthroat trout inhabit this stream and undoubtedly experienced adverse environmental conditions. Oil drilling activities should be discouraged wherever danger exists to trout streams and particularly those containing cutthroat.

Spring Creek - Spring Creek was electrofished August 7, 1972 at three locations near the town of Choteau. Two of the three locations receive plants of catchable rainbow trout. Only one hatchery fish was collected at the two locations. Wild rainbow outnumber brook trout in the planted sections but brook trout predominate in the unplanted area. Rainbow trout ranged from 2.6-11.0 inches in the three areas sampled while brook trout ranged from 3.9-10.9 inches.

Badger Creek Drainage - A total of 9 streams in the Badger Creek drainage were surveyed in July and August for general inventory purposes. Streams surveyed include Badger Creek and one tributary - Lonesome Creek; North Fork of Badger Creek and four tributaries - Red Poacher Creek, Lee Creek, Kip Creek and Pool Creek; and the South Fork of Badger Creek and one tributary - Elbow Creek.

Cutthroat only (9-16 inches) were found in the North Fork of Badger Creek drainage above a barrier located 1 mile above the confluence of the North Fork of Badger Creek with the South Fork. Barriers are also present on the South Fork approximately $\frac{1}{2}$-mile above the confluence but only brook trout (4-9 inches) were sampled in the South Fork of Badger Creek drainage. Brook, cutthroat and rainbow-cutthroat hybrids are reported by fishermen in Main Badger Creek.

As reported in Completion Report F-5-R-21, Job I-a, the Badger Creek drainage shows effects of the 1964 flood and the streams have been influenced by seismograph roads. Further seismograph exploration in the area should be confined to the existing roads and temporary roads should be closed and the land reclaimed.

Big Spring Creek - Construction of the Big Spring Creek Watershed project was in full swing during the year. The mill ditch was completed and construction was begun on the East Fork and Hanson Creek dams. Contracts for construction of the other, less important dams will be let as funds are available.

Bottom fauna samples were taken during July from the previously established stations. These samples are designed to serve as an index to long-term changes in the productivity of the stream and to moniter possible changes in the character of the stream after the flow regime is changed following the construction of the watershed dams. Two one-square foot samples were taken from each station. The combined total for each station is shown in Table 4. As in past years, the greatest number of organisms was found above town. No comparison with past years is attempted except to note that totals for different organisms fall within the magnitude previously observed. Statistical analysis of these data should not be made until a few more years of samples are collected.

Table 4. Number of organisms taken in two one-square foot bottom samples from Big Spring Creek and East Fork, July, 1972.

Organism	Fish Hatchery	East Fork	Burleigh's	Montana Power	St. Leo School	Above Sewer	Below Sewer	Trestle	Falls
Trichoptera									
Brachycentridae	642	17	1,313	512	17	39	2	0	0
Leptoceridae	27	0	514	596	21	58	7	4	3
Glonosomatidae	201	12	120	189	4	20	0	2	2
Limnephilidae	5	0	30	13	0	0	0	0	0
Hydropsychidae	3	1	9	4	0	0	0	0	0
Hydroptilidae	0	0	28	5	0	0	0	0	0
Ephemeroptera									
Heptogeniidae	28	14	25	18	49	173	53	169	71
Baltiscidae	1	1	0	0	16	68	1	90	23
Tricorythidae	0	9	1	0	0	0	0	1	0
Baetidae	0	0	3	1	7	17	21	39	12
Plecoptera									
Perlodidae	0	0	17	0	0	0	0	9	1
Diptera									
Tendipedidae	9	37	1	29	187	324	58	3	0
Simulidae	0	0	1	0	3	0	1	12	1
Tipulidae	0	0	0	0	0	10	0	0	4
Phogionidae	0	0	0	0	0	9	0	0	1
Culicidae	0	1	0	0	0	4	0	0	0
Musidae	0	0	0	0	1	7	0	0	0
Heptageniidae	0	0	0	0	1	26	0	0	0
Coleoptera									
Hydroenidae	0	0	0	7	0	0	6	0	1
Dytiscidae	0	0	1	4	0	0	21	0	0
Mollusca									
Ancylidae	0	1	0	1	2	0	4	0	0
Physidae	0	0	0	2	0	0	3	0	0
Hydrochnae									
Hydrachidae	0	0	1	0	0	13	2	0	1
Tricladida									
Planariidae	0	1	1	0	0	0	0	0	0
Totals	916	94	2,055	1,381	308	768	179	329	120
Ave. per Sq. Ft.	458	47	1,032	690	154	384	90	164	60

As per the terms of the Department's responsibilities under the fishing access agreement with Gail Burleigh, nearly $900.00 was spent on riprap of several badly eroding areas. Willows were planted in several of the areas riprapped in past years and seem to be surviving. An attempt should again be made to have Burleigh stay back away from the bank during his haying operation, as he is preventing willows from becoming established in several areas by keeping them mowed.

A parcel of land of about 40 acres was located on lower Spring Creek and its purchase negotiated for fishing access and game bird habitat. Owners of other areas were also contacted but none were interested in selling. Every effort should be made to purchase additional sites, above or below town.

A new sawmill was erected along Spring Creek below town and its wastes were causing a pollution problem. The mill has been shut down periodically by the County Attorney but the problem has not been completely solved as yet. Developments here should be watched carefully to prevent this source of pollution from adding to the problems already plaguing the stream. Another pollution problem, snow dumping by the City of Lewistown, did not occur because of the light snowfall during the winter of 1972-73. If this practice is continued in the future, further attempts should be made to stop it. The County has been dumping cars in a marshy area draining into Spring Creek. A complaint to the City-County Sanitarian was answered with assurances that this would not continue. It appears, however, that the practice may be continued in the future and further action may be necessary.

Spring Creek was open to fishing the past winter for the first time. Fishing pressure was light, as expected, and some good fishing was experienced. The effect of this season on the trout populations should be determined after two or three years.

An attempt was made to obtain population estimates from the established shocking sections during late summer of 1972. However, periodic heavy rains and high turbidity allowed only the marking runs in two of the sections. No conclusions on populations can be made but it appeared that abundance may have been below that previously observed. Lowered shocking success may have been a result of higher flow levels, however.

Warm Spring Creek - Warm Spring Creek was successfully shocked for the first time during the late fall of 1972. An upper section near the spring and one about 5 miles downstream were sampled. Catches consisted mainly of mountain sucker, longnose sucker, white sucker and longnose dace. The rainbow trout taken confirmed our

belief that growth is not great and that survival over one year is minimal. Scales were difficult to interpret because of the warm water and lack of a distinct annulus but few trout, based on length, had been in the stream over 1½ years.

A negative impact declaration was filed to plant smallmouth bass in this stream and every effort should be made to substitute this species for the present annual stocking of rainbow.

Yogo Creek - Yogo Creek is a small tributary of the Middle Fork of the Judith River. It is a popular fishing stream and camping area throughout the summer. Several sections above the sapphire mine were shocked on August 8, 1972 and a fair brook trout population was observed. Average size was small, however, with the largest fish weighing about a quarter pound.

South Fork McDonald Creek - Four sections, totaling about 1,500 feet, of the South Fork of McDonald Creek between Forest Grove and Grass Range, were electrofished during June. This is a small silty stream draining part of the foothills of the Snowy Mountains that has been damaged badly by poor agricultural practices. It does support a limited fishery for wild rainbow trout, however. Four rainbow trout averaging 10.9 inches (range 5.8-14.1) and 0.70 pounds (range .07-1.33) were taken. White, longnose and mountain suckers were present in all sections.

A small tributary, Duncan Creek, was also shocked with suckers the only fish being taken.

North Fork Flatwillow Creek - Five sections of the North Fork of Flatwillow Creek were electrofished during July. Flatwillow Creek is a small stream draining part of the northeast corner of the Snowy Mountains. It contains cutthroat trout in the upper reaches where it is fairly inaccessible. Brook trout support a moderately heavy fishery in the lower stretches. The shocking was performed in this lower area. Small numbers of brook trout were taken in the upper four sections. Most were age 0 but ranged up to 12.4 inches and 0.79 pounds. Fourteen of the 68 brook trout were age 1 and older. Mountain, white and longnose sucker were taken in limited numbers. The lower section is in an area fairly popular with campers and receives most of the fishing pressure. Fish habitat is better in this area than the upstream areas, also. This better habitat was reflected in the electrofishing results. A 400-foot section yielded 68 brook trout and 5 wild rainbow. Catchable rainbow are stocked annually in the vicinity of this section but none were observed. Most brook trout were age 0 but older individuals ranged up to 9.5 inches and 0.40 pounds. Rainbow trout ranged from 5.0 inches (0.06 pound) to 9.4 inches (0.34 pound).

Judith River - The Judith River is a tributary of the Missouri River, draining a large portion of the northeast corner of the Little Belt Mountains. The stream is subject to extreme flow fluctuations due to logging in the headwaters and irrigation in the valley. The lower portions of the stream that are in the proximity of springs maintain favorable flow and temperature levels. Modest populations of rainbow trout with lesser numbers of brook trout and an occasional cutthroat and whitefish are present. Better trout populations are found in the mountain areas.

The mark-recapture technique was used on a section on the Julian Rogers Ranch during July, 1972. This area is just below a substantial spring and maintains a small flow all summer. A reliable population estimate could not be made because sample sizes were not sufficiently large. Based on the limited information, however, a tentative estimate of about 300 wild rainbow 6-inches and larger was made. Thirteen brook trout ranging from 5.0 to 13.9 inches (1.10 pounds) were taken as were 6 whitefish and one cutthroat. Thirty-seven hatchery rainbow from plants in 1971 and earlier in 1972 were captured.

Following shocking, one thousand catchable rainbow trout were marked by removal of the adipose fin and planted in the upper portion of the section to get an idea of survival of these fish in this stream.

On June 11, 1973 the section was again electrofished. The catch consisted of 33 adipose-marked rainbow, 80 wild rainbow, 8 unmarked hatchery rainbow, 8 brook trout, 6 whitefish, 1 cutthroat and 1 cutthroat-rainbow hybrid. Only tenuous conclusions can be made regarding survival of the marked trout because of the unknowns involved such as angling mortality, migration and the proportion of those remaining that were captured by shocking. It appears, however, that 20-25 percent of the fish in the section were taken; thus the number of marked rainbow surviving within the section probably approximated 150, or 15 percent of those planted.

Running Wolf Creek - Three sections of Running Wolf Creek were observed during July, primarily because the Stanford Rod and Gun Club insisted that the brook trout had disappeared and requested that we stock it with rainbow trout. Very good numbers of brook trout and a few wild rainbow were observed in all sections, however, as seen in Table 5.

Recovery rate was low because of the heavy brush. It is obvious that the brook trout in this popular creek have been able to maintain a fishable population under the present fishing effort and that stocking is unwarranted.

Table 5. Summary of Shocking sections on Running Wolf Creek, July, 1972.

Section	Length (Ft)	Number Rainbow trout Age 1 & Older	Number Brook Trout Age 1 & Older
Lower	210	0	68
Middle	230	5	74
Upper	200	11	54

North Fork of the Musselshell River - The rotenone treatment of the approximately two miles of the North Fork of the Musselshell River above Bair Reservoir presented an opportunity to study the repopulation of the treated area by the upstream population of brook trout. Three study sections were established in the treated area and one immediately above. These have been periodically shocked since immediately after treatment in October of 1971 through June, 1973. It appears that stable populations have already been achieved. A more complete report will be prepared.

Birch Creek Drainage - Nineteen streams were surveyed during July in the Birch Creek drainage. Phillips Creek drains into the upper end of Swift Reservoir below the confluence of the Middle and South Forks of Birch Creek. A barrier on Phillips Creek is present $\frac{1}{4}$-mile above the mouth and rainbow trout (10-11 inches) were collected below the barrier but no fish were observed above the barrier.

The South Fork of Birch Creek has good habitat and contains numerous barriers and partial barriers throughout its course. No fish were collected above the lowermost barrier but rainbow (12-18 inches) and cutthroat (10-12 inches) were taken below this barrier. Six tributaries to the South Fork were also surveyed (Post Creek, Phone Creek, Lake Creek, Circus Creek, Pinto Creek and Crazy Creek). Most of these streams are of little fisheries value and are probably intermittent at times during the year. Consideration should be given to planting cutthroat endemic to the area in the approximately 5-6 miles of barren water of the South Fork. This could conceivably be done by helicopter.

Six streams were surveyed in the Middle Fork of Birch Creek drainage. These include the Middle Fork of Birch Creek, Pinky Creek, Tubby Creek, Field Creek, Spike Creek and Lost Horse Creek. The only fish collected were rainbow and cutthroat near the mouth of the Middle Fork. Tubby Creek and Lost Horse Creek are the only tributaries that could serve as value to a fishery, the other tributaries being dry or intermittent.

The North Fork of Birch Creek was inventoried along with Haywood Creek, Hungry Man Creek, Killem Horse Creek and Blind Creek. Cutthroat (7-11 inches) were taken in the North Fork but no fish were observed in the tributaries except Haywood Creek. Small cutthroat (3-6 inches) were found in this stream above and below a barrier.

Table 6 lists the location of barriers found on the streams surveyed along with the species of fish present above and below the barriers.

Table 6. Location of barriers and species of fish present.

Stream	County	Location of Barrier	Fish Present* Above	Below
Sheep Creek	Teton	27N- 9W-6	?	CT, Eb
S. Fork Dupuyer Cr.	Teton	27N- 9W-36	CT	CT
N. Fork Badger Cr.	Pondera	29N-12W-25	CT	CT,Rb,Eb
S. Fork Badger Cr.	Pondera	29N-12W-25	Eb	CT,Rb,Eb
Phillips Creek	Pondera	27N-10W-34	?	Rb
S. Fork Birch Cr.	Teton	27N-10W-10	none	CT, Rb
Mid. Fork Birch Cr.	Teton	27N-10W-8	?	CT, Rb
N. Fork Birch Cr.	Pondera	28N-10W-21	CT	CT, Rb
Haywood Creek	Pondera	28N-10W-21	CT	CT

Species abbreviations: CT-cutthroat trout; Rb-rainbow trout; Eb-brook trout.

Prepared By: William J. Hill & Duane Phinney

Date: April 1, 1974

Code numbers of waters referred to in this report are as follows:

14-0200	Big Badger Creek	14-5400	South Fork Birch Creek
14-0440	Blind Creek	14-5480	South Fk. Dupuyer Creek
14-0760	Circus Creek	14-5720	Spike Creek
14-1040	Crazy Creek	14-5760	Spring Creek
14-1640	Dupuyer Creek	14-6280	Tubby Creek
14-1860	Elbow Creek	14-7080	Bynum Reservoir
14-1960	Field Creek	14-7320	Eureka Reservoir
14-2360	Haywood Creek	14-7330	Fey Reservoir
14-2480	Hungry Man Creek	14-7370	Fitzpatrick Lake
14-2680	Kill Em Horse Creek	14-7620	Henry Reservoir
14-2740	Kip Creek	14-8060	Loch Pond
14-2880	Lee Creek	14-8210	Martin Reservoir #1
14-3080	Lonesome Creek	14-8211	Martin Reservoir #2
14-3160	Lost Horse Creek	14-8540	Priest Butte Lake
14-3440	Middle Fork Birch Cr.	14-9030	Steil Pond
14-3760	North Fk. Big Badger Cr.	14-9080	Stephens Pond #1
14-3800	North Fk. Birch Creek	14-9081	Stephens Pond #2
14-3840	North Fk. Dupuyer Creek	14-9091	Stewart Reservoir #1
14-3920	N. Fk. Little Badger Cr.	14-9092	Stewart Reservoir #2
14-4120	Phillips Creek	14-9093	Stewart Reservoir #3
14-4160	Phone Creek	14-9240	Tiber Reservoir
14-4240	Pinky Creek	16-0300	Big Spring Creek
14-4280	Pinto Creek	16-1340	East Fk. Big Spring Cr.
14-4360	Pool Creek	16-1820	Judith River - Sec. 1
14-4380	Post Creek	16-3160	Running Wolf Creek
14-4560	Red Poacher Creek	16-3920	Warm Spring Creek
14-5000	Sheep Creek	16-4260	Yogo Creek
14-5360	South Fk. Badger Cr.	16-4300	Ackley Lake

16-4400	Barta Pond
16-4463	Benes Pond
16-4590	C-1
16-4620	Carters Ponds
16-4840	Crystal Lake
16-5960	Holgate Reservoir
16-6260	Kingsbury Pond
16-6460	Komarek Reservoir
16-6784	Martin Reservoir
16-7286	Norman Reservoir #1
16-8660	Urs Pond
16-8703	Volf Reservoir
17-9616	Sutherlin Reservoir
18-1380	Cottonwood Creek
18-4560	N. Fk. Flatwillow Cr.
18-4620	N. Fk. Musselshell R.
18-5640	S. Fk. McDonald Creek
18-7220	Box Elder Cr. Res.
18-7321	Brooks Reservoir #1
18-7322	Brooks Reservoir #2
18-7510	Forest Lake
18-7560	Drag Creek Reservoir
18-7750	Bair Reservoir
18-7945	Johnson Reservoir
18-8110	Kovacich Pond
18-8380	Martinsdale Reservoir
18-8720	Petrolia Reservoir
18-8745	Peterson Pond
18-8840	Rindel Pond
18-9440	War Horse Lake
18-9500	Yellow Water Lake
20-7130	Dickens Lake
20-7635	Lames Pond
20-7900	Nilan Reservoir
20-8400	Tunnel Lake
20-8500	Willow Creek Reservoir

MONTANA DEPARTMENT OF FISH AND GAME
FISHERIES DIVISION

JOB PROGRESS REPORT

State Montana

Project No. F-5-R-22 Title Central Montana Fisheries Study

Job No. I-b Title Fish Management Surveys

Period Covered July 1, 1972 to June 30, 1973

ABSTRACT

Tagging studies of northern pike were continued for the third consecutive year at Pishkun Reservoir and the second consecutive year at Lake Frances. A total of 764 northern pike were tagged and released in the two reservoirs in 1972 and angler returns account for 10.7 percent and 6.2 percent for Pishkun Reservoir and Lake Frances respectively. Accumulative tag returns for fish tagged in 1970 in Pishkun Reservoir have reached 43.6 percent and 25.9 percent for fish tagged in 1971. Northern pike tagged in 1971 in Lake Frances have an accumulative return of 19.1 percent. The northern pike population in Pishkun Reservoir was estimated at 1,232.

Additional data collected in conjunction with the tagging studies includes information on recapture and movement of northern pike, tag loss, sex ratios, water temperatures, water levels, age and growth and reproduction. Data is also presented on kokanee and walleye populations and a sucker removal program.

Background information is discussed in the section on findings.

OBJECTIVES

The objective of this survey is to determine reproduction, growth, harvest and effect of restrictive fishing regulations on northern pike populations in Pishkun Reservoir and Lake Frances.

PROCEDURES

Fish were collected using 4-foot by 6-foot frame net traps (1-inch and ½-inch mesh) with 60-foot leads; 3-foot by 4-foot frame net traps (¼-inch mesh) with 35-foot leads; 125-foot by 6-foot and 125-foot by 24-foot gill nets; and a 50-foot minnow seine with ¼-inch mesh. Measurements of fish include total length to the nearest tenth of an inch and weights to the nearest hundredth of a pound. Scale samples were secured for age and growth studies. Northern pike were marked by a caudal fin clip or T-tag and the left pectoral fin was clipped to facilitate determining tag loss in future years. Water temperatures were registered on a Taylor maximum-minimum thermometer and a seven-day thermograph. Harvest was determined through voluntary angler tag returns. Water level data was obtained from the local irrigation district records.

FINDINGS

Pishkun Reservoir

History - Pishkun Reservoir in southwestern Teton County contains 1,550 surface acres and has a maximum depth of 80 feet. The reservoir serves as irrigation storage and fluctuates 10-15 feet during the irrigation season. The reservoir fills in early spring with water supplied by canal from Diversion Dam on the Sun River. Fish populations found in the reservoir include northern pike, yellow perch, kokanee, rainbow trout and white sucker.

Species Composition - Frame net traps were fished in Pishkun Reservoir from April 17, 1972 to April 29, 1972 to capture northern pike on their spawning run. A total of 1,167 adult northern pike were taken along with 6 immature fish. Other species taken include 421 white sucker, 22 yellow perch, 5 rainbow trout and 1 kokanee. The reservoir was rapidly filling at this time and northern pike were the main species utilizing the shoreline, hence the smaller numbers of other fish taken.

Marking - Of the total adult northern pike taken in traps, 726 were marked and released, 375 were recaptures and 66 were not marked (Table 1). Of 726 northern pike marked and released in 1972, 393 (291 males, 102 females) were marked with a numbered T-tag and also with a left pectoral fin clip to aid in recaptures over a long period of time. Two hundred-ten (143 males, 67 females) were marked with an upper caudal clip for a short term recovery. In addition to fish marked for the first time in 1972, 95 (74 males, 21 females) and 28 (24 males, 4 females) northern pike represent fish tagged in

1971 and 1970 respectively. The first capture of these fish during 1972 represent a mark and subsequent capture count as recaptures.

Table 1. Northern pike taken by trapping periods, Pishkun Reservoir, 1972.

Trapping Period	Total Fish Captured	Number Marked & Released				Number Recaptured				Number Unmarked & Released
		1972 Tags	Caudal Clip	1971 Tags	1970 Tags	1972 Tags	Caudal Clip	1971 Tags	1970 Tags	
4-20-72	127	109	--	15	3	--	--	--	--	--
4-24-72	145	113	--	19	7	3	--	3	--	--
4-26-72	231	144	--	26	7	41	--	9	4	--
4-27-72	201	27	83	17	5	60	--	7	2	--
4-28-72	273	--	127	10	4	86	25	18	3	--
4-29-72	190	--	--	8	2	58	26	24	6	66
Totals	1167	393	210	95	28	248	51	61	15	66

All fish taken during 1972 were separated according to six individual trap areas in which they were captured (Figure 1). Examination of Figure 1 reveals that only the western part of the lake was trapped. This was purposely done to avoid wind and wave action on traps. Trapping areas were not limited to one specific location, rather they were fished in the same general area as much as possible and were moved only to adjust to increasing water levels. Four of the traps were fished during all six trapping periods and the remaining two traps were fished during the last four trapping periods (Table 2). Upon removal from traps, fish were handled and released a short distance away from the trap site (with the trap being collapsed) to prevent immediate re-entry to the same trap. After release, the trap was reset.

Recapture and Movement - A total of 375 northern pike were recaptured during 1972 (Table 1). Of this total, 248 were recaptures of fish tagged in 1972, 51 were fish marked with caudal clips, 61 were previously tagged in 1971 and 15 were previously tagged in 1970.

FIGURE 1. PISHKUN RESERVOIR.

Of 375 recaptures, 242 were taken one time, 71 two times and 11 were taken three times following original mark and release procedures. The remaining 51 had a caudal clip only so recognition of individual fish was not possible. Further reference to recaptures will not include these 51 fish which had been marked to obtain additional data for population estimates. Population estimates will be discussed in a later section.

Male northern pike were recaptured at a higher rate than female northern pike as shown in Table 3. This rate holds true for first, second and third recaptures.

Table 2. Number of northern pike taken by trapping area and trapping period, Pishkun Reservoir, 1972.

Trapping Period	Trap 1	Trap 2	Trap 3	Trap 4	Trap 5	Trap 6	Total
4-20-72	7	86	26	8	--	--	127
4-24-72	26	67	37	15	--	--	145
4-26-72	63	47	17	27	55	22	231
4-27-72	29	40	32	15	43	42	201
4-28-72	54	53	32	23	59	52	273
4-29-72	55	14	33	19	46	23	190
Totals	234	307	177	107	203	139	1167

Table 3. Differential recapture (%) between male and female northern pike following marking, Pishkun Reservoir, 1972.

Number Marked		% Recapture		
		First Recapture	Second Recapture	Third Recapture
Male	389	56.5	16.7	2.6
Female	127	37.0	4.7	0.8

Somewhat random movement of tagged fish was noted following marking (see Table 4). Females generally were recaptured in areas other than the original marking site. Males tended to frequent the same area in which they were marked, particularly the first recapture but movement became more random in the second and third recaptures. Table 5 shows the approximate distance between trapping areas with the greatest distance being 12,250 feet and the least 2,500 feet.

Table 4. Northern pike, Pishkun Reservoir - Area marked and area recaptured.

Area & Number Marked		First Recapture Trap						Second Recapture Trap						Third Recapture Trap					
		1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
Trap No. 1																			
Male	81	19	3			3	10	5	3			2							
Female	31	7				4	1												
Trap No. 2																			
Male	150	4	35	8	6	17	16	3	4	6	2	10	4	1	1		2	2	
Female	32		5	1	4	2	1			2	1								
Trap No. 3																			
Male	67	2	8	14	2	14	5	2	3	6	2	9	2	2		1		1	
Female	18		3		1	3	2		1				1					1	
Trap No. 4																			
Male	35	1		1	5	2	1				2								
Female	15		2		1	2					1								
Trap No. 5																			
Male	40	1		4	1	2	3												
Female	27	1			1	4													
Trap No. 6																			
Male	16	2	1	1		1	3												
Female	4			1		1													

Total marked	516
Total recaptured	324
First recapture	242
Second recapture	71
Third recapture	11

Table 5. Approximate distance in feet between traps (Refer to Figure 1).

	Trap 1	Trap 2	Trap 3	Trap 4	Trap 5	Trap 6
Trap 1		8,950	10,200	12,250	11,250	8,000
	Trap 2		3,350	5,400	4,400	3,550
		Trap 3		4,000	2,550	4,800
			Trap 4		2,500	6,850
				Trap 5		5,850

Tag Loss - In 1972, a total of 97 northern pike marked in 1971 were examined for fin clips and the presence or absence of tags. Only two were found to have lost their tags for a 2.06 percent tag loss. This compares to a 2.41 percent tag loss in 1971 for fish marked in 1970. Examination of 1970 marked fish during 1972 revealed no further tag loss in which 28 fish were observed, all of which still retained their tags.

Population Estimate - A population estimate of 1,232 northern pike was computed using the basic Schnabel method described by Rounsefell and Everhart (1960). The estimate (Table 6) includes fish of age groups III and older. The estimate indicates that 41.8 percent of the population was tagged while angler catches of tagged and untagged fish represent 42.7 percent tagged. The 1972 estimate of 1,232 fish compares with 2,086 in 1971 and 1,645 in 1970.

A number of assumptions have to be made when marking fish and making population estimates. In the present study it is assumed that tagging and fin clipping had no adverse effects on the behavior of the fish and that tagged fish were as vulnerable to trapping as untagged fish. It is also assumed that no mortality resulted from the various marking methods or handling.

Sex Ratios - Since this study was initiated in 1970, female northern pike have steadily decreased (Table 7). Females are taken in greater proportions by anglers than during spring netting.

Table 6. 1972 northern pike population estimate for Pishkun Reservoir.

Time Interval (t)	Marked Fish at Large M(t)	Fish Captured C(t)	Marked Fish Recaptured R(t)	M(t-1)C(t)	M(t-1)C(t) R(t)	Cumulative E	Cumulative D	G/H
A	B	C	D	E	F	G	H	I
1	127							
2	266	145	6	18,415	3,069	18,415	6	3,069
3	443	231	54	61,446	1,138	79,861	60	1,331
4	575	201	69	89,043	1,290	168,904	129	1,309
5	716	273	132	156,975	1,189	325,879	261	1,249
6		190	114	136,040	1,193	461,919	375	1,232
			375	461,919	1,232			

Number of recaptures 375
1.96 Standard error is 37.96
Population at P of 0.05 is 1,232 (confidence limits of 1,093 to 1,371)

Table 7. Sex ratios of northern pike, Pishkun Reservoir, 1970-1972.

	Number			Sex Ratio (M:F)		
	1970	1971	1972	1970	1971	1972
Tagged fish	498	559	393	100:60	100:57	100:35
Untagged fish	--	422	276	--	100:53	100:49
Recaptures	--	83	123	--	100:48	100:26
All fish	498	1064	792	100:60	100:55	100:38
Angler tag returns	175	143	65	100:90	100:77	100:51

Water Temperatures and Water Levels - Water temperatures during trapping operations ranged from a minimum of 36° F. on April 17 to the maximum of 54° F. on April 25.

Water levels began to rise April 17 (the same date traps were first set) and had risen approximately 8 feet by the time trapping was completed. Maximum water levels were attained May 19 and fluctuated throughout the summer reaching the minimum level September 1, 1972 (Figure 2).

Age and Growth - A total of 132 northern pike scales were collected and analyzed during trapping operations. Age groups III through VI were represented and include mature fish only (Table 8). Only five fish taken not considered mature and they represented age groups II and III.

When captured, 290 mature males averaged 22.5 inches total length (range 15.9-28.3) and 102 females averaged 23.3 inches (range 16.5-28.4). The oldest male taken was 6 years old and the oldest female was 5 years old. The majority of the fish appear to be 3 and 4 years old with 35.4 percent of the males being 3 years and 43.1 percent 4 years, while 20.9 percent of the females were 3 years and 73.1 percent 4 years old.

Using recaptures of fish tagged in 1971, average annual increments were determined (age groups not differentiated) by computing differences in total lengths. A total of 84 tagged males averaged 3.2 inches (range: -0.6 to 6.1) increase in total length from 1971 to 1972. The minus increment represents one fish which measured 23.8 inches in 1971 and 23.2 inches in 1972. It is not known if an error in procedures resulted in this discrepency or if the decrease in total length actually occurred. Eighteen tagged females

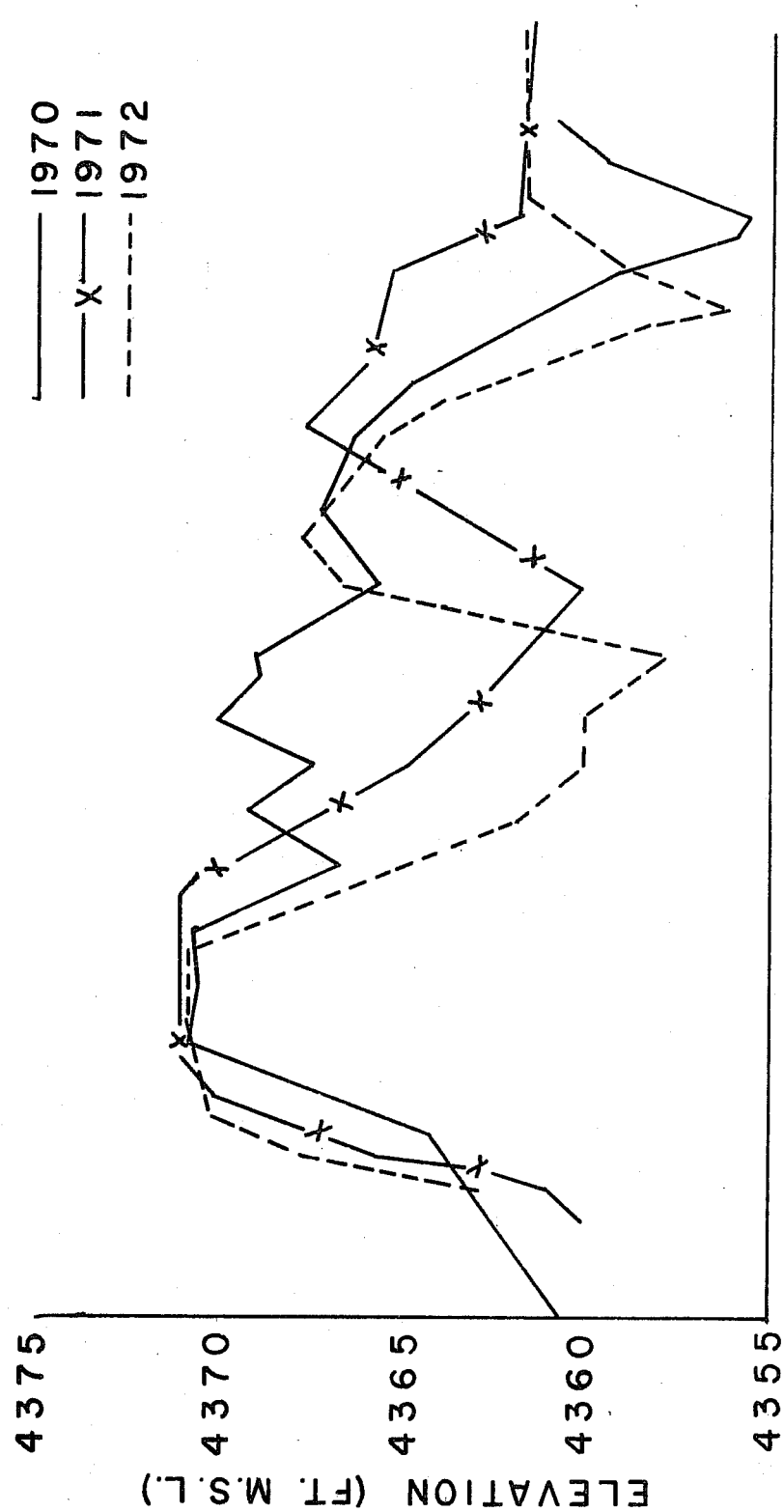

FIGURE 2. WATER LEVELS, PISHKUN RESERVOIR, 1970-72.

Table 8. Average calculated total lengths (TL) in inches of northern pike, Pishkun Reservoir, 1972.

Year	Age Group	Number		Average TL at end of year of life											
				1		2		3		4		5		6	
		M	F	M	F	M	F	M	F	M	F	M	F	M	F
1969	III	23	14	7.4	7.1	14.2	13.5	20.1	20.0						
1968	IV	28	49	6.7	7.4	12.5	13.8	17.5	19.2	21.6	24.0				
1967	V	10	4	6.9	6.9	11.9	12.9	17.3	18.2	21.3	22.3	24.2	25.6		
1966	VI	4	--	6.8	--	13.4	--	18.0	--	21.5	--	23.9	--	26.1	--
1972	Averages	65	67	7.0	7.3	13.1	13.7	18.4	19.3	21.5	23.9	24.1	25.6	26.1	--
1971	"	90	84	6.6	6.6	12.6	13.0	17.6	18.2	21.0	22.1	23.3	25.3	25.6	25.7
1970	"	90	75	6.7	6.8	12.6	13.9	17.7	18.9	20.9	22.6	23.8	27.7	26.2	32.9

averaged 3.8 inches (range 1.2 to 5.8) increase in total length from 1971 to 1972. The average annual increment from scale analysis of untagged fish indicatesan increase in total length of 4.4 inches (range 1.5 to 7.3) for 65 males and 5.1 inches (range 1.9 to 8.9) for 67 females. This data shows the possibility of growth retardation connected with tagging and marking of northern pike. Similar results are noticed for the 1971 data which shows average annual increments for 1970 tagged fish as follows: 55 males - 2.7 inches (range 1.0 to 4.6), and 27 females - 3.0 inches (range 0.6 to 5.2). Untagged fish (scale analysis) show these average increments: 91 males - 4.8 inches (range 1.0 to 8.7), and 84 females - 5.3 inches (range 2.1 to 9.9).

Harvest - Anglers voluntarily returned 65 tags from northern pike during 1972 (Table 9). June accounted for 32 of the reported tag returns for 49.2 percent of the total. Examination of Table 9 shows comparable monthly returns for 1970-1972.

Table 9. Northern pike tag returns by month, Pishkun Reservoir, 1970-1972.

Month	1970		1971*		1972**	
	No.	%	No.	%	No.	%
May	17	9.5	18	12.5	5	7.7
June	83	46.6	72	50.0	32	49.2
July	53	29.8	27	18.7	11	17.0
August	11	6.2	20	13.9	8	12.3
September	2	1.1	6	4.2	6	9.2
October	--	--	--	--	--	--
November	3	1.7	--	--	--	--
December	--	--	1	0.7	2	3.1
January	3	1.7	--	--	--	--
February	6	3.4	--	--	1	1.5
Totals	178	100.0	144	100.0	65	100.0

* Includes 1970 tags taken during 1971.
** Includes 1970 and 1971 tags taken during 1972.

Of the 65 tags returned by anglers in 1972, 42 were of fish tagged during 1972 for 10.7 percent return (Table 10). An additional 19 tags were returned from fish tagged in 1971 and 4 tags were returned from fish tagged in 1970. Accumulative returns for 1970 and 1971 are 43.6 percent and 25.9 percent respectively. To date, 1,450 northern pike have been tagged in Pishkun Reservoir and 404 (27.8%) have been returned. The breakdown of percent return for male and female respectively of all males and females tagged is as follows: 1970 - 37.3, 48.1; 1971 - 20.2, 31.0; 1972 - 9.6, 13.7. The greater return of females suggest that they are more easily taken by hook and line.

Fishing Regulations - For many years the statewide limit on northern pike was 15 fish. This was changed in 1971 to a limit of ten pounds and further changed in 1972 to a limit of three fish. The limit changes were based on findings of this study which indicated high returns of tagged fish (35.7% return in one year for fish tagged in 1970 and has accumulated to 43.6% by 1972). Although lower returns have been experienced for fish tagged in 1971 (25.9% accumulative for two years) and 1972 (10.7%), reference is again made to the greater vulnerability of females to the anglers creel. A limit of three northern pike appears adequate and should not overharvest females to the extent of limiting reproduction.

Reproduction - Young-of-the-year northern pike were sampled by seine on August 17, 1973, and averaged 11.2 young per seine haul and 5.2 inches total length (range 3.7-6.7). Other young-of-the-year fish taken include yellow perch, white sucker and an unidentified minnow species.

Reproduction of northern pike is dependent on water levels and the existing vegetation, both aquatic and terrestrial (some terrestrial vegetation is usually flooded at maximum pool). Approximately 8 acres of marsh area and shoreline were fenced in the spring of 1971 to exclude cattle grazing and vegetation growth has been very good. Spawning northern pike were observed in this area during May of 1972 and young-of-the-year were also collected from this area during August.

Summer Surveys - Floating gill nets were used to sample kokanee introduced in 1970 and 1971. Only one kokanee (10.9 inches, 0.47 pounds) was taken on June 6-7, 1972. Other fish taken include 20 yellow perch, 4 northern pike, 1 rainbow trout and 14 white sucker. Gill nets on August 17-18, 1972, produced 66 yellow perch, 8 kokanee, 1 northern pike and 2 white sucker. Kokanee averaged 14.5 inches (range 12.8-17.6) and 1.17 pounds (range 0.82-2.04) and all were from the 1970 introduction. Fishermen reported catching several kokanee during late summer by trolling.

Table 10. Accumulative tag returns for northern pike, Pishkun Reservoir, 1970-1972.

Year	No. Tagged	No. Returns (%)[1] by Year Tagged 1970	1971	1972
1970	498	178 (35.7)		
1971	559	35 (10.9)	117 (20.9)	
1972	393	4 (1.4)	28 (6.3)[2]	42 (10.7)
Accumulative[3]	1450	217 (43.6)	145 (25.9)	42 (10.7)

1/ Percent return based on tagged fish left in population.
2/ Includes 19 tag returns plus 9 tag losses (2.06% of 442 = 9).
3/ Accumulative return based on original tagged population.

Lake Frances

History - Lake Frances is a 5,536 surface acre irrigation storage reservoir in Pondera County with a maximum depth of 45 feet. Water is supplied by canal and diversions from Birch Creek and Dupuyer Creek. The reservoir fills in early spring and fluctuates eight to ten feet during the irrigation season. Species of fish found in the reservoir include northern pike, yellow perch, rainbow trout, walleye, kokanee, white sucker, longnose sucker and burbot.

Species Composition - Two frame net traps were fished in Lake Frances from April 11, 1972, to April 25, 1972 for purposes of collecting northern pike on their spawning run. A total of 445 northern pike were taken along with 690 white and longnose sucker, 10 rainbow trout, 1 yellow perch and 3 burbot. No walleye or kokanee were taken during spring trapping.

Marking and Recapture - Of the total northern pike taken in traps, 412 were classified as adult and 33 as immature fish. A total of 371 adult fish (262 males, 109 females) were marked with a numbered T-tag and with a left pectoral fin clip to facilitate in determination of tag loss in future investigations. An additional 33 males were taken in traps but were not marked.

A total of eight northern pike were recaptured, four had been tagged in 1971 and the remaining four were fish marked in 1972. Since only two traps could be fished successfully due to the configuration of the shoreline, the data gathered only presents general trends. Insufficient data was obtained to compute reliable numbers of recapture, population estimates and tag loss. Tag loss is evident, however. Of four fish tagged and fin clipped in 1971, one was found to have lost its tag.

Sex Ratios - Realizing the size of the reservoir and the amount of fishing effort involved, incomplete data was probably obtained for a true picture of the sex ratio of northern pike in Lake Frances. The data is probably adequate for following yearly trends (Table 11). Reference is made to the greater vulnerability of females to the anglers creel as was noticed also for Pishkun Reservoir (refer to Table 7).

Table 11. Sex ratios of northern pike, Lake Frances, 1971-1972.

	Number		Sex Ratio (M:F)	
	1971	1972	1971	1972
All Fish*	173	411	100:477	100:38
Angler tag returns	26	28	100:550	100:180

* Includes tagged, untagged and recaptured fish

Water Temperatures and Water Levels - During trapping operations, a minimum water temperature of 34° F. was recorded on April 19 and a maximum of 44° F. on April 21.

Water levels (Figure 3) increased approximately four feet during April. Fluctuations occurred throughout the summer reaching the lowest level on August 5.

Age and Growth - A total of 128 adult northern pike scale samples were analyzed and represent age groups III through VII (Table 12). Total length at capture averaged 17.7 inches (range 16.1-24.9) for males and 21.1 inches (range 16.2-41.0) for females. Nine immature fish averaged 15.3 inches (range 11.8-16.0) and represented age groups II and III.

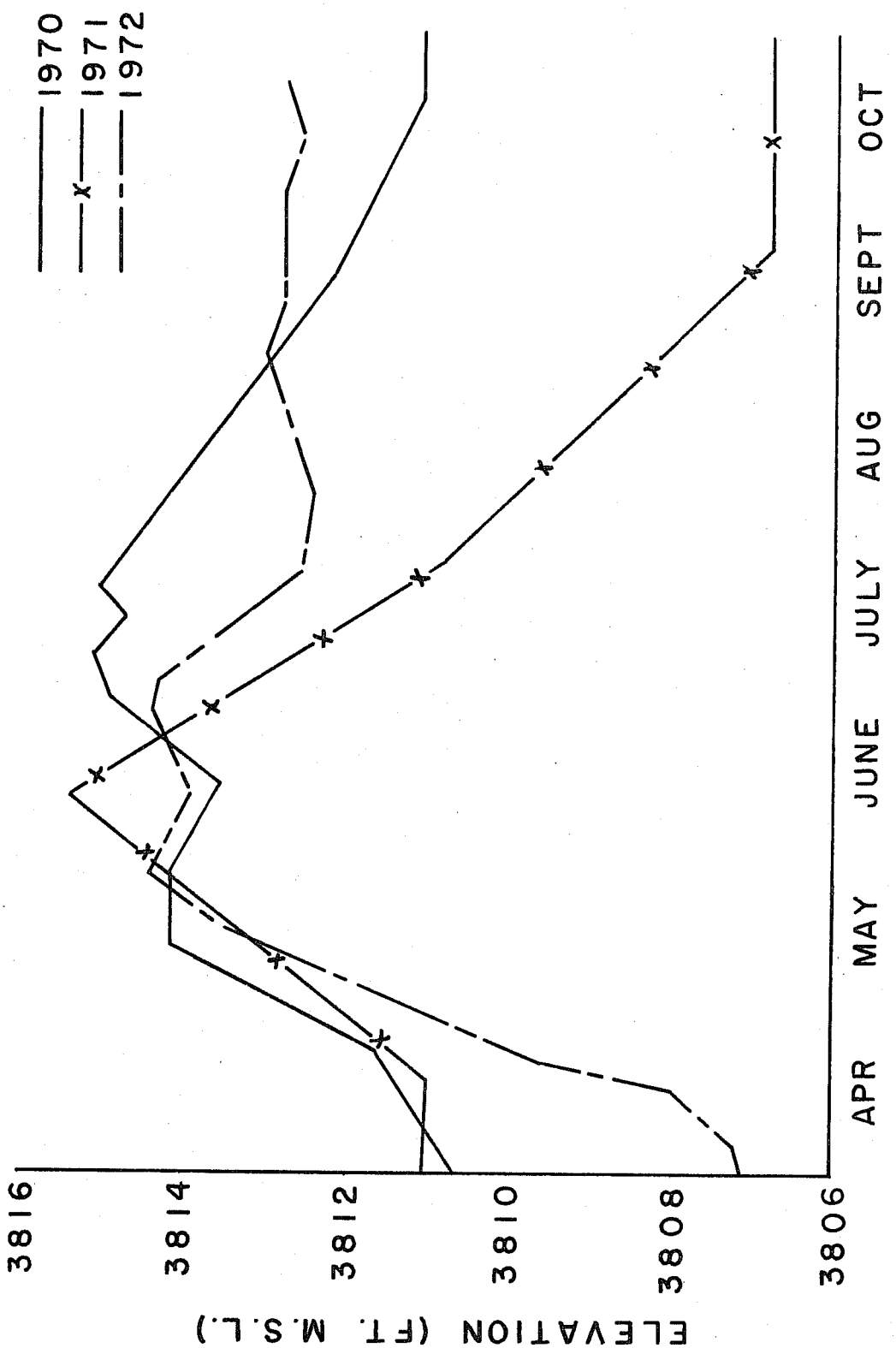

FIGURE 3. WATER LEVELS, LAKE FRANCES, 1970-72.

Table 12. Average calculated total lengths (TL) in inches of northern pike, Lake Frances, 1972.

Year	Age Group	Number M	Number F	Average TL at end of year of life 1 M	1 F	2 M	2 F	3 M	3 F	4 M	4 F	5 M	5 F	6 M	6 F	7 M	7 F
1969	III	36	41	8.5	8.9	13.7	14.7	17.5	18.5								
1968	IV	14	17	7.7	7.4	13.3	13.6	17.2	18.5	19.6	21.8						
1967	V	4	12	8.1	8.5	14.4	16.6	18.8	22.0	21.3	25.4	23.2	27.8				
1966	VI	--	2	--	8.3	--	16.0	--	22.7	--	29.4	--	33.4	--	36.5		
1965	VII	--	2	--	9.4	--	18.5	--	28.0	--	32.6	--	36.2	--	38.3	--	40.6
1972	Avgs.	54	74	8.3	8.5	13.6	14.9	17.5	19.4	20.0	24.2	23.2	29.6	--	37.4	--	40.6
1971	"	26	110	11.1	10.7	18.1	19.2	23.8	25.0	28.1	20.0	29.7	34.6	30.9	38.5	--	40.6
1970	"	52		10.4		18.9		24.7		27.3							

Three year old fish are composed of 66.7 percent of all males aged and 55.5 percent of all females. The oldest male aged was 5 years and the oldest female was 7 years old.

Harvest - During 1972, a total of 30 northern pike tags were returned by anglers, 23 from fish tagged in 1972 and 7 from fish tagged in 1971. The return for 1972 tagged fish is 6.2 percent while the accumulative return for 1971 is 19.1 percent. Tag returns were fairly evenly distributed throughout May, June, July and August, but several were taken during the ice fishing season.

To date, 544 northern pike have been tagged in Lake Frances and 56 (10.3 percent) tags have been returned. Percent return for male and female respectively of all males and females tagged is as follows: 1971 - 16.7, 19.6; 1972 - 3.4, 11.0. This data supplements that found at Pishkun Reservoir in which females are taken in greater proportions than males.

Summer Surveys - Floating gill nets were fished in June and August of 1972 to sample kokanee and walleye. No kokanee were taken in either sampling period. The fall snagging season also showed low numbers of mature kokanee as very few fish were taken. A total of four walleye were taken in gill nets and scale analysis indicates they are from the first introduction made in 1969. These fish should reproduce in 1973. The walleye averaged 15.1 inches total length (range 13.8-16.3) and 1.31 pounds (range 0.89-1.65). Fishermen reported taking several walleye during the summer. Walleye introduced in 1971 were not taken in gill nets.

Sucker Removal - Requests by sportsmen and local residents are often made to remove suckers when they are congregated in the inlet ditch to Lake Frances. Previous surveys (Hill 1971) indicate numerous suckers spawn in the reservoir as well as the inlet ditch. However, several Hutterite colonies showed interest in taking suckers to be used for canning, smoking or as garden fertilizer. Approximately 11.3 tons of white sucker (9,860 fish) were removed on May 18 and June 2, 1972. The Hutterites have shown interest in sucker removal in future years. Netting surveys in the lake in the future will evaluate the results of the sucker removal program.

RECOMMENDATIONS

Pishkun Reservoir

1. Discontinue tagging northern pike.

2. Continue to evaluate harvest of northern pike through voluntary tag returns.

3. Moniter kokanee populations.

Lake Frances

1. Continue tagging study of northern pike for one more year.
2. Moniter kokanee populations.
3. Determine success of walleye introductions and natural reproduction.
4. Evaluate sucker removal program.

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Prepared by: William J. Hill

Date: MAR 15 1974

Code numbers of waters referred to in this report are as follows:

20-7950 Pishkun Reservoir

14-7440 Lake Frances