MISSOURI'S APPROACH TO STREAM RESOURCE MANAGEMENT

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ABSTRACT

Despite continued deterioration and outright destruction of many streams Missourians still have a notable and diverse stream resource. Nearly 9,900 miles of permanent streams and 8,200 miles of intermittent streams with permanent pools remain.

Positive stream management practices and activities in Missouri include water quality surveillance and control, access site acquisistion and development, stocking for put-and-take trout fishing, National Scenic Riverways designation, commercial fishing on some larger rivers, and continuing research projects.

Three examples of application of research to stream resource problems are discussed. The first is an evaluation of gigging for rough fishes. On Big Piney River, it was shown that giggers had catch rates up to 22 times higher than hook-and-line anglers. The harvest by gig, expressed as pounds per acre, nearly equalled the average annual harvest by anglers. This regulation allows a substantial harvest of suckers which comprise most of the standing crop of stream fish.

The second example is an evaluation of a 12-inch minimum length regulation on black basses in Big Piney River. There was little change in estimated man-hours of fishing, after initiating the length limit, except for an increase in the last 2 years (1971 and 1972). The harvest of black basses declined from 2.9 to 2.5 pounds per acre during the 10-year study. However, the total fish harvest increased due to increased harvest of other centrarchids. The total number of black bass caught, including those released, nearly doubled. Similar results are evident in a 12-inch bass length study in progress on Huzzah Creek.

Because of the favorable results of these studies, including good angler acceptance, sustained total harvest, high catch rates, and good black bass angling, a statewide 12-inch minimum length limit on black bass in streams will be initiated January 1, 1974.

The last example is a measurement of the total recreational use of a stream. This study was conducted on a small stream in northwest Missouri that was threatened by channelization. Approximately 96,500 recreational trips, totaling over 348,000 man-hours, occurred in a 1-year period on a 57-mile section of this stream. Fishing pressure alone was 420 hours per acre, severalfold greater than the fishing pressure measured on other Missouri streams. Eleven types of hunting and eight non-consumptive recreational uses also were measured. Subsequent to the study, a standoff occurred between the U. S. Army Corps of Engineers and the Platte River Drainage District. In July, 1973, a Corps spokesman said the project was "out of the question" because of its probable adverse effects on Platte River.

INTRODUCTION

Missouri's stream resource includes approximately 9,865 miles of permanent water and over 8,200 miles of intermittent streams (Funk, 1968). Several programs and activities are employed in managing this large natural resource. In addition to water quality surveillance and control, some basic programs and activities include acquisition and development of access sites, put-and-take trout fishing, National Scenic Riverways designation on the Current and Jacks Fork rivers, commercial fishing on the Missouri, Mississippi, and lower St. Francis

rivers and several past and current stream research projects. The latter includes studies of stocking; fish-for-fun regulation; length limits; population dynamics; recreational use; habitat development, improvement and enhancement; fish distribution, etc.

These management programs and activities were developed through the years as attitudes, needs, and available information changed. Without exception, early historians reported fish and wildlife in numbers almost unknown today (Sauer, 1920). In this area to be known as Missouri, the drainage of the whole midcontinent met in a profusion of streams that mingled their aquatic life (Callison, 1953). In 1946, Charles Callison, at that time Editor of the Missouri Conservationist, summarized the catch rates of a group of early day sportsmen in an article entitled "How Good Were the Good Old Days" (Callison, 1946a). In 1888, this group organized the Carter County Fishing and Shooting Club. Members kept a log of their catches for 51 years, or until 1941. Their records reveal how good fishing really was (Table1). From 1891 to 1900, an average good day of fishing on the Current River yielded 13.5 fish, mostly small-mouth bass and walleyes. From 1901 to 1910, the average dropped 45% to 7.3 fish per man-day. By the period 1931-1940, success declined further to 2.3 fish per day. This is a reduction of 83% in catch rate over a 50-year period. We should remember that fishing pressure was increasing continually during those years. It is interesting to read their fishing log and see how the "Sportsmen's Conscience" was developing as the rate of harvest declined (Callison, 1946b). One club member in 1928 noted "Float from Round Spring; 158 bass, one jack salmon; all returned to river except those we ate. Hope all members will do likewise". Undoubtedly, the attitude of such people was influencial in seeing that Missouri's Fish and Game Department was taken out of politics in 1937.

Factors were at work at the turn of the century to cause the fish population to decline abruptly. The virgin pine was stripped from the Carter County hills during the years 1890 to 1905. Removal of the timber was followed by other abuses. The forests were burned annually in an attempt to control brush and improve grazing. Over grazing and plowing resulted in erosion sending millions of tons of gravel into the streams. The effects of that abuse upon the land are evident today. Mr. Callison concluded his articles by saying "The good old days were good all right, but it didn't take man long to spoil them". A similar pattern of land abuse occurred over the entire Ozark region.

In north Missouri the largest streams were raped by extensive channelization and watershed drainage practices. Locally organized drainage districts were begun as early as 1924 on one stream I am familiar with, the Platte River. Stream length was reduced as much as 50% by the removal of bends. Silt loads were increased as was runoff by the straight, narrow ditches. The result of man-made stream degradation is similar in Missouri's southeastern delta region, the "bootheel". The total loss of stream miles by channeling is almost unbelieveable. A few years ago we estimated that 1,300 miles of streams in north and west central Missouri had been lost. More recent work indicates the losses will be much higher (data collected and compiled for Missouri Department of Conservation by Ott F. Fajen). For example, Thompson River in northwest Missouri was originally 121.5 miles in length. It has been shortened to 66.5 miles, a complete loss of 45%, not to mention reduction in value of that remaining.

tices, but has caused what is far worse, the inevitable loss of many intoto. Channelization and construction of reservoirs have accomplished once and forever what man's other less obvious habits may achieve over a much longer period of time. A review of these limiting factors, subtle and otherwise, is given by Funk (1970) in a *Century of Fisheries in North America.*

APPLICATIONS OF RESEARCH TO STREAM RESOURCE PROBLEMS

In addressing the theme of this session, I thought I could most easily discuss Missouri's stream and river fishery resources in terms of my direct, personal experience. I have been involved in stream related research and management in Missouri all my professional life. Some of my observations about our problems and their solutions may be applicable to your problems. All of us have seen a decline in stream resources and an increase in pressure on the remaining stream resources. Many of us have seen the application of fisheries management practices that preceded any valid research. We can recall restrictions in the catch of stream species, and attempts to increase the numbers of fish by stocking.

Today I wish to discuss with you three areas of research in which I have been involved. These examples will give you an insight into the way we are attacking current stream problems. These research projects involved gigging, bass harvest restrictions, and recreational use surveys.

Gigging

In order for you to understand my first example, that of gigging, I must give you some background pertaining to that particular activity. Numerous evaluations of the carrying capacities of Ozark streams have been made in Missouri. Very recent studies have shown that redhorse sucker species frequently make up 50% or more of the total standing crop of fishes (Russell 1970; Fajen, 1972). In spite of their abundance, few are caught by hook and line.

Gigging, fishing by means of a spear, is the traditional method used in the Ozarks to capture redhorse suckers. Gigging is controversial because some game fish are illegally taken.

Our gigging season extends from October 1 to December 31 and from 12 noon until 12 midnight. During each 92-day gigging season, a total of 44 dark-of-the-moon nights may be suitable for gigging, depending upon a number of environmental factors such as turbidity and wind. The water surface must be calm for proper visibility. The water must also be ice-free. The regulation sets a liberal creel limit of 25 pounds plus 1 fish as the daily catch per gigger.

In the period 1951 to 1962, I was evaluating several management techniques on Niangua River, a north flowing Ozark stream. Since census personnel were available during the relatively slow hook-and-line fishing period in the fall, we decided to collect some information on the gigging fishery. Boat counts were derived by counting the number of above-water lights from the tops of high bluffs. Parties were later censused at take-out sites and gigging data obtained. In 4 years (1959-1962) on Niangua River, we found very few parties with game fish (Fleener, 1963).

In 1963, a gigging census was begun on a 45-mile section (455 acres) of Big Piney River, from Dogs Bluff to Ross Bridge (Figure 1). The census was conducted annually through 1972. Fishing pressure, expressed as hours per acre, ranged from 0.7 to 3.3 in the 92-day season (Table 2) (Fleener, 1973a). However, catch-rates, expressed as fish per hour, ranged from 4.34 to 11.08. In the same period, the catch-rates by angling ranged from 0.47 to 0.67 per hour. In other words, catch rates by giggers were up to 22 times as high as those of anglers.

The harvest of suckers by giggers, expressed as pounds per acre, ranged from 5.4 in 1966 to 39.3 in 1969, with a mean of 13.9 pounds per acre for the 10-year period. During those years, the harvest by anglers ranged from 10.3 to 26.3 pounds per acre. The mean for those years was 14.8 pounds per acre. Redhorse suckers comprised more than 99% of the harvest most years and the rest were carp and drum. Thus, gigging as regulated in Missouri, provides a means to utilize several abundant species which are not readily taken by hook-and-line

methods. There is little sport fishing in late fall and early winter so there is little if any conflict with other anglers. Despite the relatively low number of giggers, there is a fish harvest compatible with the standing crops of these species in Ozark streams (Fleener, 1970).

Black bass harvest restriction

My second example of research is a recently completed evaluation of a special regulation on an Ozark stream. Fishing pressure on most Ozark streams averages about 50 hours per acre annually. The highest pressures we have measured are from two small streams, Huzzah and Courtois creeks, about 80 miles southwest of St. Louis. Pressures averaged 167 and 147 hours per acre, respectively, for the period 1959 through 1968 (Fleener, 1972). Intense angling pressure has been exerted on smallmouth bass. This resulted in a decrease in the average length of bass in the creel. Additionally, in 1963, a study was begun on Big Piney River. A creel census was conducted on a 45-mile length of this stream from March 15 to November 30. During the years 1963 through 1966, bass less than 12 inches in total length comprised from 47 to 61% of the catch. Fishing pressure during this period ranged from 52 to 68 hours per acre, annually (Table 3).

These studies led us to believe that we could better manage these streams for better bass fishing. A review of management techniques and their probable effectiveness prompted a study of a 12-inch minimum length limit on black bass. Changes caused by the 12-inch length limit were observed from 1967 to 1972. These bass harvest restriction studies were initiated on Big Piney River and Huzzah Creek.

The creel census methods described by Fleener, 1973b, gave good statistical precision. The standard error of the mean for the annual fishing pressure ranged from 4.1 to 6.5% in the period 1963 to 1972 (Table 4). At the 95% level of confidence, the annual fishing pressure lies within the range of twice the standard error. For example, the 1963 estimate of intensity is 31,165 hours $\pm$ 2,948, or an estimated pressure ranging from 28,217 to 34,113 hours.

Prior to the length limit or from 1963 to 1966, the estimated man-hours of fishing ranged from 24,000 to 31,000 (average 28,000). With the 12-inch minimum length limit in effect, the estimated man-hours of fishing ranged from 24,000 in 1968 to 40,000 in 1972, and averaged 31,000. Obviously, the Big Piney River is still a popular fishing stream.

Prior to the length limit, the estimated total harvest ranged from 14,000 fish in 1965 to 19,000 in 1963 and averaged 16,000 fish. With the bass length limit, the estimated creel ranged from 14,000 fish in 1967 to 27,000 in 1972 and averaged 18,000. These figures do not include bass under 12 inches in length which were caught and released. The increase in numbers of fish creeled was largely due to the increased harvest of rock bass, particularly in 1972.

Prior to the length limit, the estimated harvest in pounds per acre per year ranged from 10.3 in 1965 to 13.6 in 1963 and averaged 11.7 (Table 5). With the length limit, the yield ranged from 12.1 pounds per acre in 1967 to 26.3 in 1972 and averaged 16.8. This increased yield was almost entirely due to the increased catch of rock bass during the latter 6 years. The average harvest of smallmouth bass was 2.9 pounds per acre prior to the length limit, and 2.5 pounds with the length limit in effect.

Did this regulation provide better bass fishing? Prior to 1967, the estimated legal creel of bass ranged from 1,400 in 1964 to 2,300 in 1963 (Table 6). Following the regulation change, the legal creel of bass, 12 inches and longer, ranged from 600 in 1967 to 1,300 in 1972. Catch-rates of bass per 100 angler hours ranged from 5 to 7 and averaged 6 in the years prior to the new regulation. With the 12-inch length limit the combined bass catch, those creeled plus those

released, ranged from 2,200 in 1971 to nearly 4,500 in 1969, Bass catch-rates with the 12-inch limit ranged from 4 to 17 and averaged 10 per 100 angler hours. Thus nearly twice as much bass angling was realized as a result of the length limit.

The effects of the 12-inch limit were not limited to the black bass fishery. Prior to 1967, the average weight of creeled rock bass ranged from 4.2 ounces in 1964 to 4.8 in 1963. With the 12-inch length limit on bass the average weight of rock bass ranged from 6.0 ounces in 1967 to 7.8 ounces in 1972 (Table 7). This occurred in spite of the increase in estimated numbers of rock bass creeled with the 12-inch length limit on black bass. The average weights of creeled green sunfish and longear sunfish also increased with the 12-inch length limit in effect.

A 12-inch length limit is in effect on Huzzah Creek and although the study has not been completed, the preliminary results are very similar to those obtained on Big Piney River (Fleener, 1973c).

Because of the favorable results of these studies, including good angler acceptance, sustained total harvest of fish, high catch-rates, and good bass angling, the 12-inch minimum length limit met the requirement as a beneficial regulation. We recommended that a 12-inch minimum length limit be imposed statewide on streams. This regulation was passed August 15, 1973 and will be in effect as of January 1, 1974.

Recreation use surveys

My third example of Missouri stream research is recreational use surveys which give stream managers and water resource planners a much better basis for decision making than was possible in the past. Our first use study was designed to determine the various recreational activities on Platte River in northwest Missouri (Fleener, 1971). The upper 73 miles of Platte River were channelized, during the period 1924-1928. The lower portion (from Agency to the confluence with the Missouri River, 57 miles) is not channelized but a project authorized in 1965 calls for 41.2 miles of channel realignment and enlargement from the mouth upstream to the vicinity of Agency (Figure 2). The use survey was done on the natural part of this stream.

In the past, conservation agencies have been unable to prevent this type of damage or even to obtain mitigation for the losses. The Environmental Policy Act of 1969 has focused attention which may change this and make it possible to prevent channelization of streams or to obtain suitable mitigation.

To measure all recreational activities in the Platte River Study Area, a probability sampling technique was proposed by Dr. Don Hayne, Institute of Statistics, Raleigh, North Carolina. This method yields statistically reliable estimates and confidence limits can be determined. Thirteen 2-week periods were sampled and results were expanded to estimate annual use. Twelve principal access sites were selected for sampling. Most of these were sites where traffic could be stopped effectively, and use data obtained by a trained clerk.

The proposed drainage district included 15,361 acres, but the study area was much smaller. It contained 57 miles of stream (602.5 acres) and 1,390 acres of adjacent river valley.

General recreational use of the Platte River Valley was very heavy. An estimated 96,500 trips, totaling over 348,000 hours, occurred in a 1-year period, August 31, 1970 to August 29, 1971 (Table 8). This is a conservative estimate because some access to the river was through private land, and the full width of the drainage district was not sampled.

Pole and line and set line fishing accounted for 49,500 trips, or 51% of all recreational trips. An estimated 36,000 fish were harvested, of which 19,500 were channel catfish and flathead catfish (Table 9). Fishing pressure was estimated to be 420 hours per acre. This is at least 10 times the estimated angling pressure on

Current River, a renowned Ozark stream, from 1959 to 1970 (Fleener, 1973d).

Eleven types of hunting activities accounted for an estimated 10,580 trips. The estimated harvest of selected species ranged from 31 deer to 9,100 quail. Hunters accounted for 11 and 9% of the total trips and hours, respectively.

Eight other activities accounted for 36,500 trips. Sightseeing accounted for 21,800 trips, picnicking 6,500, and camping 2,100. Other uses included nature study, boating, target shooting, and gathering berries, nuts, mushrooms, and other products. This category of miscellaneous users made up 38% of the total trips. It is apparent that the ever increasing demand for general recreation associated with natural settings should be the concern of resource agencies.

This study demonstrated that Platte River was heavily used by recreationists. Undoubtedly, most of the use was due to the river's proximity to Kansas City and St. Joseph, Missouri.

Following this study, a standoff occurred between the U. S. Army Corps of Engineers and the Platte River Drainage District. In July, 1973 Dean Schuster, Chief of the local protection section of the Corps of Engineers said the project was "out of the question" because the Missouri Department of Conservation found that channelization "would cause irreparable damage to outdoor recreation" along the Platte River.

Similar studies will be conducted in the future. A study of recreational use on Pool 21, Mississippi River was begun September 1, 1973. This study is a fine example of cooperation between the Illinois Department of Conservation; Mark Twain Refuge, Bureau of Sport Fisheries and Wildlife; the Upper Mississippi River Conservation Committee together with three of its technical sections; Rock Island District, Corps of Engineers; and the Missouri Department of Conservation. This 12-month study will provide information on the present use of the resource. Base line data for many forms of recreation are not available at the present time.

The completion of the pilot survey will provide information for designing studies of broader scope. Improved techniques have been incorporated in the study on Pool 21 so that use estimates will be reliable at the 95% level of probability instead of the 67% level used in previous studies. In future studies we are considering sampling only selected periods of heavy use to determine changes in use patterns.

We believe the information provided by the surveys will be helpful to states that choose to conduct similar studies. We have assisted the St. Paul District, Corps of Engineers in designing use surveys for pools of the Mississippi River in their district. We believe that recreational use surveys will be invaluable to planners by providing accurate information that was heretofore unavailable.

These three examples of my work are a cross section of our stream related research. Current stream investigations in Missouri are being conducted by a staff of eight research biologists, and additional work on streams is part of the responsibility of eight fisheries management biologists. This group of dedicated people is involved in 40 to 50 investigations annually. The knowledge they gain will continue to be the basis for our stream management.

What does it all mean? Where are we today? Where will we be tomorrow? In Missouri we have seen an alarming decline in our stream fishery harvest over a period from 1890 to about 1940. More alarming than the decrease in good fishing has been the total loss of 1,300 miles of stream for any fish production, let alone harvest. By the way, this trend is not completely stopped or turned around yet. We still have dams being built and streams being channelized.

One of the most obvious influences on management of any aquatic or terrestrial resource today is change. Change in attitudes, change in type of gear used, and a myriad of other changes, some yet to be defined or uncovered, dictate that we continually monitor our resources. The very best management must be based

on good sound information, Research will provide this information if we ask the right questions while planning future investigations.

Currently, we are regulating our stream fishery resources primarily through black bass harvest control. We are doing this with creel and possession limits, closed seasons and a minimum 12-inch length limit. Additionally, on certain streams we allow a gigging harvest of otherwise underutilized fishes.

What is the future for stream resources? One use that is rapidly becoming more popular is floating. On Current River, one of our more renowned float-type streams, canoeing use is increasing. During the Saturdays in the July 1-September 2, 1972 period, an average of 498 canoes were counted in the 10-mile section from Akers Ferry to Pulltite Spring (data from telephone conversation with Dr. Leo Marnell, Biologist, National Park Service, Van Buren, Missouri). Some day we may have to limit the number of canoeists using a stream per day. Other restrictive measures may have to be implemented on many uses that are currently uncontrolled. Future direction will be guided and shaped by people's attitudes, resource condition, and the amount and quality of information we have as resource managers to do our job.

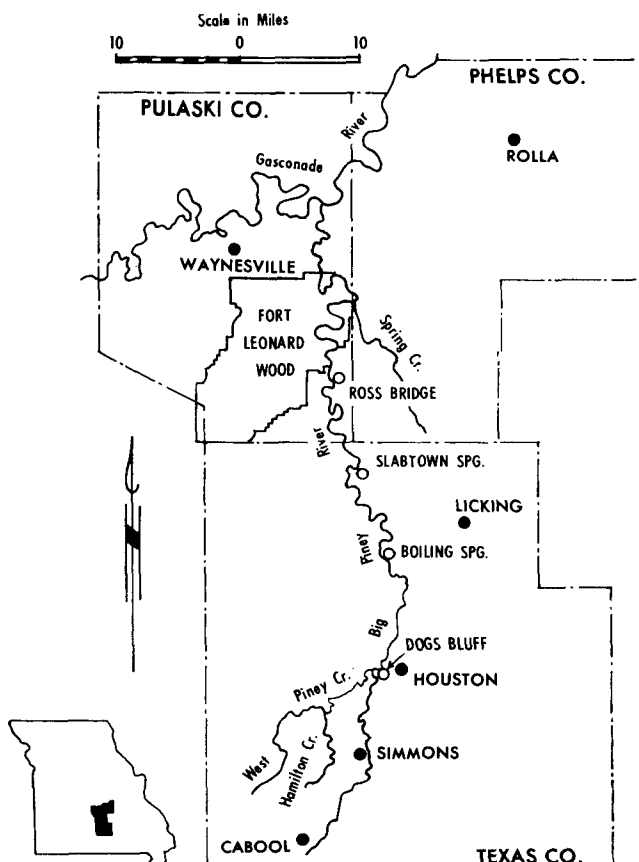

Figure 1. Map of Big Piney River.

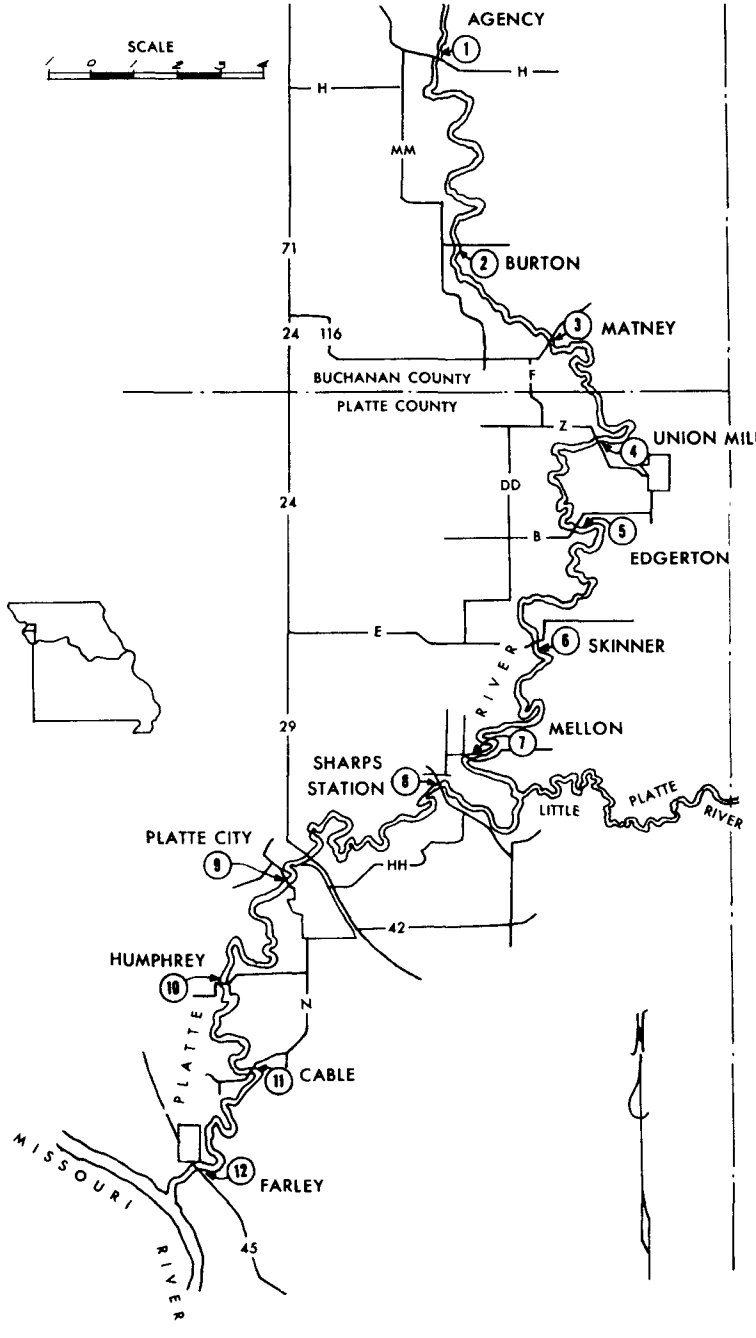

Figure 2. Map of Platte River, Missouri.

Table 1. Current River fishing calculated by decades, from records of the Carter County Fishing and Shooting Club (Callison, 1946).

Year	Number of entries	Total man-days	Total catch	Average catch per man-day
1889-1890	5	11	157	14.2
1891-1900	56	343	4,664	13.5
1901-1910	73	928	6,818	7.3
1911-1920	48	713	6,388	8.8
1921-1930	38	473	2,820	5.9
1931-1940	8	73	170	2.3

Table 2. Summary of the gigging census, Big Piney River, October 1 to December 31, 1963 through 1972.

	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	Mean
Gigging intensity:											
Total boat trips	197	187	161	113	85	194	364	298	177	217	199
Boat trips per acre	0.4	0.4	0.3	0.2	0.2	0.4	0.8	0.7	0.4	0.5	0.4
Total hours gigged	552	406	452	341	236	607	1,511	879	451	549	598
Hours gigged per acre	1.2	0.9	1.0	0.7	0.5	1.3	3.3	1.9	1.0	1.2	1.3
Gigging harvest:											
Suckers	2,775	4,457	2,730	1,426	1,834	4,084	10,653	7,073	2,864	5,206	4,310
Carp	141	39	12	55	33	142	237	77	16	26	78
Freshwater drum	28						16				4
Shad								1			Trace
Total numbers	2,944	4,496	2,742	1,481	1,867	4,226	10,906	7,156	2,880	5,232	4,393
Total pounds	3,579	7,208	4,224	2,481	2,630	6,107	17,900	8,771	3,164	7,187	6,325
Total pounds per acre	7.9	15.8	9.3	5.4	5.8	13.4	39.3	19.3	7.0	15.8	13.9
Catch rate: fish per boat hour	5.28	11.08	6.06	4.34	7.90	6.96	7.22	8.14	6.38	9.53	7.33

Table 3. Summary of the creel census for 45.0 miles (455 acres) of Big Piney River, 1963 through 1972.

	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
Number of fishermen interviewed	2,234	2,111	1,828	2,074	1,818	1,584	1,835	1,746	1,756	2,043
Trips total	5,330	5,103	4,295	4,831	4,660	4,014	6,527	5,444	6,191	6,304
Bank	3,001	2,057	1,761	1,318	1,427	987	1,228	1,562	1,332	1,882
Commercial float	812	1,073	680	894	999	907	1,498	1,171	1,395	1,362
Private float	1,517	1,973	1,854	2,619	2,234	2,120	3,801	2,711	3,464	3,060
Man-hours, estimated total	31,165	29,881	23,710	28,572	25,737	24,201	29,610	30,187	34,584	40,097
Bank	13,553	8,202	6,438	5,260	5,253	4,145	4,223	5,874	5,016	7,397
Commercial float	6,163	7,807	5,655	6,430	7,511	6,459	7,769	7,243	9,120	10,774
Private float	11,449	13,872	11,617	16,882	12,973	13,597	17,618	17,070	20,448	21,926
Catch rate fish per hour, combined	0.60	0.51	0.60	0.59	0.55	0.60	0.50	0.59	0.49	0.67
Bank	0.77	0.67	0.71	0.76	0.79	0.84	0.76	0.81	0.97	0.95
Commercial float	0.47	0.31	0.48	0.44	0.40	0.42	0.34	0.35	0.24	0.42
Private float	0.52	0.53	0.59	0.59	0.54	0.62	0.51	0.61	0.60	0.70
Catch rate, SMB per hour	0.07	0.05	0.06	0.05	0.02	0.03	0.03	0.04	0.04	0.03
Fishing pressure, hours per acre	68	66	52	63	57	53	65	66	76	88
Estimated number of each species										
Rock bass	8,113	7,038	6,046	8,143	7,234	6,932	7,918	8,776	8,781	15,885
Longear sunfish	4,992	4,116	3,550	3,603	3,783	3,940	3,665	4,132	4,484	4,901
Green sunfish	1,451	1,089	1,192	1,639	1,390	1,488	973	1,191	1,365	1,547
Smallmouth bass	2,288	1,430	1,323	1,488	585	696	893	1,096	707	1,299
Bluegills	911	605	953	843	647	506	704	845	834	1,960
Suckers	478	425	565	355	261	639	408	1,106	254	831
Largemouth bass	391	279	316	384	142	276	193	322	210	358
Carp	25	55	16	32	6	7	7	62	12	14
Other species	198	259	245	335	156	119	115	262	331	167
Total fish	18,847	15,296	14,206	16,822	14,204	14,603	14,876	17,792	16,978	26,962

Table 4. Total angling pressure in hours fished, standard error of the total ($S_{\bar{T}}$), and error at the 95% confidence level by percent, Big Piney River, 1963 to 1972.

Year	Hours	Standard error of the total	Percent
1963	31,165	1,474	4.7
1964	29,881	1,325	4.4
1965	23,710	1,169	4.9
1966	28,572	1,423	5.0
1967	25,737	1,248	4.8
1968	24,201	1,580	6.5
1969	29,610	1,566	5.3
1970	30,187	1,656	5.5
1971	30,584	1,900	5.5
1972	40,097	1,661	4.1

Table 5. Harvest of fish in pounds per acre from 45.0 miles of Big Piney River, 1963 through 1972.

	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	Ten-year average
Rock bass	5.4	4.1	3.6	4.8	6.0	6.1	7.0	8.2	8.1	17.0	7.0
Smallmouth bass	4.2	2.8	2.3	2.4	1.8	2.1	2.7	3.0	1.9	3.5	2.7
Longear sunfish	1.2	1.1	1.2	1.2	1.4	1.8	1.2	1.4	1.6	1.7	1.4
Suckers	0.4	0.6	0.7	.06	.07	1.5	0.6	3.4	0.5	1.0	1.0
Largemouth bass	0.7	0.4	0.4	0.8	0.4	0.9	0.3	0.9	0.7	0.9	0.6
Green sunfish	0.4	0.4	0.5	0.7	0.7	0.8	0.5	0.6	0.9	0.6	0.6
Bluegills	0.3	0.3	0.4	0.4	0.5	0.3	0.6	0.6	0.6	0.9	0.5
Carp	0.1	0.2	0.1	0.3	0.1	0.1	0.1	0.5	0.1	0.1	0.2
Other species	0.9	0.8	1.1	1.1	0.5	0.4	0.4	0.9	1.1	0.6	0.8
Total	13.6	10.7	10.3	12.3	12.1	14.0	13.4	19.5	15.5	26.3	14.8

Table 6. Estimated numbers of smallmouth bass harvested from 45.0 miles of Big Piney River.

Year	Estimated numbers of bass				Catch per hour			
	Legal Kept	Sublegal returned	Legal returned	Combined	Legal kept	Sublegal returned	Legal returned	Combined
1963				2,288				0.07
1964				1,430				0.05
1965				1,323				0.06
1966				1,488				0.05
1967	585	531	---	1,116	0.02	0.02	---	0.04
1968	696	3,366	9	4,071	0.03	0.14	trace	0.17
1969	893	3,514	29	4,436	0.03	0.12	trace	0.15
1970	1,096	2,146	350	3,592	0.04	0.07	0.01	0.12
1971	707	1,269	223	2,199	0.02	0.035	0.005	0.06
1972	1,299	1,770	110	3,179	0.032	0.044	0.003	0.08

Table 7. Average length in inches of centrarchids in the creel from Big Piney River. The estimated number of fish creeled in the 45-mile census area is shown in parentheses. No minimum length on bass 1963-9166, 12-inch limit in effect 1967-1972.

Year	Rock Bass			Green sunfish			Longear sunfish		
	Ave. length	Ave. weight		Ave. length	Ave. weight		Ave. length	Av. weight	
1963	7.26	4.8	(8,113)	5.60	2.0	(1,451)	4.79	1.7	(4,992)
1964	7.02	4.2	(7,040)	5.99	2.6	(1,089	5.08	1.9	(4,116)
1965	7.13	4.4	(6,046)	6.25	3.0	(1,192)	5.28	2.5	(3,550)
1966	7.11	4.3	(8,143)	6.33	3.0	(1,639)	5.29	2.4	(3,603)
Weighted average	7.13	4.43	(7,335)	6.05	2.65	(1,343)	5.08	2.08	(4,065)
1967	7.81	6.00	(7,234)	6.56	3.50	(1,390)	5.59	2.70	(3,783)
1968	7.94	6.40	(6,932)	6.68	3.80	(1,089)	5.65	3.40	(3,940)
1969	7.91	6.40	(7,918)	6.56	3.50	(973)	5.15	2.40	(3,665)
1970	8.22	6.80	(8,776)	6.78	3.80	(1,191)	5.15	2.40	(4,132)
1971	8.13	6.70	(8,781)	6.74	4.80	(1,365)	5.52	2.60	(4,484)
1972	8.49	7,80	(15,885)	6.27	3.00	(1,547)	5.41	2.55	(4,901)
Weighted average	8.15	6.86	(9,254)	6.59	3.73	(1,326)	5.42	2.67	(4,151)

Table 8. Estimates of recreational use for Platte River and adjoining land (from Agency to its confluence with the Missouri River), August 31, 1970 to August 29, 1971 expressed as trips and hours, and expression of sample reliability. Confidence interval at 67% level of probability, expressed as percent of the estimate.

Activity	Total Trips			Total Hours		
	Number	%	Confidence level	Number	%	Confidence level
Fishing						
Angling	37,253	38.6	20.0	131,179	37.7	3.6
Set lines	12,269	12.7	15.7	122,136	35.1	22.5
Subtotal	49,522	51.3		253,315	72.8	
Hunting						
Deer, gun	1,000	1.0		4,000	1.1	
Deer, bow	299	0.3	48.2	1,234	0.3	46.7
Dove	983	1.0	41.9	2,784	0.8	41.4
Rabbit	699	0.7	100.0	1,704	0.5	99.3
Quail	2,868	3.0	10.7	6,767	1.9	26.5
Duck	879	0.9	25.1	2,628	0.8	23.7
Predator	1,214	1.3	28.6	4,495	1.3	35.0
Frog	264	0.3	25.7	460	0.1	25.4
Racoon	130	0.1	79.2	259	0.1	79.5
Squirrel	985	1.0	34.3	2,634	0.8	23.3
Dog training	1,255	1.3	38.6	4,222	1.2	40.8
Subtotal	10,576	10.9		30,987	8.9	
Miscellaneous						
Nature study	305	0.3	37.7	462	0.1	52.6
Baoting	3,165	3.3	18.6	6,885	2.0	26.3
Gathering products	1,365	1.4	53.6	3,768	1.1	54.5
Picnicking	6,465	6.7	20.1	10,278	3.0	20.0
Camping	2,065	2.1	23.9	18,072	5.2	57.5
Sight-seeing	21,807	22.6	17.4	22,073	6.3	10.2
Petting	641	0.7	29.9	1,340	0.2	29.6
Target Practice	633	0.7	18.3	1,340	0.4	15.4
Subtotal	36,446	37.8		63,851	18.3	
Total	96,544	100.00	8.8	348,153	100.0	12.6

Table 9. Estimated seasonal harvests of fish from Platte River (Agency to confluence with the Missouri River) for the period August 31, 1970 to August 29, 1971.

Species	Upper Section				Lower Section				Total	
	Fall	Winter	Summer	Total	Fall	Winter	Summer	Total	Number	%
Carp			3,710	3,710	2,653	135	7,778	10,566	14,276	39.6
Channel catfish	441		1,905	2,346	2,025	66	9,345	11,436	13,782	38.3
Flathead catfish			173	173	1,206		4,399	5,605	5,778	16.0
Bullheads						269	210	479	479	1.3
Freshwater drum							754	754	754	2.1
Crappies							291	291	291	0.8
Paddlefish							72	72	72	0.2
Eel			486	486					486	1.4
Largemouth bass		66		66					66	0.2
Buffalo							16	16	16	0.1
Total	441	66	6,274	6,781	5,884	470	22,865	29,219	36,000	100.0

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