FISHERIES DIVISION

TECHNICAL REPORT

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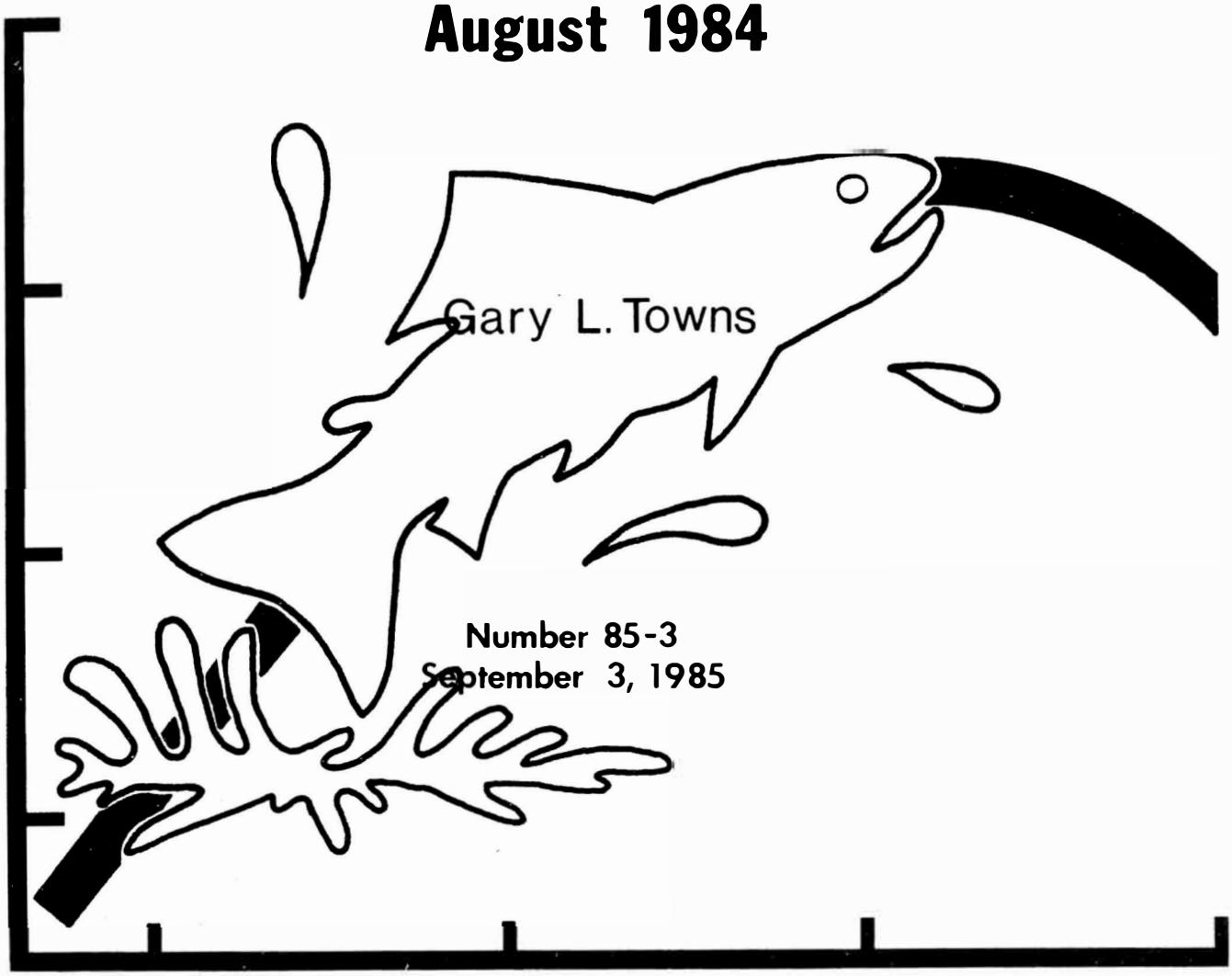

Gary L. Towns

Number 85-3
September 3, 1985

Michigan Department of
Natural Resources

MICHIGAN DEPARTMENT OF NATURAL RESOURCES
FISHERIES DIVISION

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A FISHERIES SURVEY OF THE RIVER RAISIN AUGUST 1984

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SUMMARY

Fish populations in southeastern Michigan's River Raisin were surveyed by the Fisheries Division of the Michigan Department of Natural Resources in August of 1984. Information obtained during this project will be used to develop fishery management plans.

Rotenone treatment was the only method of fish collection used during the survey. Physical conditions of the riverine environment were noted but no chemical parameters of water quality were measured. In addition to 12 sampling sites on the River Raisin, two sites on the Saline River and one on the South Branch of the River Raisin were sampled.

Over 83,000 fish were captured representing 61 species. One of these species was found only in the South Branch and one only in the Saline River. The bluntnose minnow was the most numerous species throughout the River Raisin on the basis of total catch. But, when disregarding all fish less than 3 inches long, northern hog sucker was the most numerous. Game fish comprised 14.1% by weight and 26.8% by number of the total catch. Carp accounted for only 28.3% by weight and 1.9% by number of the catch. Estimates of total fish standing crop in the River Raisin ranged from 128 to 703 pounds per acre.

Populations of smallmouth bass, northern pike, and rock bass were available to offer moderate fishing opportunities at several locations in the mainstream. However, this was not true of the South Branch of the River Raisin or the Saline River.

The River Raisin mainstream from Adrian to Dundee had a lower average standing crop of fish and a higher proportion of rough fish than the rest of the river. The major limiting factors were poor substrate, high turbidity due to sedimentation from farmland runoff, and some municipal and industrial pollution.

Comparison with 1971 survey results was difficult because of differences in fish collection methods. However, generally, from the headwaters to Dundee most fishery characteristics observed in 1984 were similar to those observed in 1971. Below Dundee conditions seem to have improved for sport fish. In 1971 fisheries were probably more influenced by poor water quality due to pollution from metropolitan areas than in 1984. Since the early survey, much of that type of pollution has been reduced. In 1984 the poorest sport fish populations existed where turbidity was high and substrates poor. In 1971 poor sport fish populations were found where substrates were adequate for good sport fisheries.

The most serious management problem is the degradation of water quality and river substrate, primarily by sedimentation. Fish cover is needed in much of the mainstream to improve habitat. Some species could be stocked to improve fishing opportunities. Addition of an anadromous species to the lower quarter of the mainstream could create some inland fishing opportunities in an area where little such fishing currently exists. Public access to the river is poor in most areas.

INTRODUCTION

The River Raisin is located in the extreme southeastern portion of Michigan's lower peninsula. Flowing in a generally southeast direction, it drains approximately 1,070 square miles. Its basin is about 60 miles in length, from 2 to 45 miles wide, and includes portions of 5 Michigan counties plus a small part of northern Ohio (Fig. 1). Major tributaries of the River Raisin include: Wolf Creek, South Branch of River Raisin, Black Creek, Macon Creek, and the Saline River. Numerous relatively small dams create impoundments and block upstream fish migrations. This report contains survey results from the Saline River, South Branch of the River Raisin, and the mainstream from near Brooklyn to Monroe.

Most of the sportfishing on the main branch of the River Raisin takes place in three general areas: near Brooklyn, from Manchester to Tecumseh, and from Dundee to Monroe (Fig. 1). Fishing near Brooklyn is greatly influenced by many impoundments and is mostly for bluegills and largemouth bass. Near Manchester stream velocity increases and the substrate is composed of more rock, gravel, and sand than in the upper river. This area has a good reputation with area anglers for smallmouth bass, northern pike, and rock bass. The same is true in the section between Dundee and Monroe. In that area walleye also are occasionally taken. For a variety of reasons an anadromous fishery is almost nonexistent in the lower River Raisin.

Very little fishing takes place between Tecumseh and Dundee. Turbid water, a sand-silt substrate, and a history of water pollution in that area have combined to deter most anglers. However, recently some good catches of northern pike have been reported.

METHODS

Rotenone sampling was the only method of fish collection used during the survey. Techniques used were similar to those employed in the Grand River survey in 1978 (Nelson and Smith 1980, 1981). Based on time, monetary considerations, ease of access, and geographic distribution, 15 sampling stations were selected (Fig. 1, Table 1). Twelve of these were located on the main branch of the river, two on the Saline River, and one on the South Branch of the River Raisin.

Station lengths averaged 630 feet but varied between 360 and 950 feet to accommodate unusual channel structure or habitat. Station widths and lengths were measured with either a measuring tape or an optical range finder. Stream flows were measured with the aid of a Gurley current meter or were interpolated from United States Department of Interior Geological Survey gaging stations.

At the downstream end of each sampling station, a barrier net (blocking seine) was placed across the river to collect the fish sample. Netting materials and techniques were similar

to those used by Nelson and Smith (1980). However, at the majority of sampling sites, low discharge rates (less than 100 cubic feet per second) allowed the use of a small-mesh blocking seine. This seine was made of knotless nylon netting with a maximum diagonal opening of 3/16 inch. Where water depth or velocity was too great for the smaller seine, a large-mesh seine (3/4-inch bar) was used. Three to five subsampler nets were placed just downstream from the barrier net to estimate the number of small fish that passed through the barrier net. These small nets were standard Michigan mini-fyke nets with the forward frame measuring 2 x 3 feet. They were constructed of knotless nylon netting with a maximum diagonal opening of 3/16 inch.

Fish were identified, measured to inch groups, and weighed to the nearest 0.1 pound in aggregate by species. To save time and storage space, large fish were measured at the sample site while smaller fish were preserved in formalin and measured later in the laboratory. Growth analysis was not one of the major objectives of the survey; however, at each station game fish scale samples were taken from up to 10 individuals per inch group.

RESULTS

Over 83,000 fish were captured during the survey. The vast majority of these were small forage fish. For example, bluntnose minnows comprised 59.7% of the total number. Yet, forage fish made up only a small part of the 5,093 pounds of fish collected.

Fifty-nine species of fish were captured in the River Raisin mainstream (Table 2). In addition, the orangespotted sunfish was found only in the Saline River and the blacknose shiner was found only in the South Branch of the River Raisin. Six species were found at every station in the mainstream. These were spotfin shiner, white sucker, northern hog sucker, yellow bullhead, rock bass, and johnny darter. Species generally associated with Lake Erie were not found, even at the most downstream station.

When considering fish larger than 3 inches (and excluding chubs, shiners, and minnows) the northern hog sucker was the most numerous species in the river, comprising 29.7% by weight and 28.6% by number of the total catch (Table 3). Carp made up only 28.3% by weight and 1.9% by number of the total catch. These figures differ greatly from those of two other large rivers in southern Michigan. In 1982, in the Kalamazoo River fish community, carp composed 67.5% by weight and 18.2% by number (Towns 1984). In 1978, in the Grand River, carp and goldfish comprised 45.6% by weight and 16.0% by number of the total catch (Nelson and Smith 1981).

Game fish comprised 14.1% by weight and 26.6% by number of the River Raisin fish community. Comparable figures for the Kalamazoo River were 12.8% and 30.1%, and for the Grand River 9.6% and 22.0%, respectively.

It is believed that the rotenone technique collected nearly all of the fish at each station. Therefore, the total weight of each sample will be considered as a conservative estimate of standing crop. Such estimates are somewhat less than the true standing crop since some fish probably escaped capture by traveling upstream out of the station during rotenone application, while others fell to the bottom of the stream, became entangled in the substrate, and so were not collected in the blocking seine.

Estimates of standing crop in the mainstream of the River Raisin ranged from 128 pounds per acre at Station 6 to 703 pounds per acre at Station 10 (Fig. 2). The average was 278 pounds per acre. In 1978, estimates of the standing crop in the Grand River ranged between 17 and 1,148 pounds per acre and averaged 160 pounds per acre. In 1982, estimates of the standing crop in the Kalamazoo River ranged between 56 and 576 pounds per acre and averaged 186 pounds per acre.

In the mainstream of the river, species diversity ranged from 19 at Station 12 to 36 at Station 10 (Table 2). Fewer species were present on the average in Stations 6–8 than in other areas of the river. The substrate type was poorer in that section (more sand, silt, and clay) and water quality problems have plagued that area in the past.

Fishery description

An extensive fishery survey of the River Raisin mainstream was conducted in 1971 by the Fisheries Division of the Michigan Department of Natural Resources. During that project, fish were collected exclusively by electrofishing and fyke netting (Shepherd 1974). Recent studies comparing fish sampling techniques have shown rotenone methods to be far superior, both quantitatively and qualitatively, to electrofishing or electrofishing and netting combined (Towns 1984). For this reason, only rotenone sampling methods were used in the present survey. Consequently, it is difficult to make direct comparisons between the 1971 and the 1984 surveys. However, general trends in the fish populations were evident and will be discussed. Specific catch data on each station is available in Fisheries Division files on standard fish collection forms R-8058.

Stations 1–5

In the 1984 survey, the upper portion of the mainstream from Station 1 through Station 5 (Fig. 1) was found to have a diverse fish population with good numbers of catchable-sized sport fish (Tables 2 and 3). The fishery at Station 1 is strongly influenced by several warmwater impoundments which are connected by the river. The catch at this site was lower than expected. Anglers have reported good catches of largemouth bass and panfish at that site and the local conservation officer confirmed those reports.

Stations 2 and 3 were similar in several ways. Both had substrates high in gravel and cobble, good game fish populations, large populations of intolerant species, and apparent good water quality. No carp were taken at either station . Several small cold-water tributaries were

found entering the river near Station 2. A mottled sculpin, normally found almost exclusively in trout streams, was captured at that site. Station 3 near Manchester was located in a reach that reputedly supports a good smallmouth bass fishery. Many smallmouth bass were captured there, however, the vast majority were sublegal. Although no northern pike were taken at that station, a minor overkill downstream resulted in the capture of two legal-sized pike, one of which was over 30 inches long and weighed 6.6 pounds. A good population of silver shiner was found at Station 3. Smaller numbers of this species were present at Station 4. This reach of the River Raisin is reported to be one of the two known remaining habitats for this threatened species in Michigan. Silver shiners require clean water and silt-free substrate, and prefer deep riffles in moderately large streams (Smith et al. 1981).

The substrate at Station 4 was composed mostly of a mixture of sand, silt, and clay. Carp made up nearly 41% of the fish standing crop, and the total standing crop had decreased substantially from that of Station 3 (Fig. 2). These changes were more likely the result of substrate differences rather than changes in water quality.

Station 5 held the highest percentage of legal-sized smallmouth bass but a smaller bass population than many other stations (Table 4). This section had good habitat and substrate for fish, but these features were largely hidden by turbid water. This turbidity probably deters anglers from fishing this reach and has resulted in an underutilized fishery for smallmouth bass.

South Branch of the River Raisin

Only one site was sampled on the South Branch of the River Raisin (Fig. 1). It was located below the Adrian Waste Water Treatment Plant (WWTP), within 1 mile of the mainstream. Areas upstream had stream velocities too slow to allow fish collection with rotenone methods.

The substrate, habitat, water clarity, and temperature of the lower South Branch appeared good for coolwater game fish, but smallmouth bass were absent from the catch. In addition, all game fish common to the mainstream, as well as several other intolerant species, were very sparse (Table 2). White suckers, a species tolerant of low oxygen conditions and some other forms of pollution, clearly predominated. Water quality problems in this reach will be discussed later in this report. Catch results indicate the stream was in a state of recovery; however, periodic pollution could have been affecting the fish population.

Stations 6–9

Standing crop of fish decreased dramatically at Station 6 and remained low through Station 9. It was uncertain whether this was the result of poor substrate or poor water quality, or both. Chemical water quality parameters were not investigated during this survey. While most features of fish habitat were good at Stations 6, 7, and 8, river substrate was very poor. It was composed primarily of sand, silt, and clay. That type of loose, shifting river bottom

provides poor breeding and living areas for crayfish and most forms of aquatic insects. These organisms are the base of the food chain for many game fish species. Shepherd (1974) found similar fishery characteristics in 1971. In that survey, the river reach between Clinton and Blissfield had a lower average number of species and game fish weight than either the upper or lower sections of the river.

In the 1984 study, Station 6 was located on the mainstream approximately 1 mile below the confluence with the South Branch of the River Raisin. The catch at that site suggested that the fish community was in a recovery stage. Some intolerant species were present, but relatively few game fish were captured. A large forage base of minnows and suckers appeared to be underutilized.

Stations 6, 7, and 8 all had signs of severe seasonal flooding, and exhibited the most turbid water conditions on the mainstream. While few legal-size game fish were captured at these sites, at least one large northern pike was taken at each (24.9, 38.0, and 35.1 inches, respectively).

A few small channel catfish were captured at Station 7. This was the furthest upstream location at which this species was found. None were taken at any station in 1971 (Shepherd 1974). The presence of these small catfish indicates that natural reproduction had taken place in the lower half of the river, but not enough adults were present to provide a significant fishery.

Station 8 (Fig. 1) had the highest turbidity, poorest substrate for game fish, and poorest fish cover of any location surveyed on the mainstream. Smallmouth bass and stonecat were absent from the catch. Other game fish and intolerant species were low in number (Table 4). Carp comprised 75% of the catch by weight, the highest in the survey. Stream sediments had odors indicating anaerobic degradation and possible farm feedlot runoff.

River substrate was much improved for game fish at Station 9. However, the river below Dundee is wide and shallow. The deepest waters in the sampled area were only 1.3 feet. This reach receives some fishing pressure. Shallowness and fishing pressure may explain the low numbers of catchable or legal-sized sport fish (Table 4). Numbers of intolerant fish such as stonecat, hog sucker, and smallmouth bass increased dramatically over Station 8. Anglers reported that walleye were taken occasionally below the dam in Dundee.

Saline River

Time constraints allowed for only two sampling locations on the Saline River (Fig. 1). This river has a history of pollution from municipal wastewater, industrial discharges, and farm feedlots. It is also known for extreme seasonal flooding and heavy sedimentation. In 1978, Smith (1981) reported the Saline River below Milan should have harbored 20 to 25 species, but he found it to be totally fishless. Apparently, some very severe pollution was in progress. The situation has improved since 1978. In the present study, 16 species were found at

both sampling locations (Tables 2 and 4); yet total fish numbers were low and numbers of young-of-the-year were especially low. A few smallmouth bass and significant numbers of intolerant species were present at Station 2 on the Saline River (SR2), but fewer of these fish were present at Station 1 (SR1). A mixture of silt, clay, and sand predominated SR1. Some gravel and cobble were present at SR2. The total standing crop at SR2, 78 pounds per acre, was the poorest of any sampling site in the entire River Raisin survey. However, game fish represented 23% of the catch by weight and no carp were present. The standing crop at SR1, 170 pounds per acre, was comparable to many stations on the River Raisin mainstream (Fig. 2). At that station, carp and white suckers accounted for 85% of the catch by weight. Game fish, primarily bullheads, made up only 8% of the catch.

Low numbers of young fish in the Saline River are probably the result of heavy siltation during spawning season and lack of adequate spawning substrates. In general, the lower Saline River near SR2 has better habitat and low-flow stream velocities for game fish than the reach at SR1. In addition, that section probably received a good deal of recruitment from the River Raisin. In contrast, the stream section near SR1 has slow summer stream velocities and poor fish habitat. That reach is also closer to most of the municipal and industrial discharges which enter the Saline River system.

Stations 10–12

Average total standing crop and numbers of game fish increased in the lower section of the mainstream (Fig. 2, Table 4). Generally, the entire river below Dundee was wide and shallow. Bottom substrates were primarily cobble and bedrock with some overlaying silt and sand. Fish cover was sparse. Similar conditions were observed in 1971 (Shepherd 1974), except that turbidity continually worsened below Dundee in 1971, whereas, in 1984 it improved. The presence of large populations of intolerant species at Stations 10, 11, and 12 during 1984 indicated good year-round water quality.

Since many low-head dams exist in the lower River Raisin, providing similar habitat, one of these was included in the survey. The area below the dam at Ida-Maybee Road (Station 10) was chosen for this purpose. At that site, in just 2.2 surface acres of water immediately below the dam, over 1,500 pounds of fish were captured. Game fish were present in good numbers, but few were legal or acceptable size. For example, of 787 smallmouth bass, just 2 were 12 inches or larger. Heavy fishing pressure at this site, especially in early summer, accounts for at least part of this fact. Two legal-size walleyes were captured at Station 10. This was the only site where walleyes were captured. This station produced 36 species of fish, which was more than at any other sampling location.

Shallow stream depth, lack of cover, and heavy fishing pressure all combined to depress numbers of catchable sport fish at Station 11. Only 5 of 377 smallmouth bass were legal size. Maximum depth in the sample area was only 1.2 feet. Catch results for smallmouth bass at

Station 12 were similar. But at that site, bass comprised a higher percentage of the catch in both weight (22%) and number (16%) than at any other station. River substrates at both of these lower stations were made up of broken bedrock, boulders, cobble, gravel, and small amounts of sand and silt. The habitat at Station 12 included deep crevices in the bedrock which provided good cover for smallmouth bass. Station 12 also had the highest standing crop of game fish (79 pounds per acre) (Fig. 2).

No fish species primarily associated with Lake Erie were found in the lower Raisin with the possible exception of walleye. In other southern Michigan river surveys, the sampling sites closest to the Great Lakes produced several species such as flathead catfish, alewife, freshwater drum, and burbot (Nelson and Smith 1981, Towns 1984). In the River Raisin, the presence of several low-head dams and industrial and municipal water uses in the city of Monroe may deter upstream migration of fish.

Fish Growth

Fish scale analysis was used to measure growth rates of game fish sampled in the River Raisin. At many stations not enough individuals per inch group were captured to make growth rates statistically significant. Thus a station by station growth comparison cannot be developed from available data. However, when considering the game fish populations of the entire river, from Station 1 through 12, all species exhibited growth rates very close to state averages. In addition, all species appeared to be in good overall condition.

DISCUSSION

The River Raisin displayed a great variety of riverine habitat, substrate types, and species diversity. Many species were collected which are quite intolerant of pollution and are especially susceptible to low oxygen concentrations. For example, the somewhat rare brindled madtom was found at Stations 1 through 4 (Table 2). Smith, Taylor, and Grimshaw (1981) also found this species in 1978. They reported that this fish is restricted to clean water with riffles and is an indicator of good water quality. Northern hog sucker and stonecat are usually found in clear rocky streams having high oxygen levels. These fish were found at nearly every station in 1984, although they were reduced in numbers between Adrian and Deerfield (Table 2). The presence of many adult hog suckers and stonecats, at least 3 to 5 years of age, indicated that water quality has been quite good year-round for a significant time period. In addition, the silver shiner, currently listed as a threatened species by the Michigan Department of Natural Resources, was found at Stations 3 and 4. This species requires clean water and silt-free substrate (Smith et al. 1981).

Some of the above results were rather surprising since the River Raisin has a reputation for poor water quality. In 1971 fish samples were analyzed for polychlorinated byphenyl (PCB) contamination (Shepherd 1974). The majority of samples contained less than the limit established by the U. S. Food and Drug Administration; however, some results from that study indicated possible PCB discharges into the mainstream at Tecumseh and into the South Branch at Adrian. Also in that study some evidence of dieldrin contamination in fish was evident in the mainstream below the confluence with the Saline River. A study in 1973 indicated that there had been a general improvement in water quality since 1971, but that several problems relating to low oxygen levels still existed (Michigan Water Resource Commission 1974). A comprehensive report in 1979 stated that biological sampling in 1975, 1977, and 1978 indicated some recovery from the water quality conditions observed in 1973 (Michigan Department of Natural Resources 1979). However, the same study reported that the South Branch downstream from Adrian remained degraded due to a combination of organic loading from the Adrian WWTP and intermittent toxic discharges.

These reports have brought pollution problems to the forefront and helped to stimulate corrective measures. Yet, their presentation through the media has worked to develop opinions in the minds of some area residents that the river is polluted and has little chance of ever being a significant recreational resource.

Actually, many improvements in water quality have taken place in recent years. For example, excessive ammonia and phosphorous levels were found downstream of the Adrian WWTP in 1973. Improvements since then have made that facility one of the best municipal wastewater treatment plants in the state (Babcock 1985, personal communication, Department of Natural Resources, Water Quality Division, Jackson). In addition, substantial discharges of organic solids into the South Branch of the Raisin from a rendering operation were largely eliminated in 1983. This has brought about a dramatic difference in the aquatic animal life of that stream. In 1983 aquatic life grossly degraded and river substrates covered with bacterial slime growths (Creal 1985, personal communication, Michigan Department of Natural Resources, Surface Water Quality Division, Lansing). One year later, the present survey sampled 23 species of fish and recorded a total standing crop of 463 pounds per acre. However, it was obvious that the stream was still in a state of recovery since the fish population was dominated by species tolerant of low oxygen levels.

More improvements in the water quality of the River Raisin are anticipated in the near future. The process of upgrading the Blissfield WWTP from primary to secondary treatment will begin in 1985 (Babcock 1985). Construction which will upgrade the Tecumseh WWTP to an advanced secondary system is scheduled for completion in early 1987.

As more point source water pollution problems are corrected, major limiting factors to fishery development focus on sedimentation and seasonal flooding. The vast majority of the

River Raisin watershed is cropland composed of highly erodible soils. Many farmers in the area practice fall plowing. This method of tillage is among the worst for accelerating wind and waterborne erosion of soil. Eventually the soil ends up in nearby streams. Sedimentation can be very damaging to fish populations. Hassler (1970) found that silt deposition of only 0.04 inches (1.0 mm) per day, during early embryonic development of northern pike eggs, caused mortalities of 97% or more. Winemiller and Taylor (1982) found that severe spring flooding in an Ohio stream terminated smallmouth bass nesting and destroyed all nests which had been constructed. In some areas of the middle and lower River Raisin, spring floods results in a five to tenfold increase in river surface area over low-flow conditions. In all likelihood floods displace many fish throughout the flood plain and cause reductions in the fish population. Some fish undoubtedly become trapped in upland areas as flood waters recede.

Over the last century much of the lowland contiguous with the lower half of the River Raisin has been ditched and drained. This has greatly reduced spawning and nursery habitat for northern pike and many fish species and has limited the natural recruitment of game fish to the River Raisin fishery.

The problems of sedimentation, habitat degradation, and to some extent flooding, are man-made. Society must determine the importance of rectifying these conditions. Unfortunately, economics and human health concerns are usually the only forces which drive society to improve environmental conditions for fish. It will be a sad commentary on our society if strict upland erosion controls are practiced only after soils have become so infertile, after years of erosion, that the ability of those soils to grow crops becomes limiting and uneconomical.

As for the present, the recently completed and the scheduled reductions in municipal pollution have helped to make the future of the River Raisin as a recreational resource much brighter than it was only a few years ago.

Management Considerations

River sections from the headwaters to Adrian and from Dundee to Monroe presently provide fair to good fishing for some game species. Both areas have adequate high potential and warrant more intensive fishery management. Smallmouth bass is the game fish best suited for those areas. The upper River Raisin already has good fish cover, but more logs and deep water areas would increase bass survival during winter months and summer low-flow periods. The lower end of the Raisin is shallow and cover for large fish is very sparse. Addition of permanent fish cover in this area would be beneficial. These structures should be well designed, since hydraulic pressure during peak flows would wash away poorly secured cover.

The middle section of the River Raisin, from Tecumseh to Dundee, has been adversely affected by pollution and heavy sedimentation. Many of the water quality problems related to

municipal and industrial pollution in that reach have been greatly reduced over the last 2 decades. More of these problems will be curtailed in the next 3 to 4 years. This will leave sedimentation as the major limiting factor in the development of a significant sport fishery.

With reduced sedimentation and improved water quality, the river could support more game fish between Adrian and Dundee. The habitat in that reach is presently adequate for channel catfish. Stocked in large numbers, this species might provide a good self-sustaining fishery.

Walleyes do well in the lower sections of some other rather turbid rivers in southern Michigan. Stocked walleyes might survive in sufficient numbers to create a moderate fishery from Adrian to Dundee. In addition, some of these fish could reside in the few deep-water areas from Dundee to Monroe. Any increases in water quality or reductions in sediment loading would improve this possibility.

Northern pike is presently the only game fish abundant enough to support a fishery from Adrian to Dundee. This survey indicated that there was an underutilized forage base of minnows and suckers in that area. The adult pike population is probably reduced during floods and the survival of pike eggs and fry is undoubtedly poor due to suffocation by sediment. Stocked pike fingerlings could augment natural reproduction and increase the adult pike population. Pike stocking is not recommended below Dundee since little habitat presently exists for pike in that area.

Plans are now being developed to pass salmon, trout, and other migratory species through fish ladders to Ida-Maybee Road (Station 10) and possibly as far as Dundee. The development of an anadromous fishery could stimulate water quality improvement efforts because more attention would be given to the river as a recreational resource.

Steep banks and poor access limit recreational use of the river. Public access needs must be addressed if the full potential of the River Raisin is to be achieved.

ACKNOWLEDGMENTS

The author wishes to thank the numerous Michigan Department of Natural Resources Fisheries Division personnel who made the survey possible. A special thanks is extended to Dr. Philip R. Yant from The University of Michigan for the identification of rare fish species and to Michelle Rick for the assimilation of data necessary for the survey report.

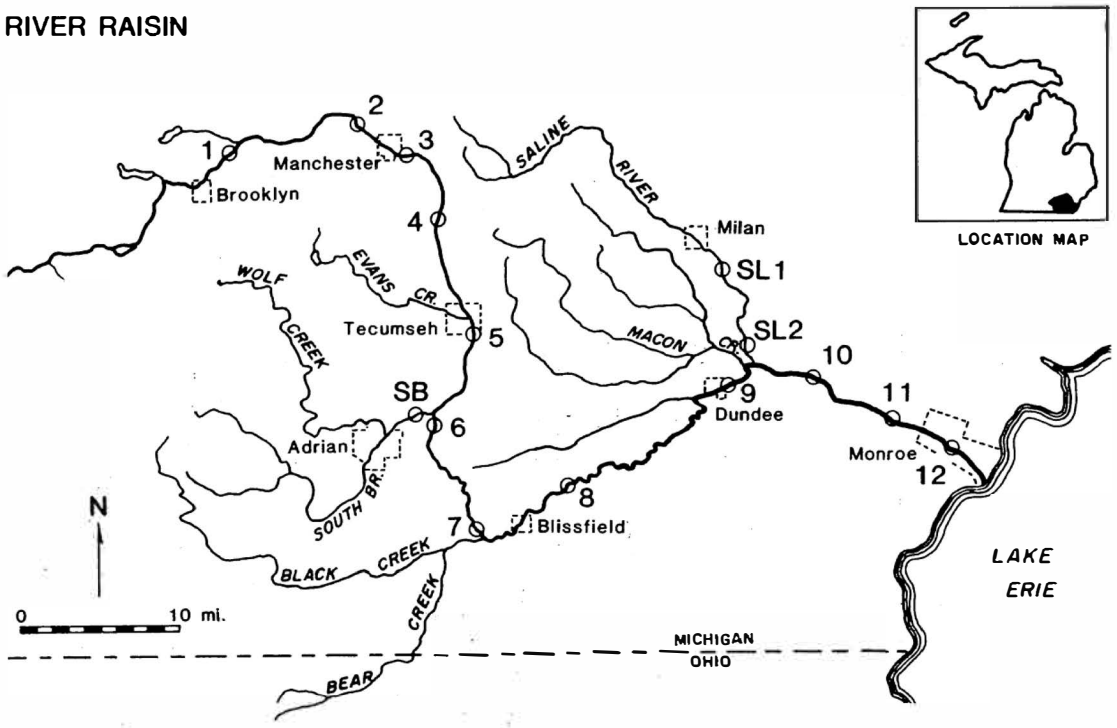

Figure 1. Locations of sampling stations during the 1984 River Raisin fishery survey.

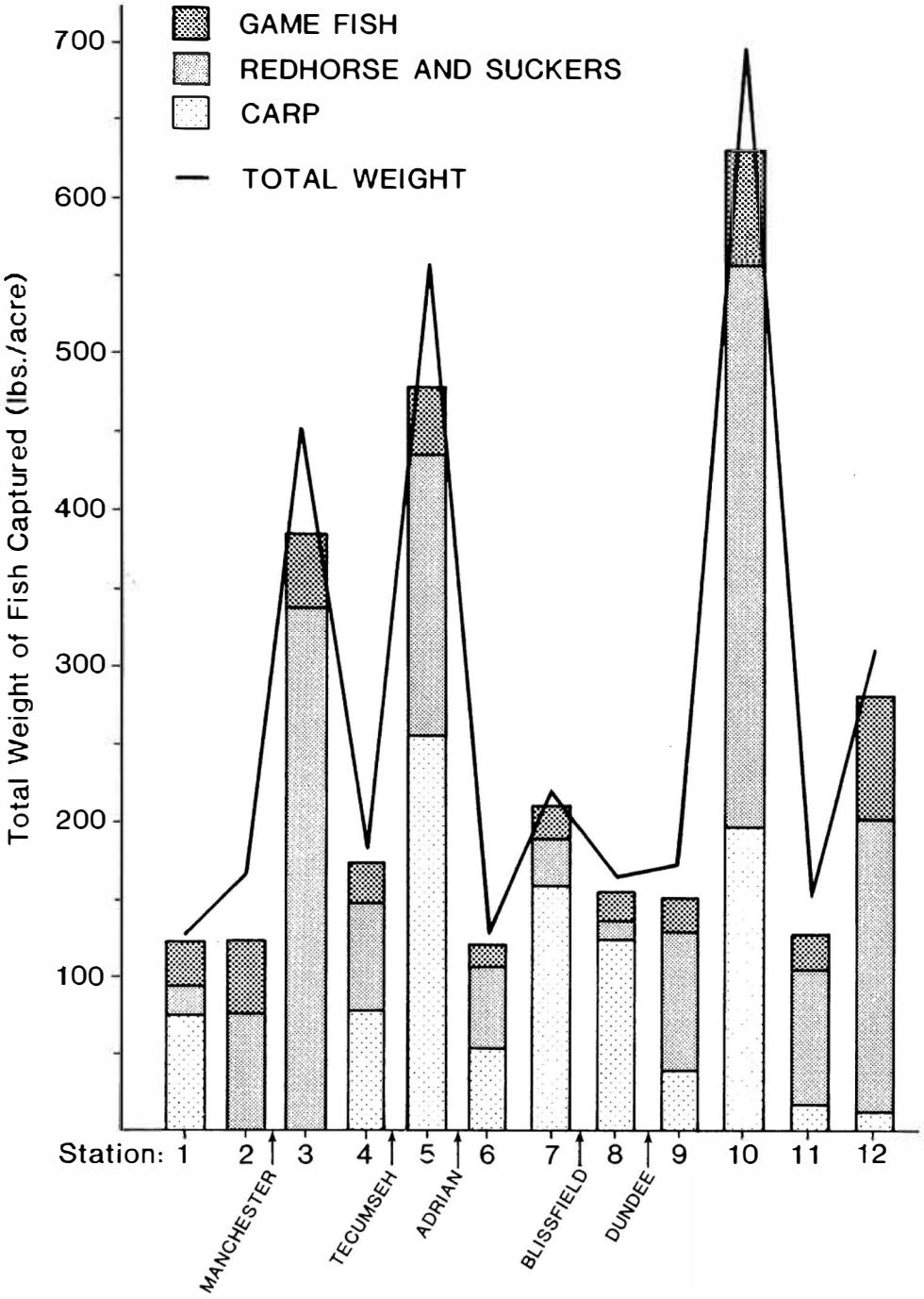

Figure 2. The weight of game fish, redhorse and suckers (includes northern hog sucker, white sucker, and all redhorse sp.), and carp captured at each station during the 1984 River Raisin fishery survey. The solid line represents the weight of all fish captured.

Table 1. Locations of sampling stations during the 1984 River Raisin fishery survey.

Station	County	Location	Length (ft)	Upstream limit and description
1	Jackson	T4S,R2E,Sec.8	500	500 ft above Wolf Lake Rd.
2	Washtenaw	T3S,R3E,Sec.33	600	600 ft above Sharon Valley Rd.
3	Washtenaw	T4S,R3E,Sec.1	510	310 ft above Austin Rd, east of M-52.
4	Washtenaw	T4S,R4E,Sec.29,32	830	360 ft above Allen Rd.
5	Lenawee	T5S,R4E,Sec.34	500	450 ft above Russell Rd.
6	Lenawee	T6S,R4E,Sec.32	680	400 ft above Academy Rd.
7	Lenawee	T7S,R4E,Sec.34	700	400 ft above E. Gorman Rd.
8	Lenawee	T7S,R5E,Sec.22	605	575 ft above shallow area in river on Bob Vaidic farm, SE of intersection of Rouget & S. Piotter Rds.
9	Monroe	T6S,R6E,Sec.18	900	300 ft below M-50 in Dundee.
10	Monroe	T6S,R7E,Sec.13	360	Dam above Ida-Maybee Rd.
11	Monroe	T6S,R8E,Sec.32	950	200 ft below Raisinville Rd.
12	Monroe	T6S,R9E,Sec.31	420	Railroad bridge above Roseler Rd.
South Branch	Lenawee	T6S,R4E,Sec.30	585	On City of Adrian property, south of Heritage Park.
Saline River 1	Monroe	T5S,R7E,Sec.7	400	350 ft above Sherman Rd.
Saline River 2	Monroe	T6S,R7E,Sec.5	425	Along the south side of Day Rd, east of bridge.

Table 2. List of species captured at each station during the 1984 River Raisin fishery survey.

Species	Station														
	1	2	3	4	5	6	7	8	9	10	11	12	SB[1]	SL1[2]	SL2[3]
Northern brook lamprey *Ichthyomyzon fossor*	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–
Bowfin *Amia calva*	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Central mudminnow *Umbra limi*	x	x	–	–	–	–	–	x	–	x	–	–	–	–	x
Grass pickerel *Esox americanus vermiculatus*	x	x	x	–	–	x	–	–	–	–	x	–	–	–	–
Northern pike *Esox lucius*	x	x	–	x	x	x	x	x	x	x	x	–	x	–	–
(Central) stoneroller *Campostoma anomalum*	–	–	–	–	–	x	x	–	–	x	x	x	x	–	x
(Common) carp *Cyprinus carpio*	x	–	–	x	x	x	x	x	x	x	x	x	x	x	–
Goldfish *Carassius auratus*	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Silverjaw minnow *Ericymba buccata*	–	–	–	–	–	x	–	–	x	–	x	–	x	–	–
Hornyhead chub *Nocomis biguttatus*	–	x	x	x	–	x	–	–	x	x	x	x	–	x	–
River chub *Nocomis micropogon*	–	x	x	x	x	x	x	–	x	x	x	–	x	–	–
Emerald shiner *Notropis atherinoides*	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Striped shiner *Notropis chrysocephalus*	–	x	x	x	x	x	–	–	x	x	x	x	–	–	–
Common shiner *Notropis cornutus*	x	x	–	x	x	x	x	x	x	x	–	–	x	x	–
Blacknose shiner *Notropis heterolepis*	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–
Spottail shiner *Notropis hudsonius*	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–
Silver shiner *Notropis photogenis*	–	–	x	x	–	–	–	–	–	–	–	–	–	–	–
Rosyface shiner *Notropis rubellus*	–	x	–	x	x	–	–	–	–	–	–	–	–	–	–

Table 2. Continued:

Species	Station														
	1	2	3	4	5	6	7	8	9	10	11	12	SB[1]	SL1[2]	SL2[3]
Spotfin shiner Notropis spilopterus	x	x	x	x	x	x	x	x	x	x	x	x	–	x	x
Sand shiner Notropis stramineus	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Redfin shiner Notropis umbratilis	–	–	–	–	x	x	x	x	x	–	x	x	–	x	–
Mimic shiner Notropis volucellus	–	–	–	–	–	–	–	–	x	x	–	–	–	–	–
Bluntnose minnow Pimephales notatus	x	x	–	x	x	x	x	x	x	x	x	x	x	x	x
Fathead minnow Pimephales promelas	–	–	–	–	–	–	x	–	–	–	–	–	x	–	–
Blacknose dace Rhinichthys atratulus	–	–	–	–	–	–	–	–	–	x	–	–	x	–	x
Creek chub Semotilus atromaculatus	–	x	x	x	x	x	x	x	x	x	x	x	x	x	x
White sucker Catostomus commersoni	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Lake chubsucker Erimyzon sucetta	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–
(Northern) hog sucker Hypentelium nigricans	x	x	x	x	x	x	x	x	x	x	x	x	x	–	x
Silver redhorse Moxostoma anisurum	–	–	–	–	–	–	–	–	–	x	–	–	–	x	x
Black redhorse Moxostoma duquesnei	–	x	x	x	x	–	–	–	–	–	–	–	–	–	–
Golden redhorse Moxostoma erythrurum	–	–	–	x	x	x	x	x	x	x	x	–	x	–	x
Shorthead redhorse Moxostoma macrolepidotum	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Brown bullhead Ictalurus nebulosus	–	x	–	x	–	–	–	–	–	–	–	–	–	–	–
Black bullhead Ictalurus melas	–	–	–	x	x	–	x	x	–	x	–	–	–	x	–
Yellow bullhead Ictalurus natalis	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Channel catfish Ictalurus punctatus	–	–	–	–	–	–	x	–	x	x	x	x	–	–	–
Stonecat Noturus flavus	–	x	x	x	x	x	x	–	x	x	x	x	x	x	x

Table 2. Continued:

Species	Station														
	1	2	3	4	5	6	7	8	9	10	11	12	SB[1]	SL1[2]	SL2[3]
Tadpole madtom Noturus gyrinus	x	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Brindled madtom Noturus miurus	x	x	x	x	–	–	–	–	–	–	–	–	–	–	–
Blackstripe topminnow Fundulus notatus	x	–	–	–	–	–	–	–	–	–	–	–	–	–	
Brook silverside Labidesthes sicculus	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Rock bass Ambloplites rupestris	x	x	x	x	x	x	x	x	x	x	x	x	x	–	x
Warmouth Lepomis gulosus	x	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Green sunfish Lepomis cyanellus	–	–	–	x	x	x	x	x	x	x	x	x	x	x	x
Pumpkinseed Lepomis gibbosus	x	x	x	x	–	–	–	–	–	x	x	–	x	–	–
Orangespotted sunfish Lepomis humilis	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–
Bluegill Lepomis macrochirus	x	x	x	x	x	x	–	x	x	x	–	–	–	–	–
Longear sunfish Lepomis megalotis	x	x	x	x	x	–	–	–	–	x	–	–	–	–	–
Smallmouth bass Micropterus dolomieui	–	x	x	x	x	x	x	–	x	x	x	x	–	–	x
Largemouth bass Micropterus salmoides	x	x	x	x	x	x	–	–	x	x	–	–	x	x	–
Black crappie Pomoxis nigromaculatus	x	–	x	x	x	x	x	–	x	x	–	–	x	x	–
Greenside darter Etheostoma blennioides	–	x	x	x	–	x	x	x	x	x	x	x	–	–	–
Rainbow darter Etheostoma caeruleum	x	x	x	–	–	–	–	–	–	–	–	–	–	–	–
Fantail darter Etheostoma flabellare	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Johnny darter Etheostoma nigrum	x	x	x	x	x	x	x	x	x	x	x	x	–	–	–
Yellow perch Perca flavescens	x	–	–	–	x	x	x	–	x	–	–	–	x	–	–
Logperch Percina caprodes	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Table 2. Continued:

Species	Station														
	1	2	3	4	5	6	7	8	9	10	11	12	SB[1]	SL1[2]	SL2[3]
Blackside darter Percina maculata	–	–	–	x	–	x	x	x	x	x	x	x	x	–	x
Walleye Stizostedion vitreum	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Mottled sculpin Cottus bairdi	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Number of species per station	28	30	24	32	26	28	25	20	29	36	24	19	23	16	16

[1]South Branch of River Raisin.

[2]Saline River 1.

[3]Saline River 2.

Table 3. Percent of catch, by weight and number, for various species of fish larger than 3 inches collected during the 1984 River Raisin fish survey. Chubs, shiners, and minnows are excluded.

Species	Catch composition (percent)	
	Weight	Number
Northern pike	1.9	1.0
White sucker	15.2	14.7
Northern hog sucker	29.7	28.6
Redhorse spp.	8.1	7.7
Carp	28.3	1.9
Bullhead spp.	1.1	1.9
Channel catfish	0.0	0.1
Stonecat	3.8	12.0
Brindled madton	0.3	2.3
Smallmouth bass	7.6	15.0
Largemouth bass	0.2	0.2
Bluegill	0.4	0.9
Pumpkinseed	0.0	0.4
Green sunfish	0.2	5.6
Rock bass	2.7	6.9
Black crappie	0.2	0.4
Other spp.	0.2	0.4

Table 4. Numbers of common fish collected per surface, at each station, during the 1984 River Raisin Fishery Survey. The value in parentheses indicates the number of legal- or acceptable-sized fish collected.[1]

Species	Station														
	1	2	3	4	5	6	7	8	9	10	11	12	SB[2]	SL1[3]	SL2[4]
Game fish															
Smallmouth bass	—	51	267	14	84	5	2	—	20	366	69	320	—	—	13
	—	(2)	(4)	(0)	(8)	(0)	(0)	—	(0.5)	(1)	(1)	(3)	—	—	(4)
Northern pike	3	12	1	3	2	10	6	8	14	20	2	—	2	—	—
	(0)	(2)	(1)	(2)	(0)	(1)	(3)	(1)	(0)	(2)	(0)	—	(0)	—	—
Rock bass	36	114	98	97	42	21	10	44	132	141	23	121	8	—	58
	(9)	(57)	(33)	(15)	(18)	(9)	(2)	(14)	(11)	(28)	(6)	(29)	(0)	—	(21)
Largemouth bass	13	4	9	15	6	3	—	—	2	4	—	—	2	11	—
	(0)	(0)	(0)	(0)	(0)	(0)	—	—	(0)	(0)	—	—	(0)	(0)	—
Bluegill	55	2	56	8	6	1	—	1	1	14	—	—	—	—	—
	(17)	(0)	(0)	(1)	(0)	(0)	—	(0)	(0)	(5)	—	—	—	—	—
Bullhead spp.	22	6	16	21	60	14	32	11	17	31	3	1	36	41	13
	(6)	(4)	(7)	(13)	(38)	(9)	(4)	(3)	(8)	(5)	(1)	(1)	(10)	(23)	(13)
Channel catfish	—	—	—	—	—	—	5	—	1	2	—	1	—	—	—
	—	—	—	—	—	—	(0)	—	(0.5)	(1)	—	(1)	—	—	—
Walleye	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—
	—	—	—	—	—	—	—	—	—	(1)	—	—	—	—	—

Table 4. Continued:

Species	Station														
	1	2	3	4	5	6	7	8	9	10	11	12	SB[2]	SL1[3]	SL2[4]
Coarse fish															
Carp	17	—	—	8	56	8	20	18	7	38	4	10	6	35	—
Redhorse sp.	—	59	291	169	386	212	55	2	49	20	1	—	2	5	88
White sucker	9	20	74	1	164	342	286	39	9	239	123	189	2,190	43	75
Hog sucker	31	216	275	56	144	68	42	11	219	665	102	322	72	—	38
Stonecat	—	147	225	19	240	26	3	—	113	126	118	159	10	5	50

[1]Legal- or acceptable-size fish are defined as: bluegill and rock bass—6 inches and up; bullhead and channel catfish—7 inches and up; walleye—15 inches and up; pike—20 inches and up.

[2]South Branch - River Raisin.

[3]Saline River - Station 1.

[4]Saline River - Station 2.

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