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USE OF CHANNEL CATFISH TO CREATE AN URBAN FISHERY IN LIONS' LAKE, MANKATO, MINNESOTA

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USE OF CHANNEL CATFISH TO CREATE AN URBAN FISHERY IN LIONS' LAKE, MANKATO, MINNESOTA[1]

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Abstract.--An increased demand for fishing near urban areas has led to efforts to change urban fisheries management strategies. During 1987 and 1988 channel catfish *Ictalurus punctatus* of harvestable size (0.5 - 1.5 kg) were stocked at high densities in a 2.8 ha lake located in Mankato, Minnesota. Catfish were sought primarily by experienced adult anglers. In 1987, a channel catfish fishery was established that resulted in high catch rates and near complete harvest of stocked fish. In 1988, lower catch rates and a reduced harvest were observed. In addition to providing opportunities to persons with restricted mobility (people that are poor, young, old, handicapped, or restricted by social or cultural barriers), benefit:cost ratios indicate that stocking channel catfish in urban areas can be cost-effective.

INTRODUCTION

During recent decades in Minnesota, the demand for angling opportunities in urban areas has increased commensurate with the population shift from rural to urban areas. In 1985, 60% of all Minnesotans and 53% of all Minnesota anglers lived in urban areas (USFWS 1989). Minnesota contains many lakes; however, in many urban areas there is a paucity of fishable waters easily accessible to anglers. Public demand for angling opportunities in urban areas will undoubtedly continue to rise in the future. Those who lack the mobility necessary to reach popular fishing waters outside urban areas are affected most by the lack of urban outdoor recreational opportunities. Among these are low-income individuals, the very young or very old, the physically or mentally handicapped, and people restricted by social or cultural barriers.

Angling is an activity well suited to participation by most individuals regardless of age, sex, or physical ability. The therapeutic value of recreational angling is widely recognized. It may be especially valuable in densely populated areas where other opportunities to participate in outdoor activities are limited (Marloff 1984). Unlike most other forms of urban recreation, angling can be enjoyed by nearly anyone

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and nearly any time.

Managing urban fisheries in Minnesota fits well with the Minnesota Cooperative Opportunities for Resource Enhancement (CORE) program. CORE funds can be used to improve accessibility to small lakes or ponds by construction of fishing piers and improving shoreline locations that might otherwise be suitable but lack convenient angling sites.

Traditional fish management techniques are often not appropriate for managing urban fisheries due to unusually high angler demands directed to areas with habitat unsuitable for many species of fish. Urban fisheries management seeks to bring fish to the public rather than requiring the public to travel to the fish (Botts 1984). The quality of urban fishing is primarily determined by the catchability of stocked fish (Alcorn 1981).

Urban programs being conducted in other states are similar in design and scope. Harvestable sized channel catfish *Ictalurus punctatus*, bullhead *Ictalurus* spp., carp *Cyprinus carpio*, or rainbow trout *Onchorhynchus mykiss* have been stocked at rates from 112 to 560 kg/ha in ponds ranging in size from O.12 to 10.1 ha (Shupp 198O; Theurer 198O; Jeffries 1985). To distribute catches more evenly over time, frequent stockings of fewer fish may be preferable to a single large annual stocking (Jeffries 1980; Shupp 1980).

Costs involved in establishing and maintaining a put-and-take catfish and bullhead fishery are relatively small compared to the amount of angling opportunities created. Haas (1984) estimated costs of $0.19 to $0.48 per angler trip, based on stocking urban fish lakes in St. Louis and Kansas City, Missouri to provide 188,000 angler trips. In New York, urban ponds provided thousands of angler-h/ha at costs between $1.44 and $1.5O per angler trip from 1977 to 1978 (Shupp 198O).

Annual fishing pressure in urban lakes tends to be high. Kansas City urban ponds received 8,642-13,580 angler-h/ha from March through May 198O (Theurer 198O) while ponds in St. Louis received up to 25,185 angler-h/ha in 1978 (Jeffries 198O). Catch rates were relatively high despite such heavy angling pressure. In Kansas City and St. Louis ponds, catch rates for all species combined were O.48-O.66 fish/h. Catch rates ranged from O.18 to 2.2 fish/h for bullhead in New York urban ponds (Shupp 198O).

Minnesota fisheries managers have used low quality urban lakes in previous years to provide angling opportunities by stocking various species of panfish and bullhead to create or augment existing fisheries (MN DNR File Data). This study was the first attempt to use urban lakes for recreational catfish angling by Minnesota urbanites. Providing better opportunities for catfish angling to urban individuals would provide fisheries managers another tool to use in urban lakes management.

METHODS

Study Area

Lions' Lake, a 2.8 ha lake with a mean depth < 1.0 m, was selected because it was partially located within a municipal park surrounded by residential single and multiple family housing. A T-shaped fishing pier with provisions for handicapped individuals was built. The pier was financed by CORE funds from the MN DNR. Construction of a hard surfaced asphalt pathway provided easy public access to the pier and lake.

Fish populations before the initiation of channel catfish stocking provided limited opportunities for quality angling. Fish populations in Lions' Lake were surveyed using 6 and 19 mm mesh double frame trap nets in 1983 and 1985 (MN DNR File Data). Identical gear was used in April 1987 and 1988 prior to the stocking of channel catfish. Fish populations in 1987 consisted of many small bluegill *Lepomis macrochirus*, black bullhead *Ictalurus melas*, and black crappie *Pomoxis nigromaculatus* (Table 1). In 1988, a few channel catfish,

Table 1. Mean trapnet CPUE by species from Lions' Lake, 1983 to 1988.

	Channel catfish		Black bullhead		Black crappie		Bluegill		Largemouth bass		Yellow perch	
Year	CPUE	Size range (mm)	CPUE	Size range (mm)	CPUE	Size range (mm)	CPUE	Size range (mm)	CPUE	Size range (mm)	CPUE	Size range (mm)
1983	-	-	2	(51-251)	14	(89-251)	1	(178-203)	-	-	-	-
1985	-	-	56	(114-330)	50	(140-191)	25	(127-165)	-	-	-	-
1987	-	-	5	(142-155)	20	(97-205)	-	-	-	-	-	-
1988	0.5	(429-485)	3	(93-155)	20	(95-198)	35	(94-140)	0.3	(170)	0.3	(163)

largemouth bass *Micropterus salmoides*, and yellow perch *Perca flavescens* were captured in addition to the other species.

Channel Catfish Stocking

Channel catfish weighing 0.45 to 1.36 kg were bought through competitive bids from private sources. Catfish were stocked twice during summer 1987 and once in 1988 (Table 2). Stocking of catfish in 1988 was delayed until 19 June due to logistical problems. In both years, attempts were made to stock adequate numbers of catchable sized fish to create a viable fishery. Upon delivery to Lions' Lake, the catfish were visually inspected for signs of disease or obvious stress. All fish were judged to be in excellent condition.

Angler Survey

A creel survey to estimate fishing pressure and harvest was conducted each year during the interval between the first stocking of catfish and Labor Day weekend. A random sample, two-stage design was used. The survey schedule was designed so that an average of four 2 h daytime creel periods per week were sampled at random. Angling in the municipal park was not allowed during the period from 2300 h until sunrise when the park was closed. Anglers were not surveyed during this period, and angling activity was presumed to be minimal.

Instantaneous angler counts were made at the beginning, midpoint, and end of each 2 h sampling period. Anglers were interviewed at the end of the survey period or at the end of their fishing trip, whichever came first. Most interviews (88%) were based on completed trips. Standardized forms were used to record fishing effort, catch, and harvest data. Additional data on the age and sex of the anglers, fishing methods, species preference (1988 only), distance traveled, and fishing pier use were also collected.

Data were analyzed by 3 week periods to estimate within season fishing pressure, harvest, and success (Table 3). All but the last period of each season were 21 d in length. Daily angling pressure (for shore, pier, and total angling) was estimated by multiplying the mean of instantaneous counts by available daytime angling hours. Angling pressure for each period was estimated from the means of daily estimates. Fish harvest was estimated by multiplying the CPUE for each species by the estimated fishing hours. Estimates for all time periods were summed for full season totals.

RESULTS

The urban fishing program on Lions' Lake attracted anglers who were mostly young to middle aged and predominantly male (Table 4). One to three percent of the Lions' Lake anglers were older than 64 years. In 1987, 88% of the travel to Lions' Lake by anglers was restricted to less than 6 miles. In 1988, 84% traveled less than 1 mile to fish. The fishing pier at Lions' Lake was used by 43% of the anglers. Individuals under the age of 16 used the pier the most.

Fishing pressure differed greatly between years (Table 5). Fishing effort in 1988 was 55% lower than 1987 during comparable periods from June through September. In both years, increases in fishing effort appeared to coincide with channel catfish stockings. Fishing pressure tended to decrease as summer progressed.

The catch rate of all species combined was similar for the two years although the composition of the catch differed (Table 6). The 1988 catch was dominated by bluegill, whereas in 1987, black bullhead dominated the catch. Mean catch rates of channel catfish were 0.36 fish/h in 1987 and 0.18 fish/h in 1988. In 1987, the highest catch rates for channel catfish coincided with channel catfish stockings. Channel catfish catch rates were unaffected by stockings in 1988. Although channel catfish catch rates were below the 0.5 fish/h goal, anglers who sought channel catfish in 1988 attained a

Table 2. Size range, stocking rates, and cost of channel catfish stocked in Lions' Lake, 1987-1988.

Date	Size range (Kg)	Stocking rates (Kg/ha)	(No/ha)	Cost
14 May 1987	0.34 - 1.13	647	611	$5,148
17 July 1987	0.34 - 1.13	321	357	$3,400
19 June 1988	0.34 - 1.36	240	353	$2,250

Table 3. Sample periods used for creel survey analyses, Lions' Lake, 1987-1988.

Sample period	Sample dates (inclusive)	Days in sample period	Number days surveyed
1	14 May-3 June 1987	21	7
2	4 June-24 June 1987	21	10
3	25 June-15 July 1987	21	8
	20 June-10 July 1988	21	7
4	16 July-5 Aug. 1987	21	13
	11 July-31 July 1988	21	11
5	6 Aug.-26 Aug. 1987	21	9
	1 Aug.-21 Aug. 1988	21	11
6	27 Aug.-7 Sept. 1987	12	7

Table 4. Age and sex distributions expressed as percentages and distances in miles traveled by Lions' Lake anglers during 1987 and 1988.

	1987	1988
Sex		
Male	81	72
Female	19	28
Age		
< 16 years	35	55
16-64 years	62	44
> 64 years	3	1
Distance traveled (one way)		
< 1 mile	29	84
1-6 miles	58	16
> 6 miles	12	<1

Table 5. Fishing pressure (angler-h), percent of total annual fishing pressure, and daily pressure (angler-h/ha/d) at Lions' Lake during summer, 1987 and 1988.

Period	Year	Fishing pressure (angler-h)	Percent of total annual pressure	Daily pressure (hours/ha/d)
1	1987[a]	2,873	42	48.3
2	1987	753	11	12.7
3	1987	890	13	15.0
	1988[a]	682	47	11.5
4	1987[a]	890	13	15.0
	1988	296	20	5.0
5	1987	1,095	16	18.4
	1988	326	23	5.5
6	1987	342	5	10.1
	1988	145	10	3.7
Totals				
	1987	6,843		20.6
	1988	1,449		6.6
		8,292		15.0

[a] Channel catfish stocked at beginning of period.

mean catch rate for that species of 0.34 fish/h.

In 1988, 41% of the anglers fished for channel catfish. The remainder of the anglers (primarily youths), either did not have a specific species preference (39%) or preferred to fish for one of the other species in the lake. In both years worms were the most frequently used bait (50 - 69%). Chicken livers were used by 6 - 14% of the anglers, while the remainder used some other natural or artificial bait.

An estimated 2,212 kg (790 kg/ha) of fish were harvested from Lions' Lake during 117 d in 1987 and 139 kg (49.6 kg/ha) during 78 d in 1988. Channel catfish made up 97% and 96% of the total harvest by weight in 1987 and 1988, respectively, but accounted for only 74 and 64% of the number of fish harvested during these 2 years (Table 7). The average size of channel catfish caught (920 g in 1987 and 725 g in 1988) approximated the size at which they were stocked.

Rates of channel catfish harvest for each period were used to estimate the reduction in density of catfish after each stocking (Figure 1). Catfish from the 1987 stocking were not used for the 1988 estimates. Within the first 3 weeks after the first channel catfish stocking in 1987, the density dropped to about 200/ha from an initial density of 611/ha. The total harvest dropped precipitately (80%) after the first 3 weeks (Table 7). In 1988, no substantial reduction in channel catfish density was observed (Figure 1) as only 21% of the stocked fish were harvested.

DISCUSSION

Urban fishing opportunities at Lions' Lake were not noticeably used by individuals with restricted mobility other than youths despite adequate accommodations. School aged children were expected to take advantage of this urban fishing opportunity because school was not in session during most of the creel survey. Lions' Lake anglers were also characterized by a smaller proportion of females than the 39% given by the USFWS (1989) as an average for Minnesota. Even

Table 6. Catch rates (fish/h) of channel catfish (CCF), black crappie (BLC), black bullhead (BLB), bluegill (BLG), and largemouth bass (LMB) with 2 standard errors (95% confidence intervals) in parentheses at Lions' Lake during summer creel periods, 1987 and 1988.

	All fish		BLB		CCF		BLG		LMB		BLC	
Period	1987	1988	1987	1988	1987	1988	1987	1988	1987	1988	1987	1988
1	3.49	-	2.31	-	0.42[a]	-	0.02	-	0.52	-	0.23	-
	(0.49)	-	(0.76)	-	(0.20)	-	(0.03)	-	(0.38)	-	(0.14)	-
2	3.20	-	2.14	-	0.34	-	0.02	-	0.65	-	0.06	-
	(1.05)	-	(1.08)	-	(0.18)	-	(0.04)	-	(0.31)	-	(0.09)	-
3	2.06	3.16	0.72	0.06	0.12	0.18[a]	0.03	2.63	1.11	0.09	0.08	0.20
	(0.73)	(1.68)	(0.43)	(0.08)	(0.13)	(0.24)	(0.04)	(1.70)	(0.48)	(0.10)	(0.10)	(0.37)
4	1.76	2.81	0.51	0.23	0.69[a]	0.32	0.04	1.67	0.44	0.50	0.08	0.09
	(0.62)	(1.68)	(0.27)	(0.25)	(0.42)	(0.54)	(0.06)	(1.50)	(0.30)	(0.50)	(0.10)	(0.15)
5	1.65	1.11	0.99	0.30	0.23	0.16	0.09	1.00	0.21	0.16	0.13	0.08
	(0.59)	(0.65)	(0.38)	(0.20)	(0.06)	(0.13)	(0.02)	(0.36)	(0.14)	(0.18)	(0.12)	(0.15)
6	0.82	2.82	0.31	0.33	0.06	0.00	0.35	2.39	0.10	0.09	0.00	0.00
	(0.45)	(0.86)	(0.21)	(0.44)	(0.07)	(0.00)	(0.41)	(0.69)	(0.10)	(0.11)	(0.00)	(0.00)
All	2.20	2.58	1.15	0.22	0.36	0.18	0.08	1.85	0.51	0.22	0.11	0.10
	(0.31)	(0.68)	(0.20)	(0.13)	(0.10)	(0.16)	(0.05)	(0.67)	(0.07)	(0.14)	(0.05)	(0.11)

[a] Channel catfish stocked at beginning of period.

Table 7. Estimated harvest (kg) of channel catfish (CCF), black crappie (BLC), bluegill (BLG), largemouth bass (LMB), and black bullhead (BLB) with 2 standard errors (95% confidence intervals) in parentheses, from Lions' Lake, 1987 and 1988.

	BLB		CCF		BLG		LMB		BLC	
Period	1987	1988	1987	1988	1987	1988	1987	1988	1987	1988
1	0.0 (0.0)	0.0 (0.0)	1240.2[a] (781.8)	0.0 (0.0)	15.2 (21.8)	0.0 (0.0)	4.0 (8.0)	0.0 (0.0)	35.8 (36.5)	0.0 (0.0)
2	1.5 (3.2)	0.0 (0.0)	249.1 (140.0)	0.0 (0.0)	3.3 (6.6)	0.0 (0.0)	1.4 (1.3)	0.0 (0.0)	4.3 (6.2)	0.0 (0.0)
3	0.0 (0.0)	0.0 (0.0)	86.0 (141.9)	69.8[a] (129.4)	0.0 (0.0)	3.8 (8.2)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
4	0.0 (0.0)	0.6 (0.0)	439.1[a] (262.8)	37.0 (62.9)	0.0 (0.0)	0.4 (0.0)	0.0 (0.0)	1.8 (4.0)	3.1 (3.9)	0.6 (0.0)
5	2.1 (0.5)	0.0 (0.0)	102.0 (64.1)	39.9 (39.2)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
6	0.0 (0.0)	0.0 (0.0)	26.7 (32.5)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Total	3.5 (4.4)	0.7 (0.0)	2141.7 (854.6)	133.2 (120.4)	18.5 (22.8)	2.5 (4.4)	5.4 (8.2)	2.2 (4.6)	43.2 (37.2)	0.0 (0.0)
Average weight (g)	50	64	959	724	234	46	48	69	83	-
Est. number harvested	70.0	11.0	2234.0	184.0	79.0	54.0	112.0	32.0	519.0	0.0

[a] Channel catfish stocked at beginning of period.

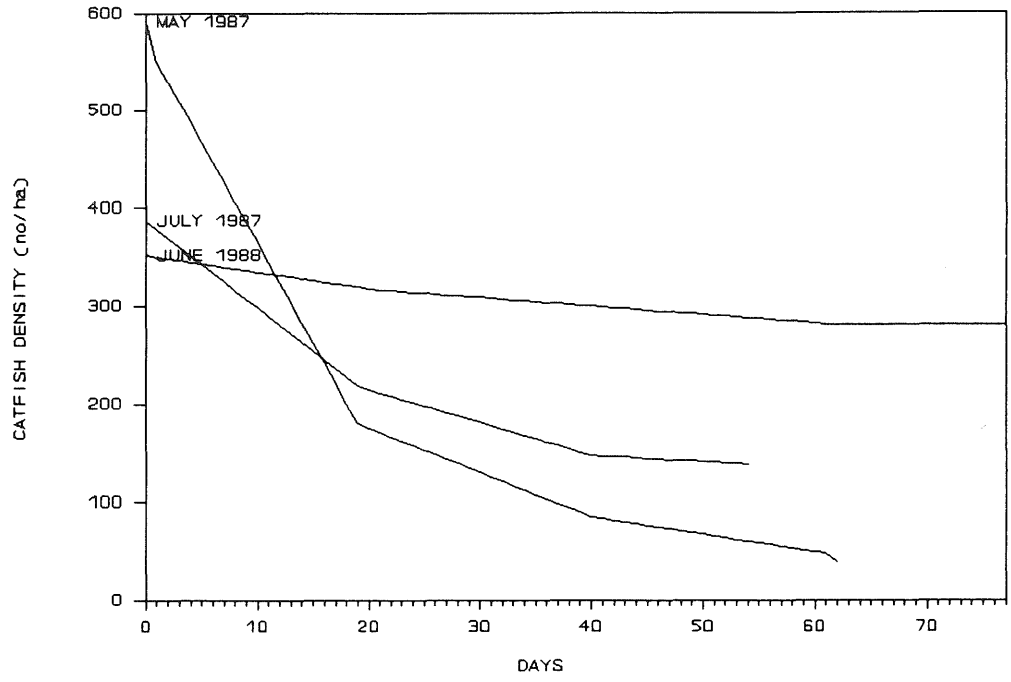

Figure 1. Estimated depletion in population density of channel catfish in Lion's Lake as a result of angler harvest. Dates given on the figure are the dates that catfish were stocked.

though the lake was fished extensively by young anglers, channel catfish were sought mostly by adult males between the ages of 16 and 64. The newly constructed fishing pier at the lake was used extensively by children, with catfish angling from the pier being infrequent.

Most of the angling effort was attributed to stocked channel catfish since few fish of harvestable size were in Lions' Lake prior to our catfish stocking. Angling pressure on Lions' Lake was similar to that reported for a Colorado urban lake by Babcock (1986). Babcock (1986) also used channel catfish exclusively at similar stocking rates (500/ha).

Stocking channel catfish to provide an urban fishery in Mankato was cost effective. Economic benefits determined using USFWS (1989) estimates for average trip length (4.6 h) and daily trip costs ($12.20), and our estimates of effort (Table 5) were $18,149 in 1987 and $3,843 in 1988. The benefit:cost ratio calculated from these estimates and the cost of stocking channel catfish (Table 1) were 2.1:1 in 1987 and 1.7:1 in 1988.

Anglers at Lions' Lake were able to reach the 0.5 fish/h goal suggested by Shupp (1972). The majority of the catch was comprised of bluegill, black crappie, and bullhead, although channel catfish alone accounted for close to 0.5 fish/h in 1987. The reported catch rates of black bullhead were probably underestimated. Many anglers said they were annoyed by catching bullhead. As a result, they tried to avoid catching bullhead and had difficulty recalling numbers caught.

Most fish other than channel catfish were not kept. In 1987, we estimated 86%

of the catfish stocked in Lions' Lake ended up in the harvest. It was not uncommon to see anglers with a limit of five catfish, especially during evening hours when catfish were more susceptible to capture and more experienced anglers fished. In 1988, the harvest rate was much lower with only 21% of the stocked catfish being harvested. Factors that may have contributed to the decline in harvest include: a later stocking date; an increase in bullhead density that interfered with catfish angling efforts; the reduced novelty of channel catfish; or the extreme heat and drought conditions in 1988, and the resultant low water levels and in situ changes in Lions' Lake.

Babcock (1986) reported a return rate of 6 to 66% from catfish stockings in Colorado and cited others who had attained return rates of 17 to 36%. Jeffries (1980) reported 60% of all stocked channel catfish were caught within 8 d of stocking in Kansas City, Missouri ponds. Depending on clientele, harvests of stocked bullhead have been reported in excess of the number stocked (Lange 1984). High stocking rates often generate high harvest rates that rapidly deplete stocked fish. As a result, high rates of return on stocked fish are observed, but the harvest is unevenly distributed over time (Shupp 1972; Jeffries 1980). By distributing channel catfish stockings over a broader time frame, harvest rates can be controlled.

Stocking harvestable-size fish in urban areas may become an increasingly attractive management alternative as long as current demographic trends continue. Cole and Ward (1989) determined that proximity to fishing sites played a key role in determining angler activity. They stated that as populations become more urbanized, fishery management must become more oriented towards urban areas.

Originally, bullhead were going to be stocked into Lions' Lake in addition to catfish. During the pre-study public information meeting, however, we found that local sentiment was against such action. It is unknown whether people equated our proposed stocking with the many small fish already present in the lake, or whether their attitudes reflected a broader bias against bullhead. Based on their perception and that there were other fishable species in Lions' Lake, we decided against stocking bullhead.

MANAGEMENT IMPLICATIONS

A successful urban fishing program can be conducted in Minnesota urban ponds with the use of channel catfish. For an urban fishing program to be successful, the fish used should meet the following criteria: 1) there must be a reliable source to supply adequate quantities of harvestable-size fish at a desirable benefit:cost ratio; 2) the fish must be able to survive the habitat into which it will be stocked for the desired period of angling; and 3) the catchability of the fish should match the clientele. Fish species that may be appropriate for use in Minnesota urban ponds include common carp, bullhead spp., rainbow trout, and brown trout *Salmo trutta* in addition to channel catfish. Where feasible, stocking one or more species would increase the angling diversity.

Stocking should be done at rates to insure catch rates of at least 0.5 fish/h. This was accomplished at Lion's Lake with 300 - 600 kg/ha of channel catfish. Additional fish will need to be stocked periodically as catch rates drop. For example, stocking channel catfish in Lions' Lake at monthly intervals starting in May is appropriate.

The success of an urban fishing program is dependent upon good public access to an urban pond. Hard surface paths to ponds and fishing piers will facilitate access for most individuals. In addition, shoreline fishing access unconstricted by steep banks, overhead vegetation, and aquatic macrophyte growth should be available to facilitate angling opportunities.

A successful urban fishing program is also dependent on marketing the newly created opportunities to targeted clientele. For example, an urban fishing program could accompany fishing events such as a "kid's fishing day," an outing for the

physically or mentally impaired, or for the elderly where transportation and perhaps some angling expertise is provided.

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