Missouri Paddlefish Plan Addendum

A report of the Paddlefish Committee

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MISSOURI PADDLEFISH PLAN ADDENDUM

Executive Summary

The original Missouri Paddlefish Management Plan was written and approved in March 1992. The plan documented the status of paddlefish and paddlefish management at that time and further recommended objectives for managing paddlefish populations in Missouri reservoirs and rivers for the succeeding 10-year period, 1992-2001. Efforts during that period focused on maintaining fisheries in Lake of the Ozarks, Harry S Truman Lake and Table Rock Lake at current levels and learning more about populations in rivers.

The Paddlefish Plan Addendum is provided to bring paddlefish status and current management efforts up-to-date. This Addendum, in conjunction with the original Plan, will serve as an interim guide for paddlefish management until a full rewrite of the Plan can be completed in 2004.

The Plan Addendum provides updated stocking information, a paddlefish fishkill summary, a summary of historical paddlefish regulations and a detailed look at current threats to paddlefish in Missouri.

We believe that the best management approach for maintaining and protecting existing sport fisheries in reservoirs continues to be stocking hatchery-produced fingerlings annually combined with a restrictive harvest season, low daily limit and length limits. Sport harvest in reservoirs should continue to be monitored to ensure that current regulations are effective in preventing overharvest and for determining replacement stocking rates. Level of paddlefish sport harvest in the Missouri and Mississippi Rivers and the lower Osage River should be monitored along with commercial harvests in the Mississippi River to aid in paddlefish management. Regulations for reservoirs and rivers should be reviewed periodically to ensure that paddlefish populations are managed properly. Informational programs should be developed to increase public awareness of the paddlefish fishery and biology.

The goal statement remains as follows:

> To manage paddlefish statewide as a trophy sport fishery.

The objectives in the Plan Addendum are as follows:

> Objective I: Manage paddlefish populations in Table Rock Lake, Lake of the Ozarks and Harry S Truman Lake to provide average annual harvests of 3,000 fish until impingement and entrainment issues at dams have been addressed. Harvest goals will be reevaluated and adjusted at that time. Manage paddlefish populations in the Lower Osage River to provide annual harvests of 500 fish until impingement and entrainment issues and minimum flow regimes that allow for consistent paddlefish spawning success have been established below Bagnell Dam. Harvest goals will be reevaluated and adjusted at that time.
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> Objective II: Manage paddlefish populations in the Missouri and Mississippi rivers and their major tributaries to achieve optimum sport harvest levels to sustain healthy populations.
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> Objective III: Minimize illegal harvest of paddlefish by sporting and commercial methods.
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> Objective IV: Increase the levels of awareness and appreciation of paddlefish so that 20% of all Missouri citizens appreciate and have increased knowledge about paddlefish.

STATUS OF PADDLEFISH POPULATIONS AND FISHERIES

Lake of the Ozarks

Lake of the Ozarks supports the largest snag fishery in Missouri and one of the largest in the United States. Construction of Harry S Truman Dam on the Osage River near Warsaw in 1977 permanently blocked spawning migrations out of Lake of the Ozarks, threatening that fishery. Traditionally, paddlefish migrated out of Lake of the Ozarks during spring river rises to spawn over clean gravel in flowing water of the Osage River (Russell 1986). This was the only location in Missouri where paddlefish spawning sites were ever documented. (Purkett 1961, Russell et al. 1980). Since impoundment of Harry S Truman Lake, a paddlefish fishery has been maintained in Lake of the Ozarks, in spite of the lack of natural reproduction. This fishery is maintained through a combination of supplemental stockings of hatchery-produced fingerlings and restrictive harvest regulations.

Between 1982 and 2000, Lake of the Ozarks received annual stockings of approximately 12,000 paddlefish fingerlings (Table 1). In 2001, a large stocking of approximately 64,000 paddlefish fingerlings took place. This large stocking occurred because of unusually high production and survival of fingerlings at Blind Pony Hatchery. This level of production is not achievable on a regular basis, and even if it were, we would not want to regularly stock this many paddlefish into any of the reservoirs. Paddlefish fingerlings are stocked at 10-14 inches total length to minimize predation.

Table 1. Number of paddlefish fry and fingerlings (10-14 inches total length) stocked into Lake of the Ozarks, Harry S Truman Lake, Table Rock Lake, and the Black River, 1972-2002. All stocked paddlefish fingerlings tagged at tip of rostrum with coded wire tags from 1994-2002. There were no paddlefish stockings in 1981, 1985 and 2002.

YEAR	LAKE OF THE OZARKS	HARRY S. TRUMAN LAKE	TABLE ROCK LAKE	BLACK RIVER
FRY	**FRY**	**FRY**	**FRY**	**FRY**
1972			400,000	
1976	104,379		264,594	
1977	100,000			
1978		4,367,795		
1979		623,700		
1983		590,224		
1987		539,000		
1991		102,000		
1992		504,575		
1993		317,700		
1994		77,600		
Total Fry	**204,379**	**7,122,594**	**664,594**	**0**

FINGERLINGS	FINGERLINGS	FINGERLINGS	FINGERLINGS	FINGERLINGS
YEAR	LAKE OF THE OZARKS	HARRY S TRUMAN LAKE	TABLE ROCK LAKE	BLACK RIVER
1972			11,779	
1973	12,388		25,326	
1974	4,365		37,718	
1975			5,171	
1976	216		1,872	
1977			2,293	
1978		180,000		
1979		147,740		
1980		42,816		
1982	15,381	17,811		
1983	9,717	11,438		
1984	26,854	21,876	22,985	
1986	4,935	5,103		
1987	11,434	11,154	15,506	
1988	25,994	26,700	21,750	
1989	17,452	16,403	12,106	
1990	10,129	29,576	9,998	
1991	5,895	5,987		
1992	2,760	4,471		
1993	10,028	39,522		
1994	10,180	29,001		
1995	10,057	11,927	5,027	
1996	7,972	9,335	2,016	
1997	1,738	3,906		
1998	18,974	18,065	10,195	512
1999	21,203	20,267	3,000	509
2000	8,190	9,694	3,128	500
2001	63,881	66,620	14,973	
Total Fingerlings	**282,774**	**729,412**	**31,296**	**1521**

Statewide recreational harvest of paddlefish presently occurs during a special 45-day snagging season (March 15th - April 30th). In Lake of the Ozarks, much of this harvest occurs in deep pools on the upper 40 miles of the Osage Arm and in the Niangua Arm between the mouth of the Little Niangua Arm and the Highway 54 Bridge.

Estimated harvest during the period 1978-1985 was about 3,000 fish per year. From 1986 -1988, harvest decreased to about 2,000 fish annually (Graham 1988). This reduction may have been caused in part by the illegal harvest of adult paddlefish for caviar. A major paddlefish egg poaching operation was eliminated in the late 1980's and the individuals arrested admitted killing many mature paddlefish for roe. Although exact figures will never be known, hundreds of mature paddlefish were killed each year for several years. These were mature paddlefish on spawning runs

out of Lake of the Ozarks that would ordinarily be available to anglers. Numbers of paddlefish available for harvest were also reduced to an unknown extent by fish kills at hydropower facilities.

During 2000 and 2001, estimated harvests of 3,295 and 5,016 fish were observed, respectively. The difference in harvest between these two years illustrates the relationship between flow and harvest. During a wet spring season (2001) when large amounts of water were released from Truman Dam, harvest was higher than during a year (2000) of low discharge (Figure 1).

Numerous regulations have been implemented over the last twenty years to both protect and enhance the quality of this limited fishery (Table 2). Three regulation changes in 1990 and one in 2000 were implemented to address illegal poaching of paddlefish for roe. On Lake of the Ozarks, the current daily and possession limit is two and four fish respectively, with a 34" minimum size limit measured from the eye to the tail fork

Figure 1. Discharge from Truman Dam – Cubic Feet/Second (1/1/2000 – 5/1/2001)

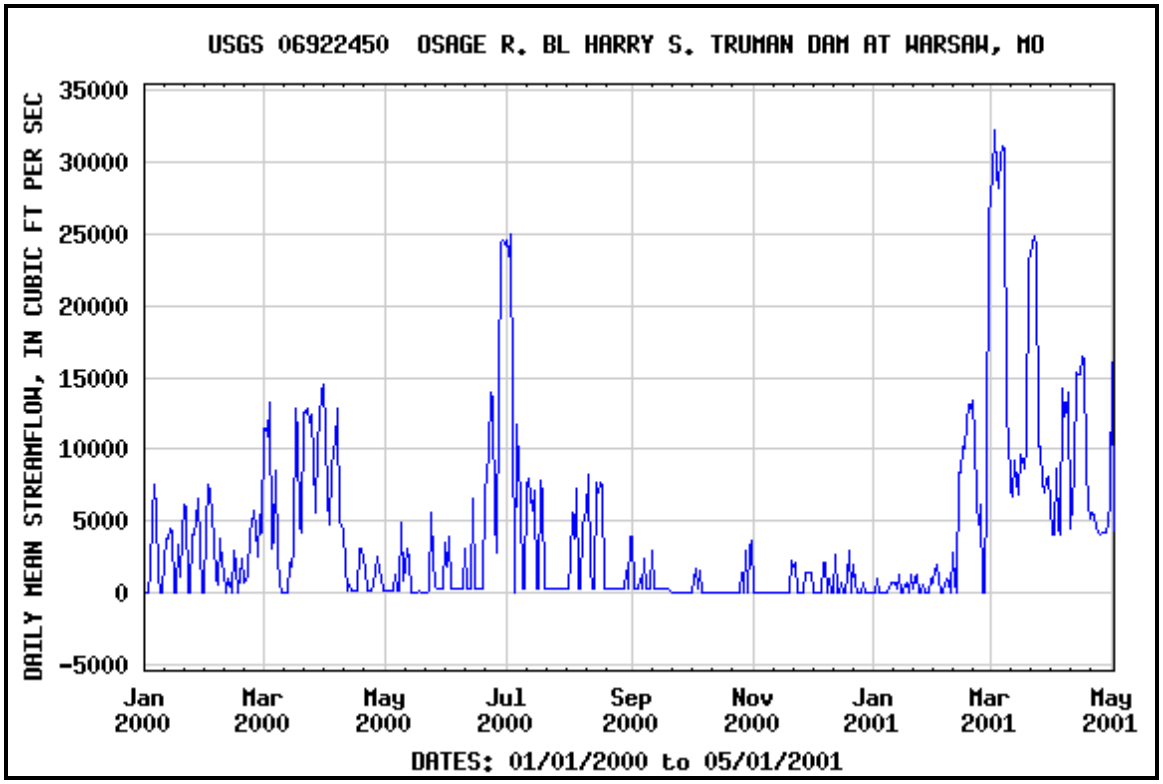


Table 2. Chronological listing of statewide and specific lake regulations used to manage paddlefish in Missouri.

Year	Regulations	Location
Pre-1978	March 15 – May 15 and October 1 – December 31 snagging season, with 2 fish daily and in possession.	Statewide
1978	3.5 mile no snagging zone below Harry S Truman Dam	Lake of the Ozarks
1979	Shorten spring snagging season (March 15 – April 30)	Lake of the Ozarks
1979	Prohibited snagging on Harry S Truman Lake and tributaries	Harry S Truman Lake
1983	No possession of paddlefish in Harry S Truman Dam tailwaters	Lake of the Ozarks
1983	No possession of paddlefish on Harry S Truman Lake and tributaries	Harry S Truman Lake
1987	24-inch (body length) length limit	Lake of the Ozarks
1990	24-inch (body length) length limit	Statewide
1990	Paddlefish parts (including eggs) may not be used as bait	Statewide
1990	Paddlefish eggs may not be transported or sold	Statewide
1990	Eliminated fall snagging season (October 1 – December 31)	Statewide
1990	Eliminated commercial harvest of paddlefish	Missouri River
1990	Permitted snagging on Harry S Truman Lake and tributaries.	Harry S Truman Lake
1997	Eliminated possession of paddlefish from Lake Springfield Dam downstream to highway 160 bridge.	Table Rock Lake
2000	34-inch (body length) length limit on Lake Ozark, Harry S Truman, Table Rock and their tributaries.	Lake Ozark, Table Rock Lake , Harry S Truman Lake
2000	Possession limit twice daily limit; extracted paddlefish eggs may not be possessed on the water or banks and may not be transported	Statewide

Osage River

A snag fishery exists below Highway 54 about 1.3 miles downstream from Bagnell Dam. The area between Highway 54 and Bagnell Dam was closed to snagging in 2000 to protect small paddlefish which congregate in this area. Paddlefish are also harvested from a few deep holes downstream extending nearly to the river mouth.

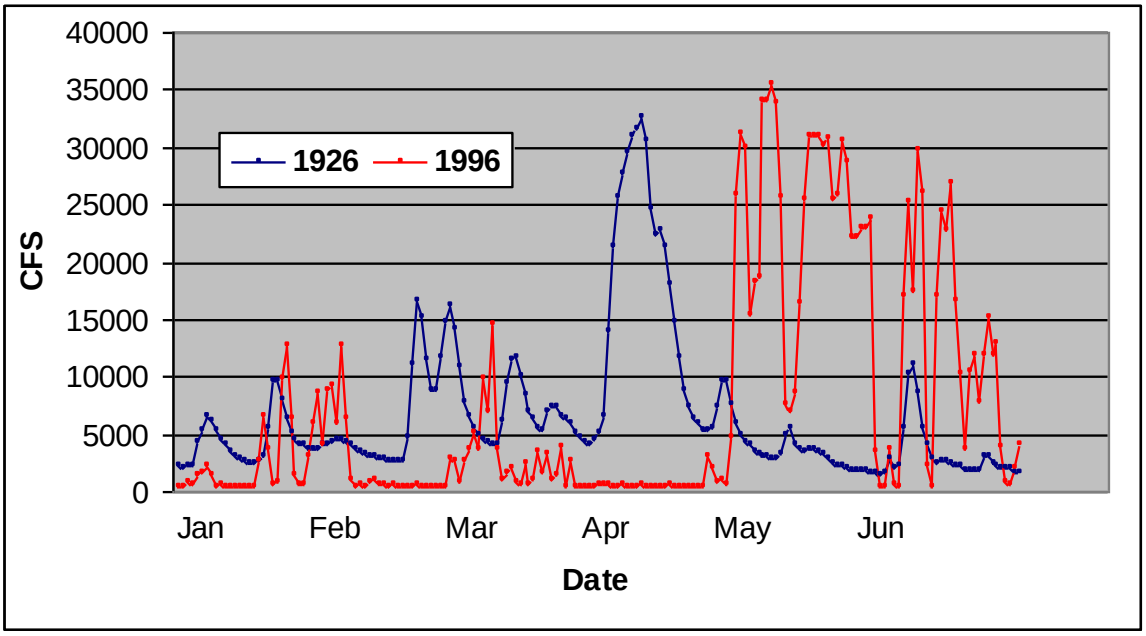
Creel census records indicate that anglers harvested very few paddlefish exceeding 20 pounds during the 60-day spring snagging season (Hanson 1976). This trend of numerous small fish has

continued to the present. Average length of paddlefish harvested in 2000 and 2001 in the lower Osage River was 32.5"(eye to fork) compared to the Osage arm of Lake of the Ozarks where the average length harvested during those same years was 39.4" (eye to fork). It was predicted that the 24-inch length limit implemented in 1990 would severely restrict harvest in this tailwater. This was apparently the case considering that during 2000 and 2001, creel surveys estimated harvests in the uppermost 7 miles of river of only 577 and 242 fish respectively. This fishery is currently managed under a daily and possession limit of two and four fish, respectively, with a 24-inch minimum size limit measured from the eye to the tail fork.

Although the lower Osage River may contain good numbers of paddlefish, chronic low dissolved oxygen releases, erratic flow patterns, and other negative impacts caused by the operation of Bagnell Dam may prevent this fishery from reaching its full potential unless conditions are improved.

Suitable habitat for spawning paddlefish exists in much of the lower Osage River in the form of clean-swept gravel bars. However, the river no longer exhibits a natural hydrology conducive to successful spawning. Instead, water level fluctuations due to peaking generation render much of this habitat unsuitable for spawning (Figure 2). Higher and more stable water levels during paddlefish spawning season would promote successful paddlefish reproduction.

Figure 2. Osage River Discharge – January 1st to June 30th in 1926 and 1996.



RIVERINE POPULATIONS

Substantial paddlefish populations occur only in the Mississippi, Missouri, and Osage rivers and the only sport fishery of significance is in the Osage River immediately below Bagnell Dam and in the lower 20 miles. Paddlefish occur in smaller tributary rivers (e.g., Marais des Cygnes, Marmaton, Black, Gasconade, Grand, Meramec, Lamine, and Moreau rivers) and some support limited fisheries, but we suspect that most of the paddlefish caught in these rivers are immature and originate from the big rivers.

Tagging programs should be assessed and utilized to learn more about the movement of paddlefish in these rivers. Potential locations to collect paddlefish could be in the Osage River below Bagnell

Dam or at concentration areas in selected small streams.

Paddlefish may spawn in the Missouri and Mississippi rivers but no spawning areas have been located in Missouri. Paddlefish fry have been collected in the Lamine River which suggests tributary streams may be important recruitment sites for the big rivers besides serving as feeding areas for small paddlefish (Brown 1989). Young of year paddlefish were collected in 2003 by trawling between river miles 13 and 225 on the Missouri River; greater numbers of fish were found below the Osage, Gasconade, Lamine and Moniteau River confluences (Grady, pers. comm.). It is suspected that paddlefish may spawn along rock wing dikes or in areas where flow is satisfactory for egg attachment and development.

Creel surveys should be used to measure the sport harvest at selected sites, and commercial harvest statistics should be utilized for monitoring the commercial harvest from the Mississippi River. Current regulations developed for reservoir fisheries should be evaluated for their application in managing riverine populations.

THREATS TO PADDLEFISH

Paddlefish are big-river inhabitants, and require precise flows, temperatures and substrate for reproduction. Water resource projects such as dredging, flow modification, and dam/ reservoir construction have altered most of the original paddlefish habitat in the United States (Sparrowe 1986). In Missouri, these same threats, along with illegal fishing for caviar production and pesticides have had negative impacts on paddlefish populations. Dam operations have also caused serious problems for paddlefish.

Dam Construction: Habitat destruction and river alteration due to dam construction are the most obvious changes that have affected abundance of paddlefish. The construction of dams on main stem streams (e.g., Bagnell Dam and Harry S Truman Dam on the Osage River) has had the most impact (Russell et. al. 1980). Dams eliminated ancestral spawning areas, interrupted natural spawning migrations, altered water flow regimes, dewatered streams, and eliminated backwaters that were important as nursery and feeding areas.

Hydropower-Impingement: In October of 2001, MDC became aware of a serious impingement problem that existed at Bagnell Dam. During routine generation, paddlefish ranging in size from 24" to 39"" (eye to fork) are being impinged on trash racks that span the openings of the intake structure to the eight main generator units. Between May 23rd and July 7th, 2002, an estimated 1,142 paddlefish were killed by impingement at Bagnell Dam (Table 3). Since neither design nor operation of Bagnell Dam have changed appreciably since construction in 1931, it is likely that this has been a chronic source of paddlefish mortality for the 70+ years that Bagnell Dam has been in existence. Lake stratification of Lake of the Ozarks allows the problem to subside temporarily as the thermocline typically develops well above the level of the turbine intakes, although some mortality during lake stratification has also been documented.

Table 3. Reported paddlefish kills in Missouri.

Date	Location	Cause	# Killed
9/8/1975	Osage River	Low D.O.	30
8/2/1978	Osage River	Low D.O.	Unknown
5/9/1980	HST Tailwater	Physical Injury	443
5/15/1980	HST Tailwater	Physical Injury	334
7/19/1981	HST Tailwater	Supersaturation, Physical Injury	3
7/29/1981	HST Tailwater	Low D.O.	24
8/17/1981	HST Tailwater	Unknown	Unknown
4/1983	HST Tailwater	Physical Injury	Unknown
5/1983	HST Tailwater	Physical Injury	Unknown
6/21/1983	HST Tailwater	Unknown	Unknown
6/4/1986	HST Tailwater	Low D.O.	Unknown
5/23/1988	HST Tailwater	Low D.O., Degreasing agent	9
9/8/1990	Osage River	Low D.O. from Dam	18
8/10/1992	HST Tailwater	Supersaturation, Physical Injury	Unknown
8/2/1993	HST Tailwater	Supersaturation, Physical Injury	150
4/14/1994	HST Tailwater	Supersaturation, Physical Injury	1728
7/3/2001	Lake of the Ozarks	Truman Dam operation (suspected)	6
10/24/2001	Lake of the Ozarks	Dam Impingement	59
9/16/2002	Lake of the Ozarks	Dam Impingement	52
10/2/2002	Lake of the Ozarks	Dam Impingement	4
May-Jul 2002	Lake of the Ozarks/Osage River	Bagnell Dam Operation	4333
5/24/2002	Lake of the Ozarks	Truman Dam Operation	78
6/14/2002	Lake Springfield	Temperature (Power Plant cooling)	67
4/16/2003	Lake of the Ozarks	Dam Impingement	83
4/24/2003	Lake of the Ozarks	Dam Impingement	5
6/20/2003	Lake of the Ozarks	Dam Impingement	17
7/2003	Lake of the Ozarks	Dam Impingement	7

Hydropower-Entrainment

Paddlefish kills have been documented in association with spillway and turbine entrainment below both Bagnell and Harry S Truman Dams. Recently, an estimated 3,191 paddlefish were killed by entrainment at both the spillways and turbines at Bagnell Dam between May 23rd and July 7th, 2002 (Table 3).

Between April 20th and April 28th, 1994, an estimated 1,413 paddlefish were killed in the Harry S Truman Dam tailwater. It appeared that these fish were injured as they swam from the relatively calm water in front of the turbines into the high velocity water coming through the spillways.

Modification of dam operations by the Corps of Engineers since that time has helped to reduce downstream paddlefish mortality.

Hydropower -Water Quality/Dissolved Oxygen and Supersaturation

Several water quality issues that negatively impact paddlefish have been documented in association with dam operation.

Gas supersaturation is a problem that develops when atmospheric gases are driven into solution under pressure, resulting in water that contains more dissolved gas than normal. For example, spillway releases from Harry S Truman Dam that are 25,000 cubic feet per second or greater have produced gas saturation levels between 107% and 118% in the tailwater. Fish that enter this supersaturated water can develop a condition known as gas bubble disease. Symptoms of this condition are visible bubbles in the skin, fins, and exophthalmia (popeye disease). The condition can be fatal. Supersaturation has long been a problem associated with spillway releases at Harry S Truman Dam and more recently with operation of the upgraded turbines at Bagnell Dam.

Low dissolved oxygen in tailwaters below dams is a common problem, particularly during summer months when the upstream reservoir is stratified. For example, the turbine intakes at Bagnell Dam draw from the hypolimnetic zone during stratification. As a result, water entering the tailwater contains little to no dissolved oxygen. Under low flow situations, venting of turbines can dramatically improve dissolved oxygen in tailwaters. However, as volume of water released increases, effectiveness of venting declines.

Asiatic Carp: Although not much is known about the impacts of Asiatic carp on native paddlefish populations, we do know that the potential for harm exists. Certain species of Asiatic carp rely on the same food source as paddlefish.

Illegal Harvest: Since the 1980's, the demand for paddlefish eggs for caviar has resulted in significant illegal harvest of paddlefish populations including Lake of the Ozarks, Table Rock Lake and Harry S Truman Lake. Caviar made from paddlefish eggs is a suitable substitute for sturgeon caviar and the retail price is about $200 per pound. A 60-pound female paddlefish may carry 8 pounds or more of eggs and be valued at $250 to $700 to a poacher. Under ideal conditions, a poacher can catch enough paddlefish in one night's work to gross $5,000 to $15,000. In most cases, large numbers of male paddlefish were also killed because the poachers sexed the fish by cutting them open. All of the carcasses were then discarded.

Although several arrests have been made since 1986 for illegal capture of paddlefish and the resultant sale of their eggs, this problem will likely continue due to the large amount of money involved. Continued enforcement will be required to control this illegal activity. Illegal paddlefish harvest could easily exceed annual legal sport harvest.

Pesticide/Contaminant Levels: A problem that faced paddlefish management in Missouri during the early 1990's was high levels of chlordane in fish flesh from certain waters. On April 30, 1990, the Missouri Department of Health issued a "recommend no consumption" advisory on paddlefish and paddlefish eggs from Lake of the Ozarks and Table Rock Lake. More than one-half of the paddlefish tissue samples collected from these two lakes had chlordane levels that exceeded FDA's action level of 300 parts per billion (ppb). Chlordane was banned in 1988, when it was suspected to be a carcinogen linked to liver, immune and nervous system damage. While there was no immediate health risk from eating chlordane-contaminated fish, there were potential long-term risks. Once banned, the presence of chlordane in paddlefish flesh diminished rapidly until

paddlefish were deemed "safe to eat" by the Missouri Department of Health in 1995. MDC will continue to work with the Missouri Department of Health and collect paddlefish tissues for contaminant testing.

GOAL STATEMENT

The goal of the paddlefish management program in Missouri is to manage paddlefish statewide as a trophy sport fishery where the average weight of harvested paddlefish is 30 pounds or more and at least 20% of harvested paddlefish weigh 50 pounds or more. Achievement of this goal will require coordinated effort of all involved state and federal agencies and utility companies to protect important habitats, maintain populations and fisheries, modify dams and/or dam operations, increase public awareness and appreciation for paddlefish, and enforce regulations for this valuable resource.

OBJECTIVE I. **Manage paddlefish populations in Table Rock Lake, Lake of the Ozarks and Harry S Truman Lake to provide average annual harvests of 3,000 fish until impingement and entrainment issues at dams have been addressed. Harvest goals will be reevaluated and adjusted at that time. Manage paddlefish populations in the Lower Osage River to provide annual harvests of 500 fish until impingement and entrainment issues and minimum flow regimes that allow for consistent paddlefish spawning success have been established below Bagnell Dam. Harvest goals will be reevaluated and adjusted at the time.**

Strategy A. Monitor the harvest in Table Rock Lake, Lake of the Ozarks, Harry S Truman Lake and the Lower Osage River with creel surveys. A minimum creel schedule of two years on and two years off will be followed at each location. If funding is available or additional creel information is needed additional surveys will be added.

Task 1. Determine year-class composition of the paddlefish harvest by collecting and aging dentary bones every four years and checking all paddlefish creeled for coded wire tags in conjunction with creel surveys.

Task 2. Provide paddlefish for MDC contaminant testing and the Federal National Wildfish Health Survey testing as necessary and in conjunction with creel surveys.

Task 3. Determine reproductive success of paddlefish in the Marais des Cygnes and Lower Osage rivers by trawling for juvenile fish during years when flows are appropriate. Coordination with operations at Bagnell Dam will be necessary to achieve successful spawning and adequate monitoring on the Lower Osage River.

Strategy B. Continue stocking paddlefish fingerlings and monitor survival and growth.

Task 1. Stock Table Rock Lake with 3,000 paddlefish fingerlings annually and a pulse stocking up to 6,000 fish every three years. Stock Lake of the Ozarks and Harry S Truman Lake with 15,000 paddlefish fingerlings each

annually and a pulse stocking up to 30,000 fish every three years. Stock the Black River with 750 paddlefish fingerlings annually.

Task 2. Assess and refine a marking and tagging program to monitor survival/growth of year classes and paddlefish movement through dams.

Task 3. Evaluate tag retention rates for binary coded wire tags as part of a monitoring and evaluation study beginning in the fall of 2003.

Strategy C. Review and/or modify existing paddlefish regulations as needed to ensure desired population structure and harvest.

Task 1. Evaluate harvest and exploitation rates in relation to management objectives for Table Rock Lake, Lake of the Ozarks, Harry S Truman Lake and the Lower Osage River.

Strategy D. Determine and minimize impacts to paddlefish populations from hydropower and dam operations.

Task 1. Provide safe downstream fish passage for paddlefish and other fish.

Task 2. Reduce mortalities related to dam operations at Bagnell and Harry S Truman dams.

Task 3. Improve water quality, oxygen levels, below all dams – Bagnell, Truman and Lake Springfield.

Task 4. Improve discharge hydrographs to benefit fish spawning and nursery habitats below all dams.

Task 5. Request the Federal Energy Regulatory Commission order Ameren UE to monitor and report all entrainment, impingement, gas supersaturation, and any other types of fish kills to MDC as soon as they occur.

OBJECTIVE II. Manage paddlefish populations in the Missouri and Mississippi rivers and their major tributaries to achieve optimum sport harvest levels to sustain healthy populations.

Strategy A. Assess the status of paddlefish in the Missouri and Mississippi rivers and their major tributaries.

Task 1. Develop standardized sampling methods and sample periods.

Task 2. Assess marking and tagging program and determine movement and exploitation rates.

Task 3. Locate major spawning areas in Missouri's rivers through tracking of adult paddlefish and habitat mapping.

Task 4. Determine reproductive success of paddlefish in Missouri’s rivers by trawling for juvenile fish.

Strategy B. Determine whether present commercial fishing regulations are effective for managing riverine paddlefish.

Task 1. Monitor commercial harvest of paddlefish flesh and roe annually in the Mississippi River. Tag adult paddlefish prior to commercial harvest season. Collect paddlefish rostrums from commercial fishers to recover coded wire tags.

Task 2. Determine size and age structure of commercially harvested paddlefish at 4-year intervals.

Task 3. Work with the Mississippi Interstate Cooperative Resource Association (MICRA) and border States to share paddlefish data and monitor commercial harvest. Work toward standardized regulations with border States.

Strategy C. Determine whether present sport fishing regulations are effective for managing riverine paddlefish.

Task 1. Use standardized creel surveys to monitor sport harvest at selected sites on Missouri and Mississippi rivers at 4-year intervals. Tag adult paddlefish prior to sport harvest season. Collect paddlefish rostrums to recover coded wire tags.

Task 2. Determine year class composition of paddlefish harvested by sport methods in Missouri and Mississippi rivers by collecting and aging dentary bones at 4-year intervals.

Strategy D. Determine contaminant levels in riverine paddlefish populations every 4 years.

Task 1. Provide paddlefish for MDC contaminant testing and the Federal National Wildfish Health Survey as necessary and in conjunction with creel surveys.

OBJECTIVE III. Minimize illegal harvest of paddlefish by sporting and commercial methods.

Strategy A. Ensure angler compliance with paddlefish regulations.

Task 1. Meet as needed with MDC Protection division and Fish and Wildlife Service Agents to discuss the status of illegal activities and enforcement efforts.

Task 2. Work closely with Outreach and Education and Protection divisions to prepare news releases prior to the snagging season to inform the public about paddlefish regulations and their importance.

Strategy B. Deter illegal harvest of paddlefish.

Task 1. Assist Protection Division in selecting sites for group patrols to deter paddlefish poaching, especially during the spawning season.

Strategy C. Work with Missouri private aquaculture industry to enhance paddlefish ranching as a viable tool for providing a reliable source of caviar.

Task 1. Ensure that paddlefish stocked by private sources are regulated via the current regulations in the Wildlife Code to insure no negative impacts occur to native species

Task 2. Develop a genetic marker to identify MDC hatchery-produced paddlefish.

OBJECTIVE IV. Increase the levels of awareness and appreciation of paddlefish so that 20% of all Missouri citizens appreciate and have increased knowledge about paddlefish.

Strategy A. Develop/improve informational programs for use at fairs and other events and MDC offices and nature centers.

Task 1. Utilize the two existing videos "The Paddlefish: An American Treasure" and "The Paddlefish: A Missouri Treasure" at appropriate meetings to educate the public on paddlefish life history, threats to the species, propagation/management and fishing techniques.

Task 2. Prepare a pamphlet/website information describing life history, statewide distribution, management, regulations, threats to paddlefish, fishing methods, proper cleaning methods and recipes for preparing fish for the table.

Task 3. Prepare articles annually and/or use other media sources to promote paddlefish as a trophy sport fish and discuss key regulation changes or environmental problems associated with the species.

Strategy B. Survey Missouri citizens to measure baseline levels of awareness and appreciation and to evaluate success.