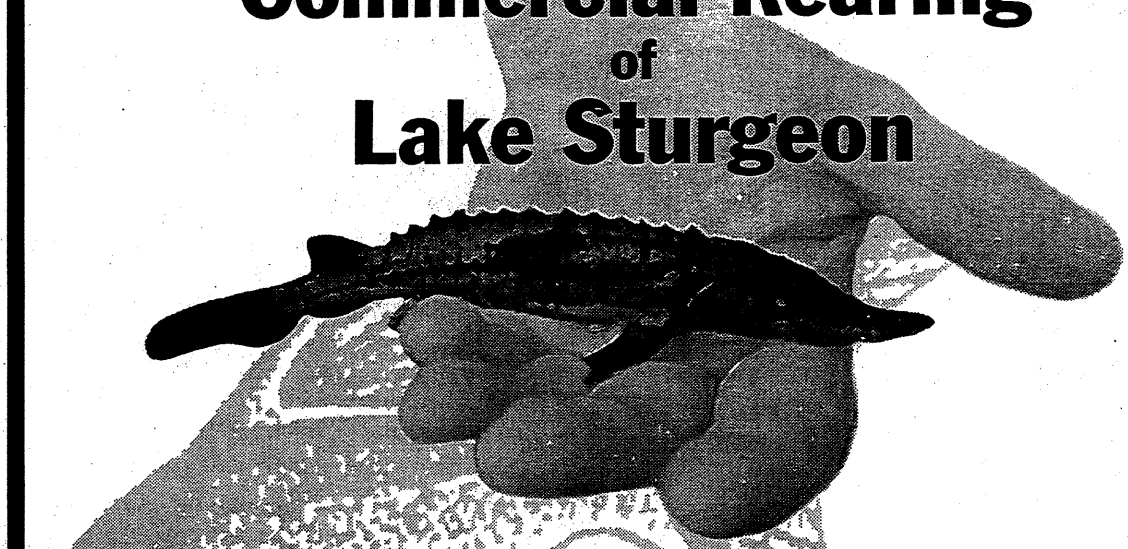
Regulatory Options for the Commercial Rearing of Lake Sturgeon



Report to the Legislature
December 2000

Departments of Agriculture, Trade & Consumer Protection and Natural Resources

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Although five options are listed for the State Legislature to consider, The Regulatory Options for the Commercial Rearing of Lake Sturgeon reveals two distinct philosophies toward the rearing of lake sturgeon by private aquaculture in Wisconsin. The first is primarily supported by the Wisconsin Aquaculture Association (WAA) and intends to end the prohibition on lake sturgeon rearing by private aquaculture. The other is supported by the Department of Natural Resources (DNR) and the Sturgeon Management Assessment Team (SMAT) and advocates keeping the current prohibition in place, but involves private aquaculture in the propagation of the species for research and rehabilitation purposes only.

The WAA believes lake sturgeon are a marketable and potentially lucrative fish that could and should be reared by private aquaculture in Wisconsin. The caviar and flesh demand for varieties of sturgeon, plus the market for live fish, is growing in North America due to Eastern European and Russian overharvest and decimation of the species. Many years have passed since the State Legislature prohibited the commercial marketing and sale of lake sturgeon in Wisconsin, and since that time, aquaculture techniques have developed and advanced making aquaculture feasible and rational. Also, of the other states and provinces surveyed in 1998, 9 of the 15 currently allow the legal sale and distribution by private commercial operations of lake sturgeon flesh and caviar. Finally, since tribes are allowed to rear lake sturgeon for monetary gain, the aquaculture industry does not think it should be excluded from this arrangement.

The Department of Natural Resources and the Sturgeon Management Assessment Team believe, and the lake sturgeon aquaculture research conducted over the last 20 years in Wisconsin illustrates, lake sturgeon as a species does not lend itself very well to aquaculture production due to a slow growth rate and very late sexual maturation. The DNR and the Sturgeon Management Assessment Team are opposed to any private aquaculture rearing of lake sturgeon that has an ultimate goal of selling flesh, caviar, or live fish for the aquarium trade, but are in favor of allowing private aquaculture operations to rear lake sturgeon through the Wisconsin Lake Sturgeon Aquaculture Agreement (WLSAA).

As part of Wisconsin's Lake Sturgeon Management Plan, the WLSAA would establish a committee, including private aquaculture, to review the criteria used for stocking, transfers, and genetics, and would allow private commercial operations to rear lake sturgeon for research and rehabilitation, but not for caviar, flesh or aquarium sales. By not allowing commercialization of lake sturgeon, the largest and healthiest population of lake sturgeon in North America should be protected from potential pirating of fish for sale on the "black market" or genetic pollution by imported lake sturgeon for commercial purposes. When first proposed, legalizing lake sturgeon commercialization for private aquaculture attracted public opposition, and will almost certainly again. Sturgeon for Tomorrow and the Wisconsin Wildlife Federation also support WLSAA proposal.

The Department of Agriculture, Trade and Consumer Protection (DATCP) advocates a proposal allowing implementation of the recommendations by SMAT while providing the opportunity for a limited number of private commercial operations to participate in a pilot project which would allow for lake sturgeon to be raised for commercial purposes with oversight from DATCP, DNR and SMAT. A pilot project assessing lake sturgeon market potential while assisting with research and rehabilitation of the species would require many years to complete, but could thoroughly assess the value to Wisconsin's aquaculture industry and the true impact of lake sturgeon aquaculture on wildstocks.

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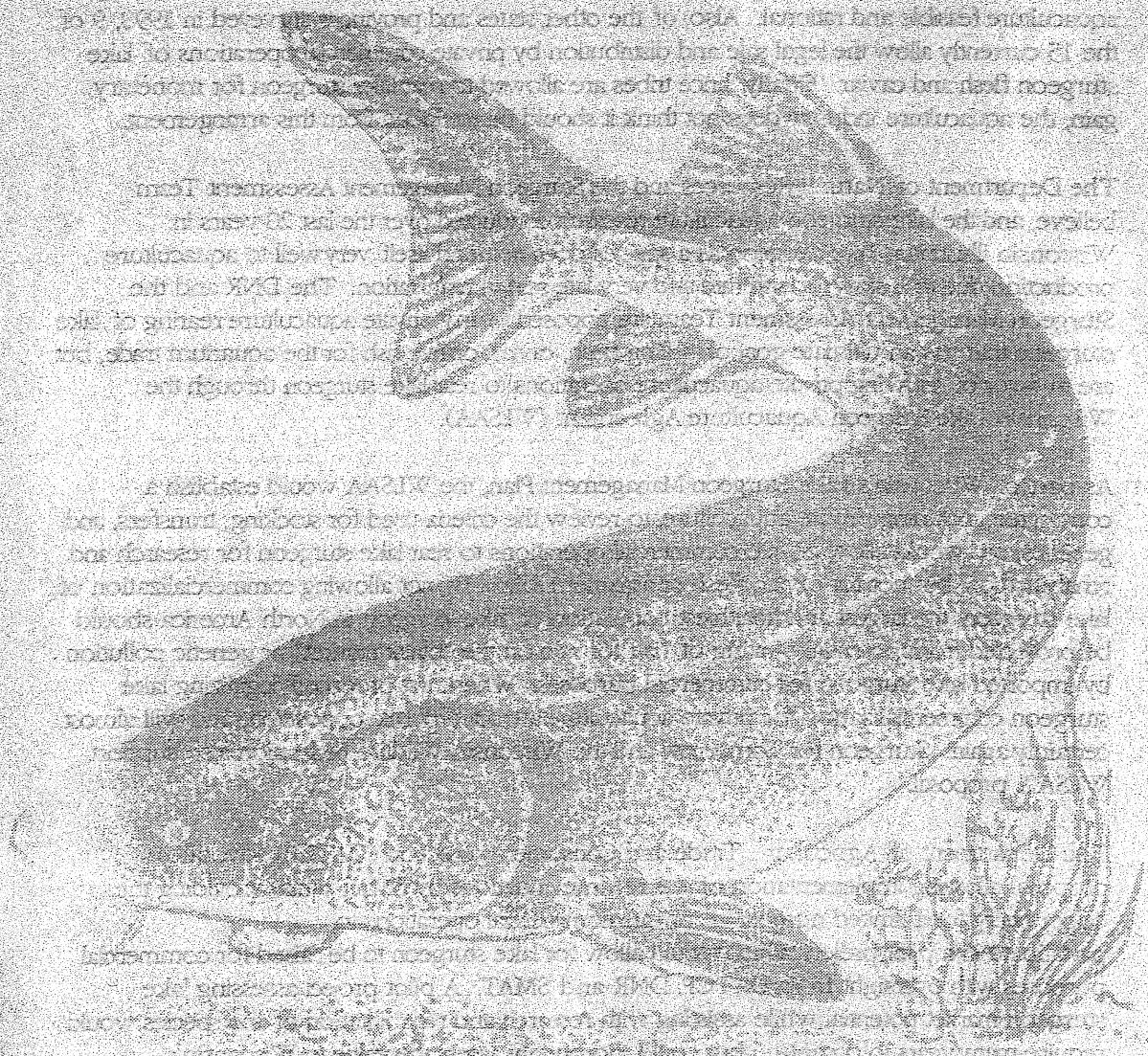
The Regulatory Options for the Commercial Rearing of Lake Sturgeon is a compilation of information on lake sturgeon biology, current regulations and enforcement, aquaculture potential, disease and health related issues, and public sentiment, plus positive and negative characteristic for each option. Contacts are listed in the rear of the report if questions or concerns arise.



In Wisconsin, the lake sturgeon is an important cultural and recreational fish that was once used for economic gain. Native American peoples throughout the Great Lakes and upper Mississippi River basins revered the fish as an important food source as well as a spiritual icon. European settlers used the fish for its flesh, caviar and swim bladders, which produced "isinglass," an important early additive for a variety of products including wine and paint. Lake sturgeon stocks were nearly wiped out throughout their range due to overharvest, commercial fishing, the building of dams on spawning streams and pollution.

Wisconsin began pro-active management of its lake sturgeon populations in 1903 with the passage of the first lake sturgeon harvest regulations, which prohibited the harvest of a fish less than 8 pounds. Since 1903, dozens of regulations, including the prohibition on commercial rearing of lake sturgeon, the ban on the sale of live sturgeon and the barring of lake sturgeon flesh or caviar sales, have been enacted to manage the harvest and protect wild lake sturgeon stocks. Wisconsin is currently home to the largest and healthiest lake sturgeon population remaining in North America. Recreational interests in Wisconsin include a hook and line fishing season as well as a spearing season. Wisconsin's lake sturgeon management program is considered a world model for its management techniques and progressive protection of wild lake sturgeon stocks.

In the mid-1990's, private aquaculture in Wisconsin expressed an interest in re-establishing the commercialization of lake sturgeon to meet a growing demand for the caviar and meat produced by the fish. The demand for sturgeon, especially in Eastern Europe, has decimated wild sturgeon stocks to the point of extinction throughout much of the world. The Wisconsin Legislature considered removing the rearing prohibition on lake sturgeon in 1997 as part of the biennial budget bill. In response, recreational lake sturgeon fishers and spearers voiced opposition to the proposal and subsequently the Legislature amended the language to the following:

95.60(6)(c) of the Wisconsin State Statutes

> (c) the Department of Agriculture, Trade and Consumer Protection, in consultation with the Department of Natural Resources, shall study regulatory options that would enable commercial rearing of lake sturgeon while protecting the wild lake sturgeon population. The Department of Agriculture, Trade and Consumer Protection shall submit the results to the Legislature under s. 13.172 (2) no later than December 31, 2000.

Pursuant to this statute, the Wisconsin Department of Agriculture, Trade and Consumer Protection and the Wisconsin Department of Natural Resources conducted a review of the scientific literature, contacted experts on sturgeon biology and consulted with aquaculture authorities to compile a broad base of knowledge on lake sturgeon. The Departments invited the public to participate in the information gathering process and solicited comments on the draft report of Regulatory Options for the Commercial Rearing of Lake Sturgeon. Interests considered during the process were private commercial operations (aquaculture industry), sturgeon recreational interests, the US Fish and Wildlife Service (USFWS), Tribal interests, DNR sturgeon management program, DNR law enforcement experts, University of Wisconsin—System sturgeon research Introduction experts, health and disease experts, and marketing consultants.

DATCP gathered input at a public workshop in January of 2000 to review and discuss issues and concerns related to the commercialization of lake sturgeon in Wisconsin. Over 30 participants, representing various issues and viewpoints relating to the commercial rearing of lake sturgeon in Wisconsin, attended the meeting. The open discussion engaged many issues related to the public and private rearing of lake sturgeon, including genetics, disease, economics, and regulation. All meeting participants and any other interested parties received the report's participant comments, outline, timeframe and draft.

From the public involvement process, five options have emerged that merit consideration by the State Legislature:

Status quo – continue the prohibition on the sale of live lake sturgeon and lake sturgeon flesh and caviar.

Implement the Wisconsin Lake Sturgeon Aquaculture Agreement, which would establish standard technical criteria for public and private lake sturgeon rearing operations for rehabilitation and stocking purposes only (recommended by the Sturgeon Management Assessment Team in the Wisconsin Lake Sturgeon Management Plan).

Create a statutorily defined Lake Sturgeon Commercial Management Board to develop the conditions of operation and oversee all commercial lake sturgeon operations in Wisconsin (conceived and recommended by the aquaculture industry).

Develop a pilot program, the Wisconsin Lake Sturgeon Commercialization Pilot Project, to work in conjunction with the directives and goals of the Wisconsin Lake Sturgeon Management Plan, but allow a limited number of private commercial operations to research and explore the potential commercial markets available from rearing lake sturgeon while assisting with the propagation of the species for rehabilitation and stocking purposes (conceived and recommended by DATCP).

Full legalization of the harvest purchase, sale, trade, barter, possession, control and transportation of lake sturgeon by private commercial aquaculture operations in Wisconsin.

The following sections provide a summary of background information on lake sturgeon biology, current regulations and enforcement, aquaculture potential, disease and health related issues, and public sentiment, plus the pros and cons for each listed option.

The value of lake sturgeon in Wisconsin is linked to recreational fishing and spearing, traditional Tribal use, and as an aesthetic resource, which is viewable in its natural habitat during the spring spawning period. The potential value from the commercial rearing of lake sturgeon has yet to be determined, but Wisconsin currently has an established and successful aquaculture industry to use as a model and resource when necessary.

Wisconsin has the most significant remaining lake sturgeon population in North America, and numerous viable fisheries continue to exist through rigidly regulated harvest management regulations and programs. A fall hook and line fishery produces an average annual harvest of 300 fish statewide, while a winter spear fishery on Lake Winnebago produces an average annual harvest of 1400 sturgeon. Thousands of individuals from Wisconsin and over 35 other states participate each year in one or both of the current fisheries.

Tribal interest and use of lake sturgeon in Wisconsin is increasing through efforts such as the Menominee Reservation Lake Sturgeon Recovery Plan. This plan, developed and implemented jointly by the Tribe, DNR, the USFWS and the general public, has begun the long term process of restoring lake sturgeon to Reservation waters for the ultimate benefit of all Tribal members.

Individuals from numerous states also participate annually in the sturgeon watch that occurs during the spring spawning period. Thousands of people travel to rivers such as the Wolf in east central Wisconsin each year in late April to see the spawning ritual of the giant fish as they concentrate along the riverbanks and in rapids to lay their eggs.

While the sale of lake sturgeon is currently prohibited, the fish does hold unexplored potential for aquaculture interests in Wisconsin. Lake sturgeon sales were permitted until the beginning of the 20th Century, but laws were enacted to protect the resource from potential extinction in Wisconsin waters. Therefore, Wisconsin's private aquaculture industry is interested in rearing lake sturgeon to supplement the demand being created around the world.

Sturgeon populations in other parts of the world are in decline from overharvest and poaching for their valuable caviar. Wisconsin lake sturgeon conservation interests believe creating a lake sturgeon aquaculture industry in Wisconsin would result in the same declining lake sturgeon populations as those experienced in other parts of the world. The aquaculture industry feels developments with technology and management practices, and the use of lake sturgeon tagging, will prevent such a situation in Wisconsin.

6 Regulatory Options for Commercialization

Under 95.60 of the Wisconsin State Statutes, the Wisconsin Department of Agriculture, Trade and Consumer Protection was assigned the task of researching, organizing and distributing the State Legislature's report on Regulatory Options for the Commercial Rearing of Lake Sturgeon. DATCP, in cooperation with DNR, consulted other interested parties on various issues to provide a comprehensive publication evaluating the necessary aspects of viability for commercial rearing of lake sturgeon by private commercial operations in Wisconsin. Numerous sources submitted information and opinions to DATCP for consideration in the report. Once the gathering of data was complete and the report was sufficiently organized, DATCP released the draft to the public for comment. The following five options were developed from the input gathered through the public involvement process:

Continue the status quo

The Wisconsin State Legislature could decide not to change the current regulations and leave the current laws in place. Current law states: 95.60(6)(a) of the Wisconsin State Statutes — No person, except the Department of Natural Resources, may rear lake sturgeon in a fish farm.

Pros

Continues DNR's successful management practices and protection of wild lake sturgeon resources;

Affords full protection of wild lake sturgeon stocks;

Provides continued and effective enforcement;

Continues rehabilitation of wild sturgeon populations under DNR's current management program.

Cons

Limits DNR's ability to contract with private aquaculture to supplement lake sturgeon rehabilitation efforts;

Prohibits exploration of potential markets by private aquaculture;

Prohibits involvement by private aquaculture in the propagation of the lake sturgeon species;

Limits involvement from private aquaculture experts;

Fails to consider advancements in technology and aquaculture management practices.

WI Lake Sturgeon Aquaculture Agreement (WLSAA)

Developed by the Sturgeon Management Assessment Team, the Wisconsin Lake Sturgeon Aquaculture Agreement would establish a cooperative partnership agreement between the Department of Natural Resources, the United States Fish and Wildlife Service (USFWS), the Department of Agriculture, Trade and Consumer Protection, other governmental agencies, academia, Native American tribes, special interest groups and the private commercial aquaculture industry. The agreement would establish a technical committee to review the criteria used for stocking, transfers, and genetics. In addition, all stocking and reintroduction proposals would be reviewed by the SMAT. The Agreement would allow lake sturgeon species propagation by private commercial operations for research and rehabilitation purposes, but not for caviar, flesh or aquarium sales.

Pros

Promotes a cooperative effort with private aquaculture in the propagation of lake sturgeon in Wisconsin;

Develops a comprehensive, statewide lake sturgeon management plan;

Provides clear goals and objectives outlined in Wisconsin's Lake Sturgeon Management Plan and incorporates a role for private aquaculture.

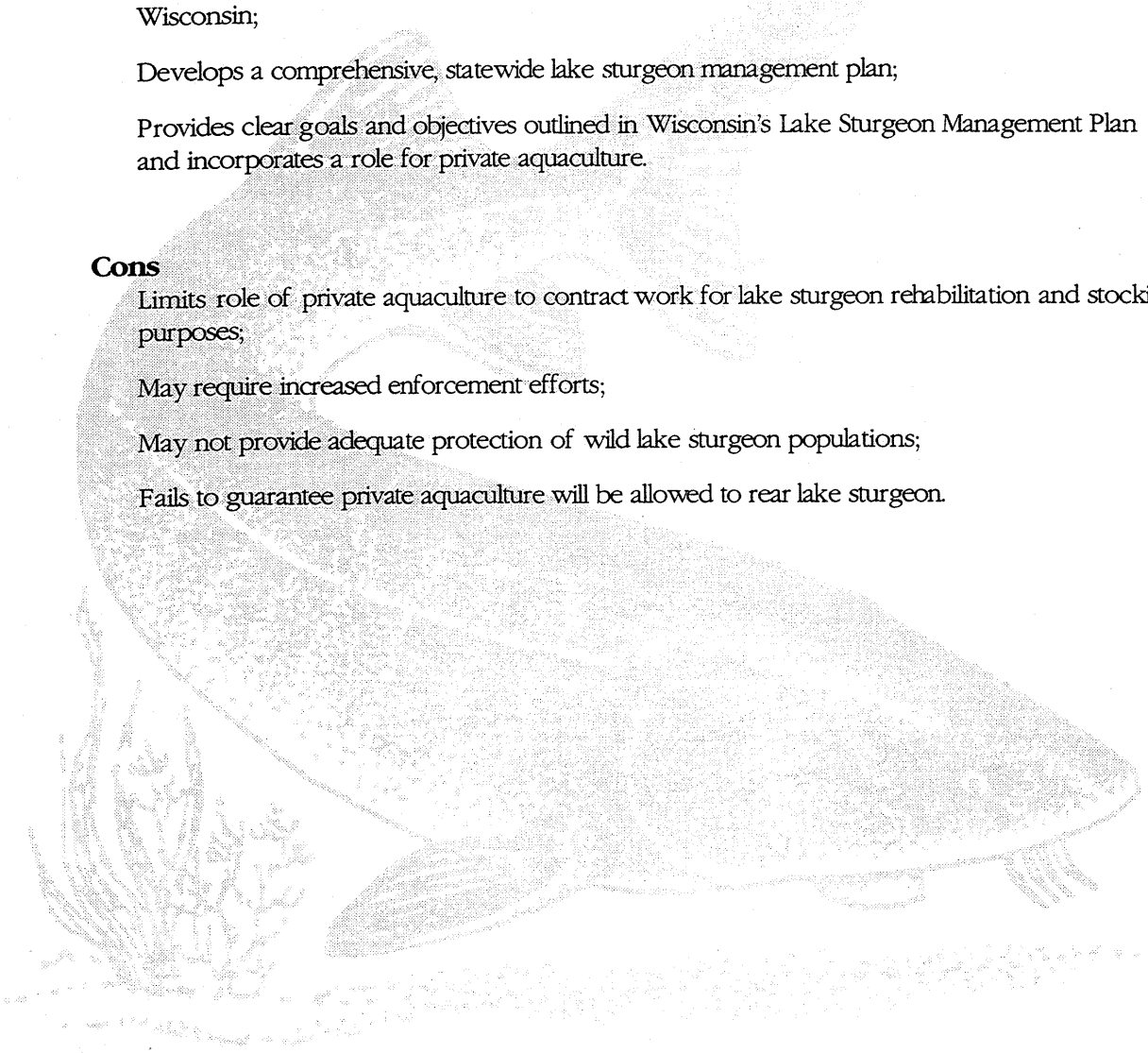
Cons

Limits role of private aquaculture to contract work for lake sturgeon rehabilitation and stocking purposes;

May require increased enforcement efforts;

May not provide adequate protection of wild lake sturgeon populations;

Fails to guarantee private aquaculture will be allowed to rear lake sturgeon.



Lake Sturgeon Commercial Management Board

The Wisconsin Aquaculture Association is recommending the organization and establishment of a Lake Sturgeon Commercial Management Board, which, by statutory authority, will determine the conditions of operation for public and private commercial lake sturgeon operations in Wisconsin, including public hatcheries. Membership of the Board would consist of representatives from various interest groups and government agencies. The Board would also be permanent and have authority determined by the State Legislature. Finally, the Lake Sturgeon Commercial Management Board would convene on a regular basis to evaluate and manage issues related to lake sturgeon.

Pros

Promotes a cooperative effort to address the common issue of lake sturgeon propagation in Wisconsin;

Provides an alternative approach to current lake sturgeon program management;

Includes extensive involvement by private aquaculture.

Cons

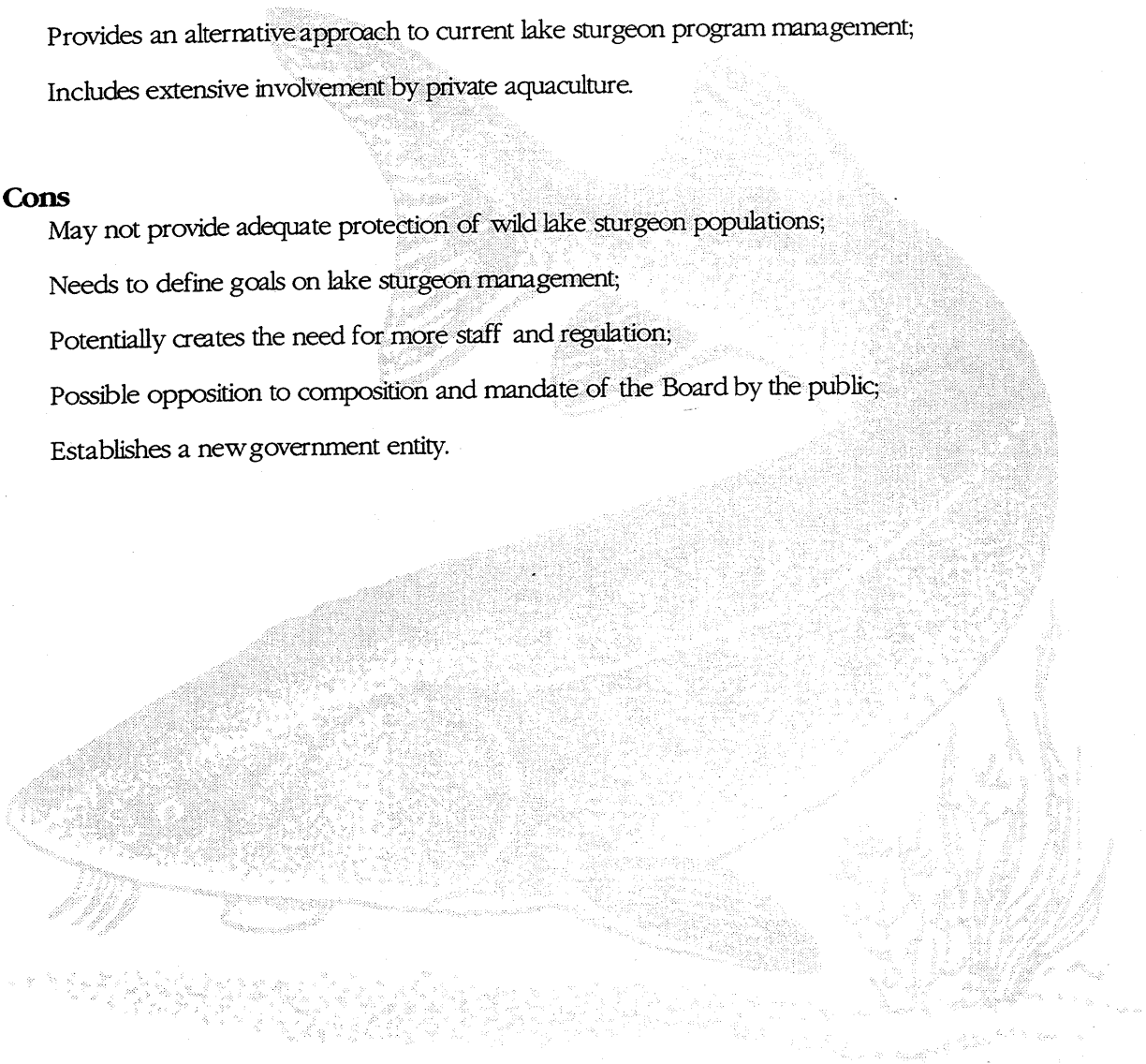
May not provide adequate protection of wild lake sturgeon populations;

Needs to define goals on lake sturgeon management;

Potentially creates the need for more staff and regulation;

Possible opposition to composition and mandate of the Board by the public;

Establishes a new government entity.



The WI Lake Sturgeon Commercialization Pilot Project

Conceived through DATCP as an effective alternative between the Wisconsin Lake Sturgeon Management Plan and the Lake Sturgeon Commercial Management Board, the Wisconsin Lake Sturgeon Commercialization Pilot Project would utilize the goals, objectives and management recommendations of the Wisconsin Lake Sturgeon Management Plan, but would complement WLSAA by allowing private aquaculture the opportunity to explore and evaluate the marketing potential of lake sturgeon while assisting with research and rehabilitation. The Pilot Project would allow a specified number of private commercial operations in Wisconsin to participate with the Sturgeon Management Assessment Team in the implementation of identified actions from the Wisconsin Lake Sturgeon Management Plan. All participants in the Pilot Project would be subject to protocol designed to ensure the safeguard of lake sturgeon health and to protect native lake sturgeon populations. Private commercial operations would assist with the statewide propagation of lake sturgeon through research and rehabilitation of the species. Under the Project, SMAT would use the private commercial operator in the same manner public and tribal hatcheries are used, except a predetermined number of lake sturgeon may be sold at the operator's discretion. SMAT and the participating private commercial operations would be required to regularly report progress with the project.

Pros

Promotes a cooperative effort to address significant issue of lake sturgeon propagation in Wisconsin;

Provides an opportunity for a limited number of private commercial operators to evaluate the marketing potential of lake sturgeon;

Maintains the integrity of the SMAT proposal and private aquaculture is involved in the rearing of the species;

Offers an opportunity to explore lake sturgeon marketing potential while minimizing the impact on wild stocks.

Provides market-based incentives for private aquaculture to invest sufficient resources for rearing while still operating under extensive oversight and control.

Cons

Raising lake sturgeon for the sale of flesh and caviar is a long term goal which may require 20 years;

May not provide adequate protection of wild lake sturgeon populations;

May increase the risk of illegal sale or laundering of wild sturgeon stocks through open markets for caviar, flesh and live fish.

Would require increased enforcement efforts.

Full Legalization of Commercial Activities

Previously considered by the State Legislature, the repeal of 95.60 (6)(a) of the Wisconsin Statutes would permit private aquaculture in Wisconsin the opportunity to rear lake sturgeon for sale with minimal government interference. Such a change would allow legal harvest, purchase, sale, barter, trade, possession, control and transportation of lake sturgeon by any farm registered with DATCP.

Pros

Lake sturgeon propagation for commercial purposes would be available to private aquaculture;

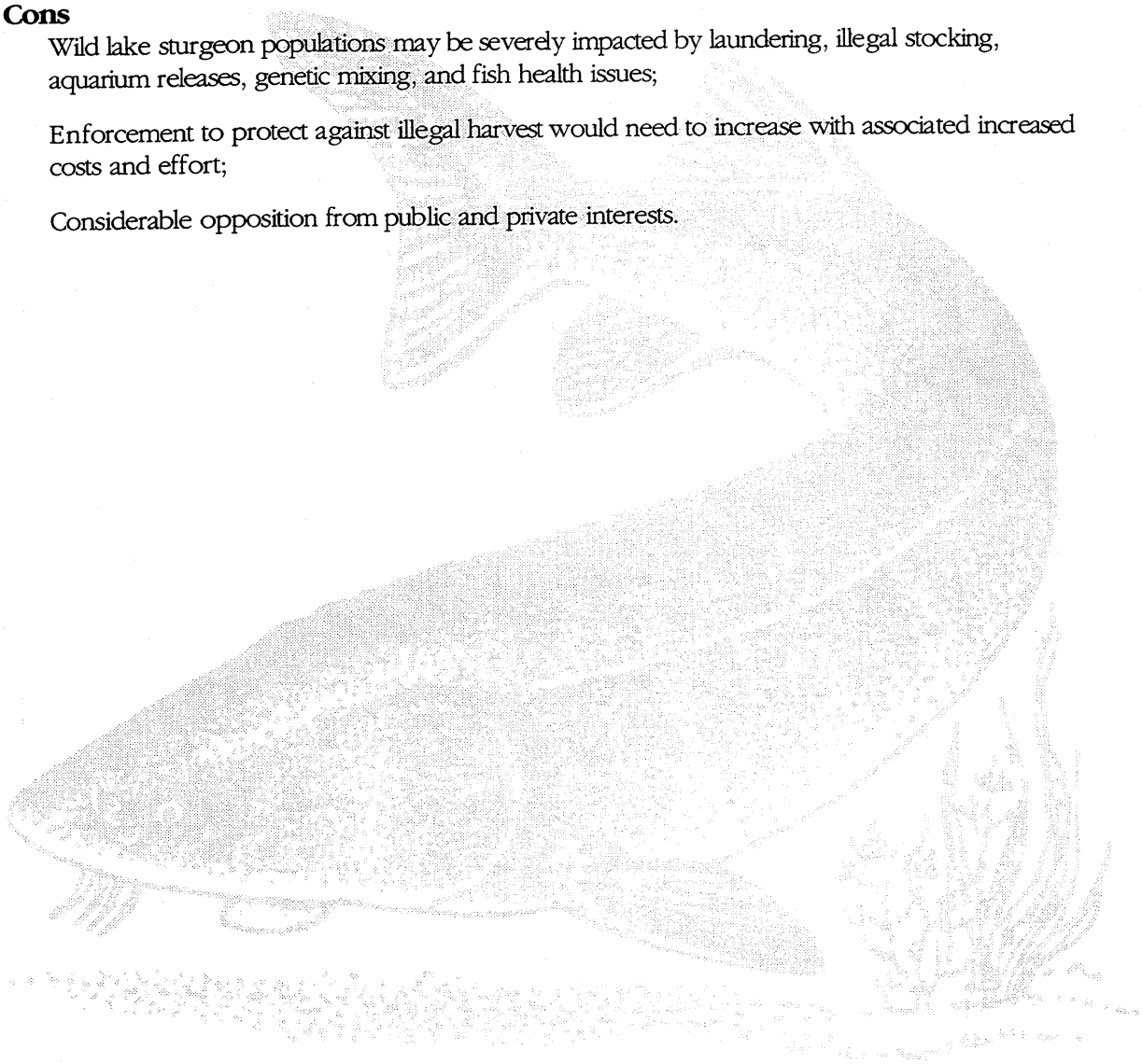
DATCP and DNR regulatory authority remains status quo.

Cons

Wild lake sturgeon populations may be severely impacted by laundering, illegal stocking, aquarium releases, genetic mixing, and fish health issues;

Enforcement to protect against illegal harvest would need to increase with associated increased costs and effort;

Considerable opposition from public and private interests.



Historical Background

Sturgeon stocks have experienced a worldwide decline not only because of the impact of human activities on sturgeon habitat, but because of the high value of the fish flesh and caviar produced from their eggs. Commercial and sport fishing pressure combined with environmental pressure from dam construction and the development of adjacent watersheds are major factors contributing to stock decline.

Historically, sturgeon products have been considered valuable in Europe, Asia, and North America. Before 1900, the United States sturgeon landings were estimated to be 15 million pounds on the East Coast and 10 million pounds on the West Coast. Out of concern for wild sturgeon stocks, most U.S. commercial sturgeon fisheries were closed by the mid 1990's. Today, the U.S. commercial sturgeon fishery is small and consists primarily of white and Atlantic sturgeon.

The international demand for sturgeon, both for its flesh and for its caviar, has always placed pressure on the world's sturgeon fisheries. The decline in sturgeon stocks was recognized in Russia and the United States in the second half of the 1800's, and the first recorded attempts at artificial propagation of sturgeon were by Ovsyanikov in Russia (1870) and by Green in the United States (1875). Programs to artificially propagate sturgeon were established in North America, and significant efforts were made between 1875 and 1912 to develop hatchery technology for Atlantic and lake sturgeon. A few efforts were made after 1912, but by 1920 serious interest in artificial propagation of lake sturgeon in North America was abandoned.

Sturgeon hatchery research continued in the Soviet Union, however, and was accelerated during the 1950's as part of mitigation programs to compensate for habitat alterations. Technical obstacles to artificial propagation were overcome. (Excerpt from the Hatchery manual for White Sturgeon with application to other North American Acipenseridae by Fred Conte, Serge Doroshov, and Paul Lutes. 1988. University of California, Division of Agriculture and Natural Resources). In the United States today, sturgeon ranching or farming occurs primarily in California and Idaho where the fast growing white sturgeon from the Pacific Ocean are used.

Lake Sturgeon Aquaculture in Wisconsin—1975 to the Present

Efforts to propagate lake sturgeon in Wisconsin were initiated in the late 1970's by Binkowski and Czeskleba (Binkowski and Czeskleba 1980, Czeskleba et. al. 1985), partially supported by funds from Sturgeon for Tomorrow. Sturgeon for Tomorrow, a private conservation group from the Lake Winnebago region, was founded in 1977 to promote wise use of Wisconsin's lake sturgeon resources and support research to develop techniques for artificial propagation of sturgeon for research and conservation purposes. By the early 1980's, some of the obstacles limiting artificial propagation of lake sturgeon had been eliminated or minimized, so the Wisconsin DNR established a program to rear lake sturgeon at its Wild Rose Hatchery for use in rehabilitation efforts in Wisconsin waters. From 1980 to the present, Wisconsin lake sturgeon eggs, sac fry or fingerlings have been used to rehabilitate wild stocks or have been used for research in numerous states and provinces including Wisconsin, Michigan, Minnesota, Ohio, Missouri, Tennessee, Georgia, Manitoba and Ontario. Since 1979, the Fisheries Research Unit at the University of Wisconsin-Milwaukee Great Lakes WATER Institute has conducted numerous experiments on the biology of lake sturgeon including

culture techniques [Binkowski 1997; Czeskleba et al (1985); Binkowski and Czeskleba (1980)].

The extensive work conducted over the past 20 years by Wisconsin DNR and University of Wisconsin-Milwaukee Great Lakes WATER Institute has shown lake sturgeon to be successfully reared in a hatchery system. However, this technology is very complex and costly (Binkowski 2000, 1997). Lake sturgeon remain a difficult species to culture. Existing research shows that lake sturgeon is a species that would be difficult to profitably produce under commercial aquaculture conditions.

Specific data suggests:
Lake sturgeon adults in spawning condition are difficult to locate and gametes are difficult to collect without negatively impacting the fish (Binkowski 1997, Binkowski and Czeskleba 1980). Lake sturgeon eggs are generally very difficult to collect due to the limited number of spawning females in a population, and due to their unique reproductive biology which, unlike most other fish species in Wisconsin, causes ovulating females to give up their eggs very sparingly (Doroshov and Binkowski 1984).

The incubation and successful hatching of sturgeon eggs can be a sensitive and difficult operation requiring specific temperature control and treatment for disease, especially fungal disease (Binkowski 2000, Binkowski 1997, Czeskleba et al 1985, Wang et al 1985). There are few chemicals approved by the FDA that can be used to treat fungal infections of sturgeon eggs.

Rearing lake sturgeon in a hatchery is very expensive as the fish do not take well to commercial fish food diets during the early life stages and must be fed expensive live or natural foods (Czeskleba et al 1985, Binkowski and Doroshov 1984). Providing the necessary food for first feeding larvae is very labor intensive and costly.

Lake sturgeon are very difficult to culture. They require optimal environmental conditions for successful growth and survival, and the technology is very complex and costly (Binkowski 1997). The cost analysis for the culture of lake sturgeon was reported on by Binkowski 1997, which included a detailed analysis of labor, equipment, supplies, and utilities. The final cost per fish at six months post hatch was $5.56. This cost was determined based on the needs for lake sturgeon resources for experimental purposes. All biological, physical, and chemical parameters were required to assure the highest quality product. We believe this same approach would be required for commercial production. If a less complete approach were used, the quality of product would be severely compromised. Our cost estimate of $5.56 is similar to the cost incurred by a private operation in Wisconsin (Red Cliff Tribal Hatchery), where their cost was estimated to be $5 to $6. Lake sturgeon culture is very labor intensive, the Red Cliff reported that 25% of the tribal hatchery labor hours per day were spent working on lake sturgeon.

A cost analysis was also conducted for one and two-year-old lake sturgeon cultured at the Great Lakes WATER Institute. The final cost per fish at one year post-hatch was $27.62 and for two years post-hatch was $234.06. Consequently, based on 20 years of lake sturgeon research experience that includes a significant effort on culture techniques, which would suggest that commercialization of lake sturgeon would not be cost-effective and competitive with other cultured species in Wisconsin.

Optimal conditions in the hatchery system must be maintained – water quality, proper feeding regime, measures to eliminate gas supersaturation – which are very labor intensive and costly even in research hatchery or rearing facilities (Binkowski 1997, Binkowski and Meyers 1983).

Contrary to popular belief, lake sturgeon do not feed on detritus and fish excrement on the bottom of ponds and fish hatchery raceways and will not "keep a hatchery clean" (Binkowski 2000)

Lake sturgeon grow very slowly and would likely not reach a marketable size (8-10 pounds) for 5 to 6 years in a hatchery system (Binkowski 1997).

Compared to other popular Wisconsin gamefish such as walleye or perch, lake sturgeon have a flesh that is relatively high in fat with a somewhat fishier taste, therefore producing a flesh with a limited market potential.

The slow growth of lake sturgeon would prevent them from reaching a size needed for caviar production until they have been in a hatchery system for potentially 20 years (Binkowski 1997, Doroshov and Binkowski 1984).

Lake sturgeon could be raised to a size suitable for private aquaria in one year, but may pose a threat to Wisconsin's natural sturgeon populations because of unwanted release and the potential introduction of disease into the wild stock (Gessner 2000).

Disease and Health Related Issues

Little is known about diseases in lake sturgeon despite existing in this region for many years. Very little scientific data has been published regarding disease and health related issues in lake sturgeon. Unfortunately, the lack of data is not limited to the lake sturgeon, many other sturgeon species have only limited information available on disease and health issues.

The unique biological characteristics of the lake sturgeon must be considered when developing a lake sturgeon health program. First, lake sturgeon travel extensive distances making it difficult for infectious organisms to be limited to a discrete body of water. An infected lake sturgeon can travel many miles to waters where it may have never experienced a particular infectious organism. In addition, many disease organisms in fish are harbored in apparently normal fish for the duration of their life span and lake sturgeon live for many years. If disease carrying lake sturgeon do not succumb to the disease, they are capable of passing the disease organism to other sturgeon or native fish. An infected fish may or may not succumb to disease, or may become a carrier.

The white sturgeon is perhaps the most extensively studied species from a disease perspective. The White Sturgeon Iridovirus (WSIV) is common and has been the most studied disease within the North American sturgeon species. Disease transmission occurs from the female to her eggs. Illness and death occur in white sturgeon that are less than 12 months old, while adults remain unaffected. It has been studied almost exclusively in Idaho, California and Oregon and is regarded as a manageable stress-mediated disease. Little is known about the geographic distribution of WSIV beyond the states of Idaho, California and Oregon but recent

evidence suggests the disease is present in many regions of white sturgeon habitation.

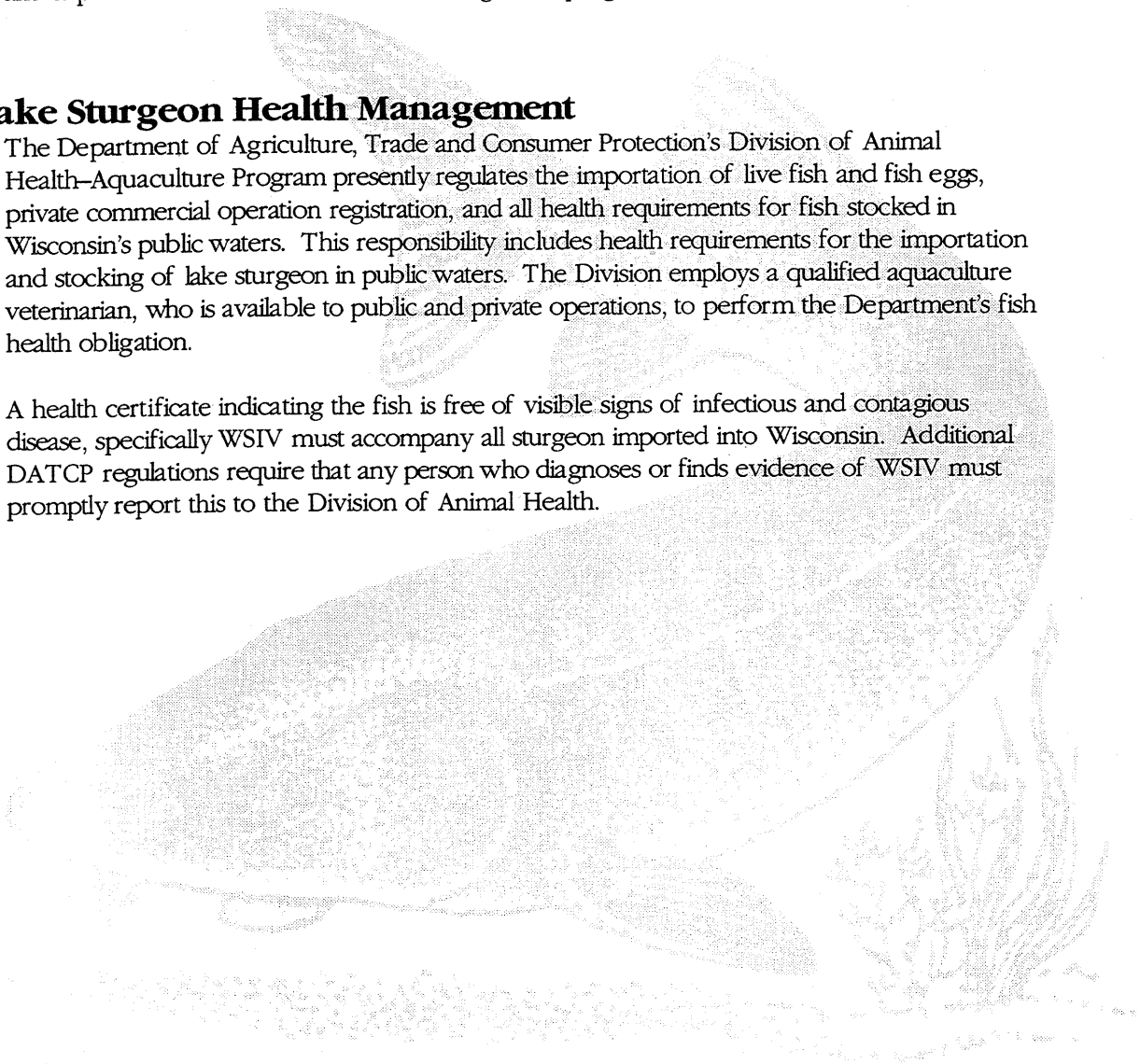
Some private commercial operations around the country, including Wisconsin, have developed and continue to use programs ensuring higher fish health standards than currently employed by public hatcheries or public waters (Kebus, 1996). An example employing white sturgeon exists at Clear Springs Foods in Idaho (see Appendix II). Such operations have offered their expertise and fish health personnel to public sector hatcheries, resulting in benefits for both the public and private interests.

The opportunity to transfer disease organisms is conceivable within the State's current lake sturgeon management structure. Lake sturgeon have been and will continue to be exchanged throughout Wisconsin, the Midwest and North America by governmental and resource agencies. While an existing program requiring the monitoring of WSIV is currently in place, any further investment in lake sturgeon by the State should include the further development and expansion of a disease and health management program to include other diseases.

Lake Sturgeon Health Management

The Department of Agriculture, Trade and Consumer Protection's Division of Animal Health–Aquaculture Program presently regulates the importation of live fish and fish eggs, private commercial operation registration, and all health requirements for fish stocked in Wisconsin's public waters. This responsibility includes health requirements for the importation and stocking of lake sturgeon in public waters. The Division employs a qualified aquaculture veterinarian, who is available to public and private operations, to perform the Department's fish health obligation.

A health certificate indicating the fish is free of visible signs of infectious and contagious disease, specifically WSIV must accompany all sturgeon imported into Wisconsin. Additional DATCP regulations require that any person who diagnoses or finds evidence of WSIV must promptly report this to the Division of Animal Health.



DATCP

The role of the Wisconsin Department of Agriculture, Trade and Consumer Protection concerning sturgeon is outlined primarily in State Statute Chapters 95.60 and 29.736. DATCP is responsible for monitoring fish health in aquaculture operations, including state hatcheries.

DATCP supports option #4, the Wisconsin Lake Sturgeon Commercialization Pilot Project. Although lake sturgeon are a valued natural resource to Wisconsin and should be protected from undue harm, the Department advocates a long-term examination of potential lake sturgeon markets and the positive and negative effects private lake sturgeon aquaculture would have on wild stocks, including stocking and rehabilitation of the species.

DATCP Division of Animal Health

The Division of Animal Health has developed in-depth health policies for other animal industries, including species of fish, which address varied diseases or criteria for specific situations. An example would be the fish health advisories for Heterosporsis in Yellow Perch and Walleye or the rules for Whirling Disease in trout and salmon. To accomplish such a feat, the Division successfully worked with angling groups, lake owners, private commercial operations, tribal interests, the Department of Natural Resources and others to secure the necessary input to make an informed decision regarding the best possible solution to the situation.

The Division of Animal Health is investigating several suitable models it could use to develop, with other lake sturgeon shareholders, an effective and efficient lake sturgeon health program.

All private commercial fish operations are currently required to register with DATCP's Division of Animal Health. Registration requires private commercial operations to maintain records on fish health and importation and exportation, including records of fish moved on and off each operation.

Division of Animal Health employees currently have the authority to review the records of any private commercial operation without notice. Failure to maintain proper records can result in loss of operation registration.

With proper resources, the Division could research, design, implement and promote a statewide lake sturgeon health plan. Such a plan may require the monitoring of lake sturgeon activities and better-trained veterinarians to oversee lake sturgeon health.

The Division of Animal Health presently is the primary fish health customer for the Wisconsin Veterinary Diagnostic Laboratory (WVDL) at University of Wisconsin–Madison. Collaborative efforts on lake sturgeon health between the Division and WVDL could further increase testing capabilities for WSI, along with testing for other organisms of concern to lake sturgeon. Upon completion of the new WVDL, the facilities and staff will be among the best in the country. In addition, the University of Wisconsin—Madison School of Veterinary Medicine is providing expertise in special veterinary health techniques (such as ultrasound on lake sturgeon) and could play a vital role in Wisconsin's lake sturgeon health program efforts.

Lake sturgeon reared on private commercial operations could be identified and traced for origin if a situation would arise requiring tracking methods through the Division of Animal Health.

With improved regulatory oversight, the legal ramifications of non-compliance with registration requirements would discourage illegal "laundering" of lake sturgeon on Wisconsin's private commercial operations.

Fish identification through tagging on commercial operations has been developed and successfully implemented in other states.

DNR

The role of the Wisconsin Department of Natural Resources concerning sturgeon is outlined primarily in State Statute Chapter 29. DNR is responsible for the protection, management and well being of fish stocks, including sturgeon, in the wild.

The Department of Natural Resources supports Option #2, participation of private commercial aquaculture operations in the rearing of lake sturgeon under a WLSAA for rehabilitation purposes, but also supports remaining with the status quo. The Department strongly opposes relaxing the prohibition of commercial rearing of lake sturgeon for flesh and/or caviar, or the sale of live fish to the aquarium industry.

DNR Bureau of Fisheries Management and Habitat Protection

An immediate concern regarding protection and enhancement of the lake sturgeon population in North America is the large number of states and provinces that still allow the commercialization of lake sturgeon flesh, caviar and live fish. If the Convention on the International Trade of Threatened and Endangered Species (CITES) is effective in controlling, or at least reducing, the illegal trade of European and Asian sturgeon products, then illegally caught or produced lake sturgeon from North America would be a viable avenue for the continued success of foreign lake sturgeon markets. The incentive is high for illegal acts, especially in the caviar and aquarium markets.

Illegal harvest of lake sturgeon could easily decimate targeted stocks. In addition, the unwanted release from a private commercial operation or an aquarium industry could seriously hamper recovery efforts due to the potential introduction of disease and possible dilution of the natural gene pool.

Aquaculture will obviously play an important role in North American lake sturgeon recovery efforts, and private commercial operations should be a partner in these efforts. Both public and private interests involved in this issue need to thoroughly discuss and agree upon the aquaculture standards that must to be met to ensure the overall success of efforts targeting the management or recovery of the public sturgeon resource. These standards have been developed by representatives of DNR, the U.S. Fish and Wildlife Service (USFWS), the Great Lakes Indian Fish and Wildlife Commission (GLIFWC), the Menominee Tribe, the University of Wisconsin—System, the aquaculture industry, several private sporting organizations, the

sport fishing industry, and the angling public, and are summarized as a recommendation in the recently completed Wisconsin Lake Sturgeon Management Plan (see appendix I).

DNR Bureau of Law Enforcement

Due to the precarious status of wild sturgeon populations and a high black market value, enforcement of lake sturgeon regulations has been a continuing high priority for Wisconsin Conservation Wardens since the mid-1900s. In addition, the DNR enlists the assistance of many volunteers each spring as "sturgeon guards" to provide 24-hour watch over major spawning sites along the Wolf River to protect the fish from poachers.

No commercial harvest of lake sturgeon is allowed in Wisconsin. Furthermore, to prevent illegal "laundering" of lake sturgeon into commercial markets, the legislature found it necessary to enact sec. 29.503(3), Wis. Stats., which prohibits Wisconsin licensed wholesale fish dealers from buying, selling, bartering, trading, possessing, controlling or transporting lake sturgeon regardless of the source.

In order to protect Wisconsin's native lake sturgeon populations, the Legislature has enacted regulations prohibiting all commercialization of lake sturgeon. Historically, lake sturgeon have had a great "black market" value with the flesh and roe being highly prized. Consequently, Conservation Wardens have found it necessary to devote extraordinary amounts of time and resources to protect this valuable native species, including overt and covert investigations into the illegal harvest and marketing of the fish. In addition, CITIES restrictions along with collapsing sturgeon populations due to over harvest in Eastern Europe, have reportedly increased worldwide interest in North American sturgeon as a possible source of roe for high-value caviar.

Because of the extremely high value and potential profits associated with a lake sturgeon trade, conservation wardens are concerned about the potential for any unscrupulous private commercial operations illegally "laundering" lake sturgeon taken from the wild. Once an illegal lake sturgeon is in an authorized private commercial operation, it would be difficult to prove where the fish originated. Identification of individual lake sturgeon using fin clips is impossible and using fin clips for batch identification of sturgeon is not effective due to fin regeneration. Larger sturgeon (fish larger than 10" or 1.5 to 2 years old) can be individually identified most effectively using PIT (passive induced transponder) tags, but exhibit only a 70% success rate (Thuemler and Fajfer 1999). The issue of "laundering" lake sturgeon is further complicated by the fact that all farm-raised fish are currently exempt from wholesale fish dealer requirements (note: wholesale fish dealer restriction mentioned above). Allowing commercial rearing of lake sturgeon would open the door for the movement of wild sturgeon flesh and caviar into commercial markets by third party operations under the guise of being farm raised fish. This would have a negative impact on Wisconsin's lake sturgeon populations and unjustly call into question the operations of honest private fish farms. Finally, legalization of commercial rearing of lake sturgeon would dramatically increase warden workloads with the need for a significant increase in patrol and enforcement activities on waters supporting native lake sturgeon populations.

The commercial rearing of lake sturgeon by private aquaculture would not only open the doors for movement of wild sturgeon into commercial commerce but would also threaten one of the most viable remaining lake sturgeon populations in North America and the world.

Lake Sturgeon Biology Facts & Figures

Description:

Body heavy, torpedo-shaped, angular (5-sided) in young, but round in adults; total length of adults averages 45"; snout short, conical; barbels on lower snout (4), smooth; upper lobe of tail fin pointed without threadlike (filamentous) extension (compare with shovelnose sturgeon); young—gray or brown dorsally with dusky dorsal and lateral blotches; adults gray to olivaceous dorsally and white ventrally.

Biology:

Lake sturgeon are slow growing, long-lived and late sexually maturing creatures. Females do not mature to spawn for the first time until they are 20 to 25 years old when raised in the wild (55" to 60" in total length) and then spawn only once every four years while potentially living up to 100 years. Males mature first at age 12 to 15 (40"to 45"), spawn every other year and live up to about age 40. After about a length of 40", females grow slightly faster than males and will generally grow to a much larger size due to their greater potential age longevity. Generally, in the wild, lake sturgeon will attain a total body weight of 10 to 15 pounds in the first ten years of their life, and females will become a caviar fish for the first time at about age 20 to 25. Lake sturgeon in Wisconsin spawn in late April to May in rapids and along current swept rocky areas in rivers they inhabit or rivers flowing into lakes they inhabit, when water temperatures reach 50° to 56° Fahrenheit. Lake sturgeon will migrate well over 100 miles against a river's current to find optimal spawning areas (Bruch 1999).

Distribution and Populations Status:

Lake sturgeon, Acipenser fulvescens, inhabit large river systems primarily in the Mississippi River, Hudson Bay and Great Lakes basins. By the early 1900's, many populations of lake sturgeon throughout their range had been greatly reduced or close to extinct because of overfishing, habitat loss, the construction of dams, and pollution (Harkness and Dymond 1961). Wisconsin has the longest running active management program for any sturgeon species in the world, since 1903. Continuous management has left the state with the best and most viable populations of lake sturgeon in the fish's natural range. Lake sturgeon have few to no natural predators after attaining a size of 12" to 15", but are very susceptible to overharvest as premature adults and adults. Lake sturgeon can tolerate only an annual harvest rate of 5%, compared to an acceptable annual harvest rate of 25% to 35% for other gamefish species, such as walleye or bass.

Lake Sturgeon in Wisconsin

In Wisconsin, lake sturgeon are present in the Mississippi River, Lake Michigan, and Lake Superior drainage basins.

The Mississippi River Basin:

Rivers include the Mississippi, St. Croix, Chippewa, Flambeau (and major tributaries), and Wisconsin. In the Wisconsin River, records place lake sturgeon upstream to the Castle Rock Flowage (Adams County).

Lake Superior Basin:

Lake sturgeon are found in the comparatively shallowwaters from Superior to Bark Point, in the vicinity of the Apostle Islands, and in the Bad River (Ashland County). Lake sturgeon are common in the St. Louis River.

Lake Michigan Basin:

Lake sturgeon are present in Green Bay, Lake Michigan, the Menominee River upstream to the White Rapids Dam, the Fox River upstream to Lake Puckaway, and the Wolf River upstream to Shawano. The Wolf River system includes Lakes Winnebago, Butte des Morts, and Winneconne, plus the Embarrass River.

Other:

Lake sturgeon have been introduced to lakes where natural reproduction did not occur, including: Big Cedar Lake (Washington County), the Madison lakes (Dane County), Chain of Lakes (Waupaca County), and Pear Lake (Washburn County).

In Wisconsin, lake sturgeon are common in the Menominee River, the lower Wolf and upper Fox Rivers, Lakes Poygan, Winneconne, Butte des Mort and Winnebago, Lake Wisconsin, the St. Croix River to Gordon Dam, Namekagon River below Trego Dam, and the Chippewa and Flambeau rivers. Lake sturgeon are uncommon to rare in the lower Wisconsin River, Mississippi River, the Madison lakes, and Lakes Michigan and Superior.

Lake Sturgeon Regulation in Wisconsin

Wisconsin law currently bans commercial harvest of lake sturgeon in Wisconsin. State law also prohibits licensed wholesale fish dealers from buying, selling, bartering, trading, possessing, controlling or transporting lake sturgeon regardless of the source. State Statutes also prohibit the importation or sale of lake sturgeon legally harvested by commercial fishers in other jurisdictions, such as from Canada.

Sport fishing regulations are also very restrictive towards anglers. Upon removal of a lake sturgeon from state waters, the angler is required to immediately tag each sturgeon and register with the DNR before 6:00pm on the day the fish is taken. Specific rules vary among bodies of water, with most locations having a fall hook and line season of six to eight weeks with a season bag limit of only one sturgeon and minimum size limit of 50 to 70 inches. The Lake Winnebago – Wolf River system is unique with sport harvest limited to a three-week spearing season through the ice during February. However to ensure against over exploitation, the season is closed within 24 hours of 80% of the harvest objective for any one of the three sex and maturity specific harvest caps is reached. The Lake Winnebago bag limit for spearing is one fish per season with a 36" minimum size limit.

Lake Sturgeon Management and Trade in North America

Since the early 1980's, there has been a steady increase in the number of states and provinces with an interest in active lake sturgeon management, restoration and research (K. Graham, MO DOC and D. Folz, WI DNR, personal communications). Lake sturgeon have been recognized by CITES as a species in potential danger and in need of improved conservation practices. Although the trade may benefit commercial interests in terms of caviar, flesh or live fish, there is also the potential to negatively impact existing lake sturgeon populations or hamper recovery efforts.

In 1998, Ron Bruch of the Wisconsin Department of Natural Resources summarized the status of legal trade and management of lake sturgeon in North America. Fisheries biologists in 15 states and provinces within the native range of lake sturgeon that either still have lake sturgeon present in their waters or have developed recovery plans, were polled and asked the following questions:

Does their state or province have an active lake sturgeon population and/or harvest management program?

Can wild lake sturgeon flesh, caviar or any other body parts be legally sold in their state or province?

Can lake sturgeon be legally raised and sold as live fish (ornamental or otherwise) or as fish products through private aquaculture in their state or province?

States and provinces polled include Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, New York, Ohio, Tennessee, Wisconsin, Alberta, Manitoba, Ontario, Quebec, and Saskatchewan.

Of the 15 states polled on the status of their lake sturgeon management and trade activities, 12 of the 15 have a lake sturgeon management and/or a recovery plan either for the entire state or province or for their waters of highest interest or need. While many viable sport, as well as some commercial fisheries for lake sturgeon are in operation at this time (Todd 1998, Mosher 1998), all states and provinces polled impose some level of harvest restriction through regulations. Lake sturgeon flesh, caviar or other body parts can be legally sold in 9 of the 15 states and provinces polled. Live lake sturgeon, as ornamental fish in the aquarium, can be legally sold in 7 of the 15 states or provinces, and not sold in this manner in 7 of 15, while the one remaining jurisdiction was not certain whether this trade was legal or not. The following table lists the polling results from each state and province.

Management and Authorized Trade of Lake Sturgeon in North America

State or Province	Has Lake Sturgeon Management Plan	Has Legal Trade of Flesh and Caviar	Has Legal Trade of Live Lake Sturgeon
Illinois	No	No	No
Indiana	No	No	No
Iowa	No	No	No
Michigan	Yes	Yes	Yes
Minnesota	Yes	Yes	Yes
Missouri	Yes	No	No
New York	Yes	Yes	Yes
Ohio	Yes	Yes	No
Tennessee	Yes	No	No
Wisconsin	Yes	No	No
Alberta	Yes	Yes	Yes
Manitoba	Yes	Yes	Yes
Ontario	Yes (L. Huron)	Yes	?
Quebec	Yes	Yes	Yes
Saskatchewan	Yes	Yes	Yes

Management of lake sturgeon has become a prominent part of the resource management programs of most states and provinces within the native range of the species. There are numerous research and management efforts occurring at this time that should result in the enhancement, re-establishment or at least maintenance of many North American lake sturgeon populations. As with other sturgeon species, recovery efforts targeting lake sturgeon are very long term endeavors that are dependent upon sustained, consistent work, and are very sensitive to negative biological and social perturbations along the way to recovery. The regular sharing or networking of experiences, technology and expertise between those responsible for lake sturgeon propagation, management, recovery, research and enforcement programs greatly enhances the probability that the impact of potential negative disruptions will be lessened.

The lake sturgeon is currently listed as a rare species in the United States because most of its habitat appears to be threatened.

The Aquaculture Industry

Wisconsin Aquaculture Association

The Wisconsin Aquaculture Association supports legalization of lake sturgeon harvest, purchase, sale, barter, trade, possession, control and transportation by private commercial aquaculture operations within Wisconsin. The prohibition on the private commercial aquaculture industry has been in place for many years and the original reasoning behind the ban was sound, but progress over time and improvements in aquaculture technology make it reasonable to remove the current prohibition under state law.

Private commercial aquaculture operations should not be barred from rearing lake sturgeon while the Wisconsin Department of Natural Resources currently performs the practice at state hatcheries. Lake sturgeon are raised for exportation to other states and provinces through agreements signed by the DNR. In addition, tribal hatcheries in Wisconsin are allowed to raise and process lake sturgeon. Finally, state funded research facilities, similar to the University of Wisconsin—Milwaukee Great Lakes Sea Grant Institute, have raised lake sturgeon in the past and have the freedom to raise lake sturgeon in the future.

The Wisconsin Aquaculture Association understands the value lake sturgeon have to Wisconsin as a natural resource, but the potential significance as an economic enhancement to current income for the State's private commercial operators has the Association considering alternatives to Wisconsin's current laws. Lake sturgeon provide two marketable products—meat and caviar. The potential markets for lake sturgeon flesh and caviar have been created through the exploitation of other species of sturgeon for their caviar and flesh. The logical progression of the market is to next consider lake sturgeon caviar and meat as a likely alternatives to the dwindling traditional varieties. The WAA would also like the opportunity to work with the State's stocking programs by providing a habitat to rear lake sturgeon for the purposes of stocking and rehabilitation of the species. Finally, lake sturgeon have the potential to assist trout hatchery systems with the maintenance of raceways.

The Wisconsin Aquaculture Association believes the issue is not about prohibition, but about the ability to raise lake sturgeon and under what conditions. The WAA recommends the organization and establishment of a statutorily defined Lake Sturgeon Commercial Management Board, which will determine the conditions of operation for all commercial lake sturgeon operations in Wisconsin. The working group will consist of: 3 members from the DNR (2 from Fisheries, 1 from Law Enforcement), 2 Tribal members, 1 University of Wisconsin System representative, 3 DATCP members (2 from Animal Health, 1 from Marketing), and 3 members from private commercial aquaculture operations (various regions of the state). The working group would be permanent and have authority determined by the State Legislature. The working group would address all issues related to public and private harvest, purchase, sale, barter, trade, possession, control, and transportation of lake sturgeon in Wisconsin. The working group would convene on a regular basis and be the State's authority on lake sturgeon.

Lake sturgeon are an important biological and economic species for Wisconsin's private commercial aquaculture operators. The status quo is an unacceptable option and the total deregulation of harvest, purchase, sale, barter, trade, possession, control and transportation is

also not acceptable. Consequently, lake sturgeon should be reared under tightly controlled situations.

The Wisconsin Aquaculture Association is prepared to address any issue concerning lake sturgeon, including genetics, health, poaching, or "black markets." The WAA is optimistic about an open and honest dialogue between all parties involved and is willing to discuss all options presented. Finally, future regulations must address sound science, economic opportunities, and environmental protection, while continuing the development and enhancement of the species.

Mac Graham
Star Prairie Trout Farm
Chair, Wis. Aquaculture Assn.

Great report, covering all the expected interests, plus a few I didn't expect.

The one I did expect but didn't see was input from DATCP Marketing Division. This is clearly the one area in which an agency can be expected to advocate for the privatization/commercialization case.

Fred Binkowski's report from the Great Lakes WATER Institute was also a surprise. Despite the many years of working together on various issues, he unbelievably cast his vote again toward prohibition and repression. WAA will certainly take this up with him (again) personally, as his false positioning as an advocate for private aquaculture smacks of duplicity. He is in a position of great authority on the issue of sturgeon, and his remarks are generally accurate, as far as they go, with one exception.

In his reason #8 for recommending that ...lake sturgeon...(are) not a species suitable for profitable private commercial operations at the expense of the public sturgeon interest,' he steps way outside his area of expertise. His view that sturgeon have 'limited market potential' is not only incorrect, but contradicts his and others notion regarding potential for 'illegal sale and movement of fish from Wisconsin's remaining wild stocks.' The black-market argument against commercialization is based precisely on the assumption of high market potential. Here in particular, I'd like to see DATCP-Marketing input, as it would carry more weight than my own.

What he fails to recognize is the creative value of private enterprise, which can succeed in many cases where research labs and agency hatcheries fail. The culture-related problems he cites (difficulty in spawning, incubation, and early feeding, water quality importance, slow growth and maturation, etc.) are similar to concerns with other fish species that have been addressed in many cases more effectively by private hatcheries.

The reason is simple, and goes beyond mere profit-orientation. Farmers will sacrifice short-term profits in the interest of longer-term gains, bringing to bear widely different motives, inspirations and perspectives. Not to say the blinders are lifted, just loosened a whole lot. This is especially true when a long-term investment, due to slow growth and maturation, is involved.

Issues of health, escape/confinement, and law enforcement (black marketing) also are met more favorably with a private commercial interest at heart. The simple matter of preventing losses and enhancing growth is obvious. Beyond this, as stewards of the water, fish farmers are more apt to be watchdogs than violators are. As in the allegations of polluting public waters through fish farming, farmers are more likely to inform of violations that negatively impact their waters or markets than they are to do the opposite.

In many ways, the repressive attitude that will deny the opportunity to even make the attempt is the largest single threat to the 'public sturgeon resource.' As with other species of fish, private hatchery enhancement efforts can be more effective than the state equivalent. One needs merely to look at the record to see where hatchery-related fish health problems originate — it's not at the private facilities. Likewise with chemical and antibiotic use and the associated problems of contamination; or needs for employee time and attention — private growers prove over and over again their daily practice of extra labor, extra commitment, extra watchfulness. The potential benefits from creative and constructive privatization in enhancement programs are huge — we just need to be given the chance.

Aquaculture has been unfairly maligned in recent years based on pollution, health and genetic threats, and now greed (black marketing). Yet never has there been a violation in an industry that predates any existing law authority over wildlife and natural resources by many decades. Binkowski's 'public sturgeon resource' has been threatened by many things since man first became involved, but never by aquaculture.

As far as conclusions go, I view the best option as one that recognizes and controls the various risk factors, through either WAA-type committees, or SMAT-type WLSAAs, but allows privatization/commercialization. If all the cultural consideration Binkowski mentions are as prohibitive to commercial culture as he suggests, there will be very little interest to begin with. I'd be surprised if more than five farms in the state show a serious interest, and they will doubtless begin at a very small scale. What risks are assumed by the state in so doing will be more than compensated for through committed efforts by the aquaculture industry in active partnership with state agencies and resource interest groups. Any doubts regarding the level of commitment and honesty the farms represent will be dispelled if those concerned merely make the effort to visit farms and spend some time with Wisconsin fish farmers. We ask just to be given the chance.

Sally Tadda
Poplar River Fishing Park

How does the State of Wisconsin think fish farming (aquaculture) will ever begin to grow, when there is so much competition from our own State agencies? I thought we were going to work together. I thought the powers that be were going to let fish farmers make enough money to at least stay on the land (and pay our TAXES!!!). Pretty soon we will have to hire someone just to do our paperwork. This is another example of not giving fish farmers a way to be competitive with other States that can already sell Lake Sturgeon. Protectionism will only get you extinction of what you are trying to protect. What if something was to happen to the lake sturgeon in the wild?

Jim Michalski
Wisconsin Aquaculture Association

I have finally read and digested the "Regulatory Options for the Commercial Rearing of Lake Sturgeon." That was quite a volume of material. There was maybe too much material. I believe that Appendix II and Appendix III were totally unnecessary, though interesting, were of no value in the discussion of the topic. They could have been left out.

I also have concern with Appendix I. Just the makeup of the "Sturgeon Management Assessment Team" is questionable—15 out of 29 people on the "Team" were DNR staff. The industry had one representative. I think this "Team" was not created to deal with the question of the commercial rearing of lake sturgeon, but rather for dealing with a much bigger topic: The management of lake sturgeon in Wisconsin. To have this many DNR operatives dealing with the commercialization question is at best a waste of manpower. At worst, it appears to be stacking of the deck against the industry.

I also have a problem with the "Sturgeon for Tomorrow" people and question the value of their testimony on this issue. Although they seem like a conservation group, they are in fact a self-serving group made up of sturgeon anglers and businessmen who benefit from sturgeon fishing. Sturgeon for Tomorrow parrots the remarks of the Great Lakes Water Institute, whom they fund to do sturgeon research. They are entitled to their opinion, but I do not see the basis of their expertise. Size and bag limits are really their domain.

The Great Lakes Water Institute and it's senior scientist, Fred Binkowski, have been one of the primary sources of information on lake sturgeon. I have concerns about his testimony. The lake sturgeon has become the exclusive domain of the senior scientist. He has "sturgeon" as his E-mail address. I conclude that ego may be a factor when there is so much negative input by Binkowski. Some of the input seems contrived: "Lake sturgeon remains a difficult species to culture and is not a species suitable for profitable private commercial operations at the expense of the public sturgeon resource because:" He then goes on to give eleven "reasons" why. Unfortunately, the reasons are facts about the culture of sturgeon and not a threat to the "public sturgeon resource." What does the lake sturgeon sensitivity to heavy metals have to do with privatization threatening the "public sturgeon resource?" For that matter, what do reasons one through nine have to do with privatization threatening the "public sturgeon resource?" Reasons ten and eleven have some merit as a threat to the "public sturgeon resource." These threats to the "public sturgeon resource" are already present with the private ownership of lake sturgeon in Minnesota and Michigan. These states do not seem to have any problems with aquarium fish release. It seems that this is the only real threat to the "public sturgeon resource:" Release of aquarium fish into the environment and the spread of disease. I mean, this is like making angling illegal because some misguided soul will release his catch in some other lake and threaten the public resource. By maintaining a private stock of lake sturgeon, private aquaculture could INCREASE the numbers of Wisconsin's remaining wild stocks and guarantee the existence of the species in case of some catastrophe in the public sturgeon population.

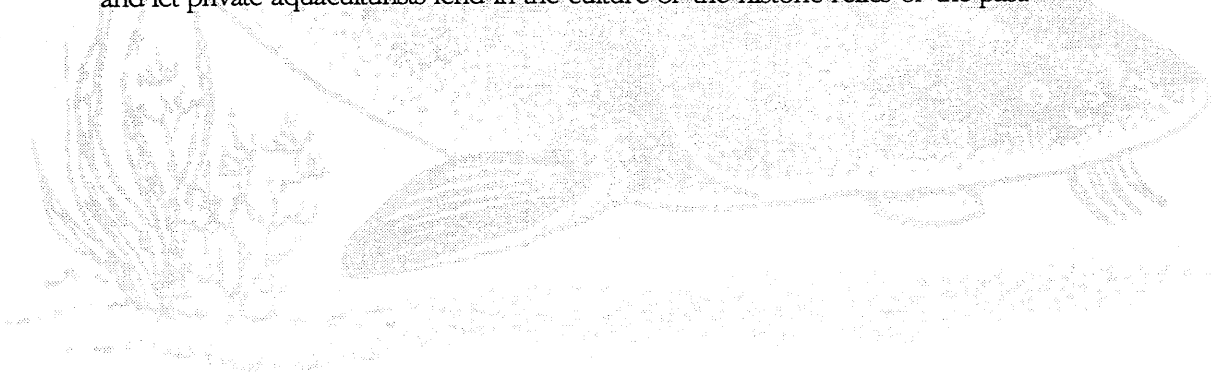
I see the Wisconsin Aquaculture Association's proposed working group as having the fairest make up in representation of various interests. With a group as defined in the WAA's proposal, we can have a meaningful and fair discussion of the lake sturgeon question in a forum where all ideas can be presented.

Historically, it has been a struggle for the private fish farmer to make progress in raising new varieties of fish in Wisconsin. Even though there has never been a citation against any fish farmer for pollution or stocking violations, people in the Department of Natural Resources are suspicious of motives and methods. Concern for the environment and the fish stocks of Wisconsin is vital for commercial aquaculture to exist and thrive. I hope that some day these meetings will help the DNR employees realize that the Department of Natural Resources and the private commercial industry are on the same side on conservation issues.

I hope my comments and observations have helped.

Steve DeBaker
Branch River Trout Hatchery

We at Branch River Trout Hatchery have long been interested in the culture of sturgeon species. We have had experience raising sturgeon from 1-2" size up to the 4-5" range. We were given a permit to raise shovelnose sturgeon 4-5 years ago, but since that time we have learned some very interesting things about the species, including that the fish will survive in cold temperatures with trout rearing applications, also that you can start them on virtually the same diet as trout. The main fallacy that some scientists have based their research on simply is not true. It is true that some techniques in rearing are different, but believe me, if it would cost too much to raise these magnificent creatures, we simply couldn't do it. When will the state of Wisconsin give up this most sacred of cows? Most likely, when it is too late to do anything about it. I'm quite sure that you have heard from all the political sides, some for, some against, but speaking as someone who not only raises these fish, but someone that enjoys the pure delight of reaching down in my ponds to literally pet these creatures, I can only tell you that these fish are not hard to raise. They serve a tremendous benefit in my hatchery, and though they take time to mature, like my homemade vintage grape wine, it is well worth the wait. I would only ask that you consider giving the private sector a chance to raise lake sturgeon, not only for their benefit, but to help put back a resource for continuing generations to enjoy. So many of these fish are shipped out of the State of Wisconsin, why not keep this resource here and let private aquaculturists lend in the culture of the historic relics of the past.



Conservation Organizations

Sturgeon for Tomorrow

The Sturgeon for Tomorrow Board of Directors and general membership in cooperation with local businesses of the Fox River Valley have worked for the past 25 years to raise monies to fund sturgeon research and management projects to promote the enhancement of sturgeon stocks. In the late 1970's, Sturgeon for Tomorrow was instrumental in funding the initial research that developed lake sturgeon culture techniques. The techniques have been used in sturgeon management programs in Wisconsin and North America.

Sturgeon for Tomorrow is opposed to the open commercialization of lake sturgeon. The organization believes open commercialization would constitute a serious threat to Wisconsin's native sturgeon stocks. Sturgeon for Tomorrow is concerned with the negative impact an unwanted release of sturgeon from a private operation could pose for Wisconsin's wild native stock, specifically disease transmission and genetic contamination. The concern extends to any aquarium industry involving lake sturgeon, which is related to private industry. Finally, Sturgeon for Tomorrow is uncomfortable with the potential for "black market" wild fish that may result from the diminishing stocks of Russian sturgeon, which produce roe (caviar).

Sturgeon for Tomorrow supports private industry involvement in the rearing of lake sturgeon for rehabilitation purposes, but only under the aquaculture standards developed through implementation of section 8 of the Wisconsin Lake Sturgeon Management Plan. Section 8 outlines lake sturgeon rearing standards for all operations (public and private), that should ensure Wisconsin's wild stocks are maintained and improved.

Sturgeon Management Assessment Team

The Sturgeon Management Assessment Team was established in December 1996 with the purpose of "reviewing, evaluating, and updating lake sturgeon management goals in Wisconsin." Team members include a diverse group of individuals from the Wisconsin Department of Natural Resources, the U.S. Fish and Wildlife Service, the Great Lakes Indian Fish and Wildlife Commission, the Menominee Tribe, the University of Wisconsin System, the aquaculture industry, several private sporting organizations, the sport fishing industry, and the general angling public. SMAT developed Wisconsin's Lake Sturgeon Management Plan to facilitate the preservation, protection, and restoration of lake sturgeon populations in Wisconsin for the benefit of the sturgeon resource and all its users.

On behalf of the Sturgeon Management Assessment Team, we'd like to take this opportunity to provide you with our position on the commercial rearing of lake sturgeon in Wisconsin. We respectfully request that it be incorporated into the Department of Agriculture, Trade and Consumer Protection's and Department of Natural Resources' Regulatory Options for the Commercial Rearing of Lake Sturgeon Report to the Wisconsin Legislature.

Wisconsin is fortunate to possess the largest and healthiest self-sustaining lake sturgeon

population in the world. Consequently, measures should be taken to ensure the viability of those populations remain into the future. Illegal harvest of lake sturgeon can easily decimate targeted stocks, while unwanted releases from an open aquaculture and aquarium industry could seriously hamper recovery efforts due to the introduction of parasites or diseases, and potential dilution of the natural gene pool.

Aquaculture will obviously play an important role in Wisconsin lake sturgeon recovery and enhancement efforts, and private aquaculture should be a partner in these efforts. Both public and private interests involved in this issue though, need to thoroughly discuss and agree upon the strict technical standards for aquaculture that need to be met to ensure the overall success of efforts targeting the management or recovery of the public sturgeon resource. These technical standards have been discussed thoroughly by the Sturgeon Management Assessment Team and are primarily addressed in Sections 3 and 8 of Wisconsin's Lake Sturgeon Management Plan.

The Sturgeon Management Assessment Team advocates that lake sturgeon propagation efforts be conducted with clear, concise, and strict technical standards for research and rehabilitation purposes only. It is our hope that these efforts can include the private aquaculture industry and that everyone can work together to preserve and restore Wisconsin's great lake sturgeon resource.

Wisconsin Wildlife Federation

It was a pleasure meeting you in September at the Sturgeon Management Assessment Team (SMAT) meeting in Stevens Point. The team is made up of a diverse group of people and interests including private aquaculture. I am a citizen member of that team representing the Wisconsin Wildlife Federation. Our organization is opposed to open commercialization of lake sturgeon. We believe that this activity, if allowed, would pose a serious threat to the native sturgeon population.

As a member of the SMAT, we spent many hours arriving at what we feel is a good plan for the future of sturgeon in this state. One section (Section 8) of the Wisconsin Lake Sturgeon Management Plan outlines a process of sturgeon rearing which excludes no one person, or group from lake sturgeon rearing so long as they adhere to the standards set forth in the Plan.

I applaud your time and efforts in preparing your report to the Legislature on the commercial rearing of lake sturgeon. I would also appreciate it if my concerns become a part of that report. I realize this is the eleventh hour but I feel they are important.

Harry Kachur

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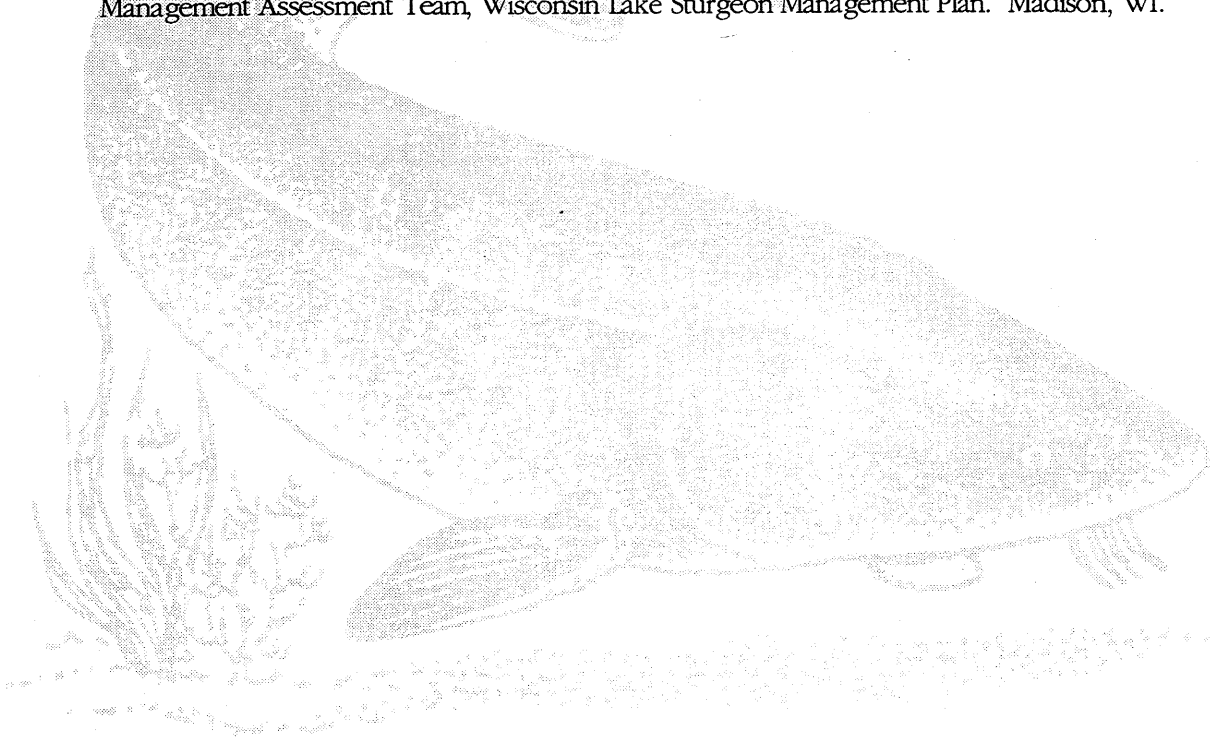


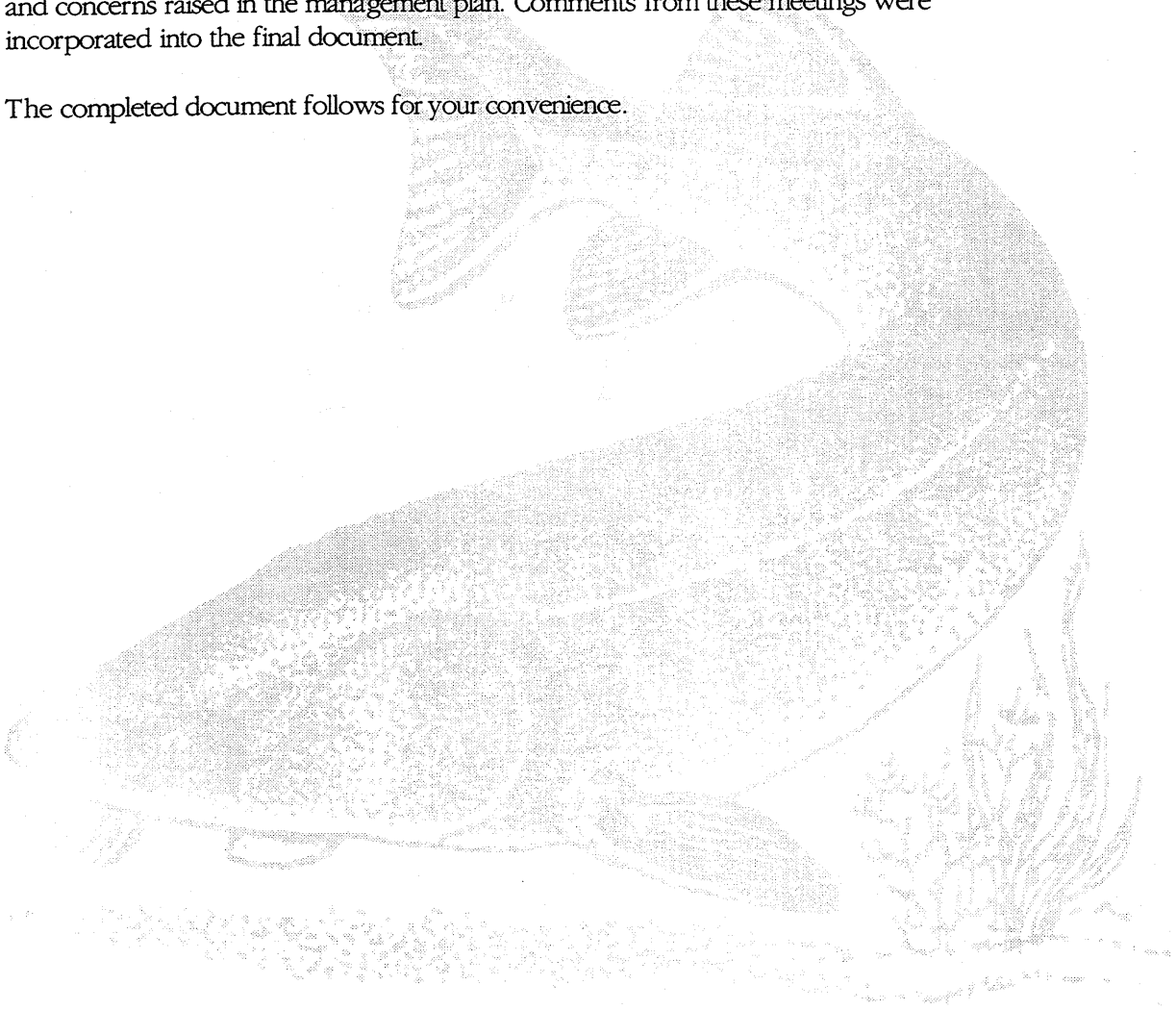
The Wisconsin Lake Sturgeon Management Plan

The Sturgeon Management Assessment Team (SMAT) was established in December 1996 with the purpose of "reviewing, evaluating, and updating lake sturgeon management goals in Wisconsin." By reviewing and updating management goals, a logical end product of SMAT's deliberations would be a revised management plan for lake sturgeon in the State of Wisconsin. The plan would be created to preserve, protect, and restore lake sturgeon populations in Wisconsin for the benefit of the sturgeon resource and all its users.

Team members included a diverse group of individuals from the Wisconsin Department of Natural Resources (WDNR), the U.S. Fish and Wildlife Service (USFWS), the Great Lakes Indian Fish and Wildlife Commission (GLIFWC), the Menominee Tribe, the University of Wisconsin—System, the aquaculture industry, several private sporting organizations, the sport fishing industry, and the angling public. Members were invited to participate in the plan development process because of their specific interest in sturgeon biology and management.

A draft management plan was presented to the public in a series of special meetings held throughout the state to give interested citizens the opportunity to provide input on the issues and concerns raised in the management plan. Comments from these meetings were incorporated into the final document.

The completed document follows for your convenience.



Wisconsin's Lake Sturgeon Management Plan

Wisconsin Department of Natural Resources
Bureau of Fisheries Management and Habitat Protection

October 2000

WISCONSIN'S LAKE STURGEON MANAGEMENT PLAN

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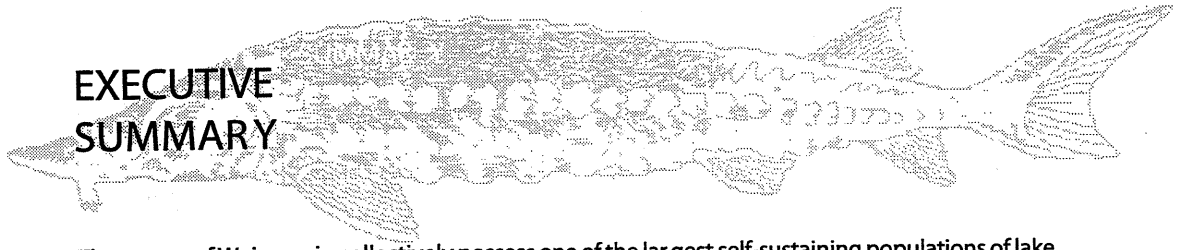
EXECUTIVE SUMMARY



The waters of W isconsin collectively possess one of the lar gest self-sustaining populations of lake sturgeon, Acipenser fulvescens , in the world. Because of the biological characteristics of lake sturgeon (e.g., slow growing, late-to-mature) and the ease in which a population may be negatively altered in an exploited fishery, it is critical that management strategies and philosophies be continually r eviewed, refined and updated.

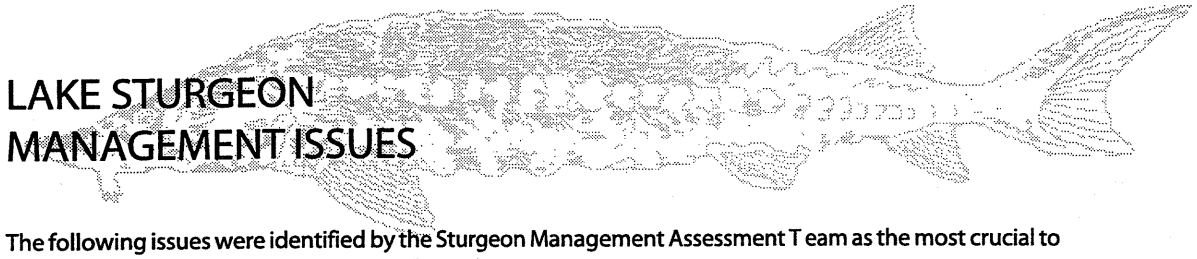
The Stur geon Management Assessment Team (S M A T) was established in December , 1996 with the purpose of "r eviewing, evaluating, and updating lake stur geon management goals in W isconsin." By reviewing and updating management goals, a logical end-pr oduct of the SMA T's deliberations would then be a r evised management plan for lake stur geon in the state of W isconsin. Team members included a diverse gr oup of individuals fr om the W isconsin Department of Natural Resour ces (WDNR), the U.S. Fish and W ildlife Service (USFWS), the Gr eat Lakes Indian Fish and W ildlife Commission (GLIFWC), the Menominee Tribe, the University System, the aquaculture industry , several private sporting or ganizations, the sport fishing industry, and the angling public. Members wer e invited to participate in the plan development process because of their specific interest in sturgeon biology and management.

Thr ough several facilitated workshops, the Stur geon Management Assessment T eam identified the following key statewide lake sturgeon management issues: the decline in abundance over the last century, the absence of compr ehensive biological and/or harvest information with which to manage populations at a statewide or watershed level, the negative effect that habitat loss, modification, or inaccessibility has had on populations, the maintenance of genetic diversity and long-term health of rehabilitated populations, the importance of protection from illegal harvest or incidental catch, the absence of a mechanism to ensure that genetic variability and other population characteristics are maintained in commercial or private industry activities, the existence of antiquated policies and management goals, and the essential involvement of the general public in an effective management program. Fr om the above list of management issues, the Team r ecommends the following actions:

- Develop standardized collection techniques for population, reintroduction, catch, and harvest assessments
- Identify critical seasonal habitats and habitat improvement opportunities
- Review stocking and r eintr oduction pr oposals to ensur e genetic integrity is maintained
- C reate a separate license fee for hook and line sturgeon fisheries
- Restrict all stur geon species pr opagation to the state of W isconsin and federal, tribal, and commer cial aquacultur e under a cooperative agr eement for r esear ch and r ehabilitation
- Implement the statewide Lake Sturgeon Management Plan

A draft management plan was presented to the public in a number of special meetings to give interested citizens the opportunity to provide input on the issues and concerns raised in the management plan. Comments from these meetings were incorporated into this final document.

This Lake Sturgeon Management Plan was created to preserve, protect, and restore lake sturgeon populations in Wisconsin for the benefit of the sturgeon resource and all its users.



LAKE STURGEON MANAGEMENT ISSUES

The following issues were identified by the Sturgeon Management Assessment Team as the most crucial to the future of sturgeon management in Wisconsin.

A. There is a need for biological information on sturgeon/dynamics to effectively manage these species on a statewide or watershed basis.

Information is often used to make a variety of management and regulatory decisions. Often times, the lack of sufficient population information hinders species-specific management goals. An information void currently exists on many sturgeon populations in Wisconsin. Population level information on the majority of our river systems is lacking and the importance of this species early life history requirements for successful recruitment is unclear. The perpetuation of self-sustaining stocks of sturgeon require a comprehensive understanding of their biology, population dynamics, habitat needs, movement and migration patterns, water quality requirements, fisheries interactions, and the short and long-term effects of human induced impacts. All aspects of target populations must be adequately assessed if this species is to be effectively managed in the future.

B. Habitat loss, modification, or inaccessibility have negatively affected sturgeon populations.

The availability of critical habitats (e.g., spawning, nursery, overwinter) is often the most important factor in the success of any fish population. When these habitats are lost or modified in some way, the resulting impacts can have a direct effect on specific populations. The majority of Wisconsin's river systems have been modified by dam construction that has simplified and fragmented riverine habitats. Water level fluctuations no longer mimic the hydrography of natural river systems. Historical spawning runs no longer occur because of the barrier effect of dams. Riparian development and the resulting sediment deposition and water quality changes have significantly reduced habitat diversity. Fish species such as lake sturgeon have had their distributions dramatically altered by river modification. For this species to continue to exist and flourish, it will be necessary to mitigate current conditions by providing passage opportunities at dams, reducing the occurrence and intensity of unnatural water level fluctuations, or by sustaining or improving river habitats and wetlands that are conducive to reproduction, growth, and survival.

C. The genetic diversity and long-term health of rehabilitated sturgeon populations must be maintained.

Interbasin transfers of fish stocks has undergone considerable scrutiny over the years because of concerns over genetic integrity. Recent assessments support the existence of several genetically distinct stocks of fish in Wisconsin. Individual strains or subpopulations may exhibit unique adaptations to their specific habitats so it is imperative that the complete realm of genetic implications are considered when proposing or implementing any propagation or stocking activity. Genetic diversity in hatchery reared fish must be maintained and maximized if at all possible.

D. There is a need for harvest and exploitation information on sturgeon to effectively manage this species on a statewide or watershed basis.

Information is often used to make a variety of management and regulatory decisions. Often times, the lack of sufficient harvest and exploitation information hinders species-specific management goals. Information is lacking on several crucial aspects of the hook and line sturgeon fishery in Wisconsin

(e.g., catch statistics, exploitation rates, sex/age structure). Also the understanding of length limits and their impact on size, age, and sex structure of sturgeon fisheries with both hook and line and spearing is unclear . Because of the natur e of the species (long-lived, late-to-mature) it is clear that management decisions must be based on as accurate and complete information as possible. Every opportunity to assess sturgeon fisheries must be taken.

E. Sturgeon populations have been reduced in many Wisconsin waters over the last 100 years.

Over the years, sturgeon populations (or portions of populations) have declined because of habitat degradation, dam construction, water quality problems, and possibly overharvest. In an effort to maintain viable populations and associated fisheries, sturgeon have been intensely managed in some areas and specifically reintroduced for restoration purposes in others. Although reintroduction efforts are satisfying the ultimate goal of "reestablishing sturgeon in waters within their original range where there is reasonable possibility of developing self-sustaining populations through natural reproductions," the impacts to the aquatic community are unknown. Biologically sound population goals should be established for sturgeon populations.

F. Sturgeon populations must receive adequate protection from illegal harvest or from incidental catch in commercial fisheries. Additionally, the current registration system is not a complete assessment tool and should be modified to provide additional information.

Sturgeon management goals can never be realized without enforcement support. Because most sturgeon typically make extensive migrations, they may be exposed to illegal harvest at a variety of locations. Enforcement activity must remain strong if populations are to be adequately protected. Illegal harvest can have significant impacts on the remaining population. Because commercial fishing operations harvest hundreds of thousands of pounds of fish on an annual basis, incidental catch of stur geon will always be of concern. Moreover, while the spearing r egistration system has been developed and modified over a number of years, the hook and line sturgeon registration process is in its infancy and may need to be reviewed and revised to provide additional harvest information .

G. Understanding, support, and involvement by the general public is essential to an effective management program.

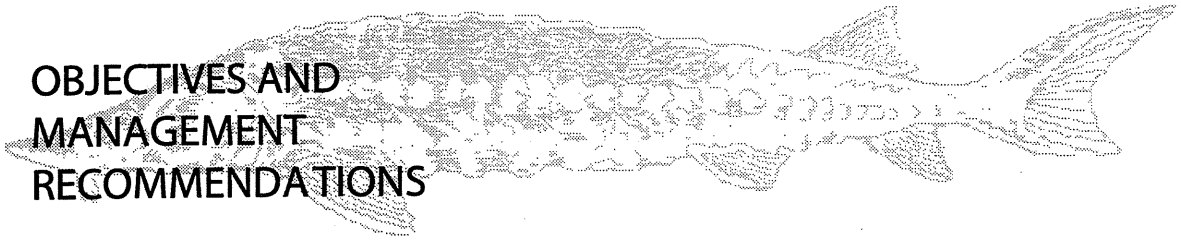
Information, education, and public involvement is critically important when trying to gain the needed support for any pr oposed management activity . Knowledge of the uniqueness of sturgeon populations is necessary to the understanding of goals and the establishment of management priorities. Increased public awareness and knowledge also facilitates compliance of the current regulatory framework. Public involvement, understanding and support are critical components in the long-term success of stur geon management in Wisconsin.

H. There is no mechanism to fully evaluate or ensure that genetic variability and other population characteristics are maintained in commercial or private industry activities.

Stur geon are unique species with r egards to longevity , spawning maturity, intolerance to pollution, etc. Consequently, genetic mixing, disease, and parasite infection, etc. could severely impact wild populations. Unlike most traditional species that may only requir e a few years to recover, recovery of a sturgeon population may take between one and two generations. Although private rearing and introductions may supplement existing populations and fisheries, it is imperative that the feasibility of such actions be completely evaluated before accepting this policy.

I. The lack of adequate statewide management goals and policies have impaired the progress of sturgeon management in Wisconsin.

Generally, the effective management of a particular species r evolves ar ound the pr esence and implementation of a concise management plan that identifies issues and problems and the associated strategies to addr ess each of them. To date, such a complete management plan does not exist for stur geon in W isconsin. In some cases, the absence of a plan has impair ed management of the species. A stur geon management plan developed thr ough a coordinated planning ef fort with agency, govern mental, university, tribal, and private inter ests will elevate the concerns r egar ding stur geon management to the appropriate administration and will provide a framework for decision making in the future.



OBJECTIVES AND MANAGEMENT RECOMMENDATIONS

Thr ough several facilitated workshops, members of the Stur geon Management Assessment Team identified several key objectives for successful sturgeon management and listed a variety of recommendations that would ultimately meet those objectives. The recommendations listed below have been given a priority order by being assigned either a high (H), medium (M), or low (L) designation.

1.0 Sturgeon Population and Life History Information Needs

Objectives
- 1.1 Maintain/enhance current sturgeon population assessments
- 1.2 Develop and implement standardized population assessments on all existing populations
- 1.3 Conduct life history research/assessments where needed

Recommendations
- a. Develop as standardized collection techniques as possible to conduct population studies (estimates, age/growth, size structure, etc.) (H)
- b. Establish a priority list of waters that need assessment work (H)
- c. Assess success of reintroductions by methods identified in Objective 1.2 (H)
- d. Identify characteristics that correlate with successful reproduction and recruitment (e.g., fungus mortality of eggs, predation on various life stages, assessment of spawning grounds) (M)
- e. Identify seasonal migration patterns (M)
- f. Identify natural sex ratios (M)
- g. Assess homing and imprinting behavior (M)
- h. Identify other research needs as appropriate (M)
- I. Search for remnant populations (L)

2.0 Habitat Protection and Enhancement

Objectives
- 2.1 Identify critical habitats and habitat requirements for various life stages
- 2.2 Identify barriers and other factors within systems negatively affecting sturgeon populations
- 2.3 Enhance habitat where possible

Recommendations
- a. Identify critical seasonal habitats and improvement opportunities (H)
- b. Ensure the impacts of dams and habitat needs of species are considered during the FERC relicensing process (H)

c. Work with dam owners to ef fectively manage or impr ove habitat in fragmented river systems. Consider dam removal, if warranted, to reconnect fragmented populations. Educate public on the impacts of dams and benefits of dam r emoval. (H)
d. Use proper flow management at dams to benefit species (including development of appropriate HSI curves for various life stages) (H)
e. Use washed rock riprap (>6") as material to create new or supplement existing spawning habitat (H)
f. Provide passage at dams where feasible and where passage would benefit sturgeon populations (H)
g. Discourage riparian uses that negatively affect populations (H)
h. Encourage riparian uses that benefit populations (M)
I. Evaluate habitat improvement pr ojects (M)
j. Complete W olf River stur geon spawning substrate and flow study r eport (M)
k. Determine water quality needs for populations (L)

3.0 Genetics and Propagation, Transfers, and Reintroduction

Objectives

3.1 Define existing strains/populations and r ole of genetics in management and rehabilitation or r eintr oduction
3.2 Ensur e statewide commitment and coor dination of stur geon pr opagation pr ograms
3.3 Maximize genetic variability in hatchery r eared fish used for rehabilitation or reintr oduction
3.4 Establish best technical criteria and pr otocol for maximum quality assurance in propagation ef forts

Recommendations

a. All stocking and r eintr oduction pr oposals be r eviewed by Stur geon Manage ment Assessment T eam (H)
b. Use similar strains within basin for stocking and transfers, unless extirpated in the basin (H)
c. Form a committee to establish genetic hatchery guidelines, standar ds, and technical criteria for the pr opagation of lake stur geon. (follow existing guidelines until own guidelines can be developed) (H)
d. Acclimate fish to water body prior to r elease (H)
e. Annually stock at the suggested minimum densities for r ehabilitation purposes for a r ecommended duration of 25 years of:

Fry	Fingerlings		Yearlings
Based on availability	River	80 per mile	40 per mile
and objectives	Lakes	1 per 2 acr es	1 per 4 acr es

These recommended rates were based upon estimated population densities of the Menomonee River (for the river rates) and Lake Winnebago (for the lake rates).The historical estimated population densities in both waters were used as starting points from which the number of fingerlings and/or yearlings needed on an annual basis to effect a complete recovery of the stock, were estimated. The true effectiveness of the implementation of these rates has not been tested and will need to be evaluated as lake sturgeon rehabilitation projects proceed. For rehabilitation of extirpated or severely depressed stocks, it is recommended that annual stocking occur for at least 25 years or one generation of a lake stugeon population.Well designed stocking evaluations conducted during that time period will provide the data necessary to adjust the stocking rates as needed to result in the ultimate densities desired for the target water

Priority List of Wisconsin Lake Sturgeon Rehabilitation Waters - The Sturgeon Management Assessment Team categorized the following waters as priorities in the lake sturgeon rehabilitation process:

A. Waters with ongoing restoration efforts:

- The Wisconsin River from Stevens Point to Lake Du Bay
- The Menominee River below Sturgeon Falls
- The Upper Flambeau River - Manitowish River system
- The St. Louis River
- The Bad River
- Menominee Reservation Waters - Middle Wolf River System; Legend Lake
- St. Croix/Namekagon River System

B. Waters in which rehabilitation can begin:

- The Upper Fox River from Princeton to Lake Butte des Morts
- Green Bay and its tributaries

C. Other potential rehabilitation waters (will need more information, plan development, etc. before rehabilitation efforts can begin):

- Lake Michigan and its tributaries
- Lake Superior and its tributaries
- Lac du Flambeau Reservation waters
- Red Cedar River
- Mississippi River

4.0 Harvest and Fisheries Information Needs

Objectives 4.1 Develop and implement standardized exploitation assessments

Recommendations

a. Develop standardized catch/harvest assessment techniques that include a measure of exploitation, effort, and age, size, and sex of fish (registrations, rotational creel surveys) (H)
b. Determine incidental catch and harvest of sturgeon in commercial fishing operations (identify areas open to commercial fishing contracts that may be closed in future) (H)
c. Continue Winnebago spearing assessment (H)
d. Examine impact of regulations (length limits, season, etc.) on spearing and hook and line fisheries (H)
e. Conduct literature review on exploitation of sturgeon fisheries (M)
f. Determine hooking mortality of sturgeon (M/L)
g. Determine impact of barriers that concentrate fish and increase harvest (L)
h. List chronology of sturgeon regulations (L)

5.0 Population Densities

Objectives 5.1 Manage lake sturgeon populations with biologically and conservationally sound goals.
5.2 Reestablish sturgeon throughout their former range

Recommendations

a. Manage for densities of Age 2+ fish at 250 fish/mile in inland rivers and 1.5 fish/acre in lake systems. (combination in flowages). Populations should be ideally represented by males up to 40 years of age and females up to 70 years of age.

6.0 Regulations and Enforcement

Objectives

6.1 Manage average annual exploitation of populations at or near 5%
6.2 Maintain strong enforcement of sturgeon regulations at all times
6.3 Protect remnant and rehabilitating sturgeon populations

Recommendations

a. Create separate licensing fee structure for H/L sturgeon fisheries (H)
b. Designate all monies collected from sturgeon licensing be used for sturgeon management and assessment work (H)
c. Standardize license and carcass tag procedures between spearing and hook and line (Tyvac tag, fee, registration procedure/information collection) (H)
d. Evaluate current minimum length limits and expand harvest assessment to make recommendations by 2002 (H)
e. Remove remnant populations from hook and line harvest opportunity (H)
f. Incorporate the hook and line sturgeon tag into the Automated License Issuance System (ALIS) (H)
g. Implement Oct. 1 license sale deadline for Winnebago spearing license (H)
h. Examine the possibility of requiring a "harvest" tag or quota system to manage harvest on hook and line fisheries (H/M)
i. Work with tribal interests to review and compare tribal and nontribal sturgeon harvest (H/M)
j. Develop one statewide sturgeon regulation and information pamphlet (tip card, etc.) (M)
k. Review boundary water regulations and promote regulation consistency (M)
l. Continue Fox/Wolf River "sturgeon patrol" and encourage other patrols on other waters (M)
m. Ensure and enhance FH/LE integration on sturgeon issues (M)

7.0 Public Input and Involvement

Objectives

7.1 Maintain proactive public involvement in sturgeon management
7.2 Develop and implement statewide public education program for sturgeon and sturgeon management

Recommendations

a. Maintain Sturgeon Management Assessment Team to implement and update Sturgeon Management Plan and review ongoing management activities (H)
b. Develop and implement local public involvement where necessary (Sturgeon Advisory Committee, Sturgeon for Tomorrow, etc.) (H)
c. Identify target audiences for sturgeon information, type of information and exchange needed, and develop appropriate educational materials to meet identified needs (e.g., video, posters, curricula, exhibits) (H)
d. Create web page that will surve as a clearinghouse for sturgeon information and education in Wisconsin. (H)
e. Produce annual sturgeon harvest and management report that includes information on spearing, hook and line, and tribal harvest (H)
f. Draft fact sheet of Sturgeon Management Plan to distribute with hook and line tag applications and sturgeon spearing licenses. (H)
g. Work with local interests to create Sturgeon for Tomorrow chapters through out the state (M)

8.0 Commercialization, Privatization, and Scientific Use of Sturgeon Resources

Objectives

8.1 Minimize/eliminate potential problems and threats from aquaculture operations and scientific users.

8.2 Prohibit the importation and distribution of all sturgeon species as a hobby fish for aquaria.

8.3 Establish a cooperative partnership agreement between the Department of Natural Resources, USFWS, Department of Agriculture, Trade, and Consumer Protection (DATCP), academia, tribes, other agencies, and the commercial aquaculture industry for the propagation of lake sturgeon, hereafter referred to as the Wisconsin Lake Sturgeon Aquaculture Agreement (WLSAA) using established technical criteria (from Objective 3.4) to assure the production of the highest quality product.

Recommendations

a. Restrict all sturgeon species propagation to DNR, USFWS, DATCP, tribal, academia, and commercial aquaculture under a WLSAA agreement for research and rehabilitation (statute change) (H)

b. Prohibit live sturgeon and/or gametes on any license except under the WLSAA agreement (H)

c. Require a scientific collector permit application for those interested in collecting and conducting research on sturgeon. A complete study proposal or plan of work with the following sections should be submitted with the application: Background, Objectives, Approach, Expected Results, Application of Results, References, and Qualifications of Participants. Additionally, applicants will be required to submit annual reports on their progress and a complete report on their project results within 90 days of project completion. Applications will be reviewed by 1) the local fisheries biologist, and 2) the Sturgeon Management Assessment Team. Note: Research cooperators are expected to conform to above reporting standards (H)

d. Use technical criteria for propagation established in Objective 3.0 in the development of the WLSAA agreement. (H)

e. Determine current jurisdictions and authorities

9.0 Management Plans

Objectives

9.1 Develop, implement, and update as needed a statewide sturgeon management plan for Wisconsin

Recommendations

a. Implement statewide sturgeon management plan (H)

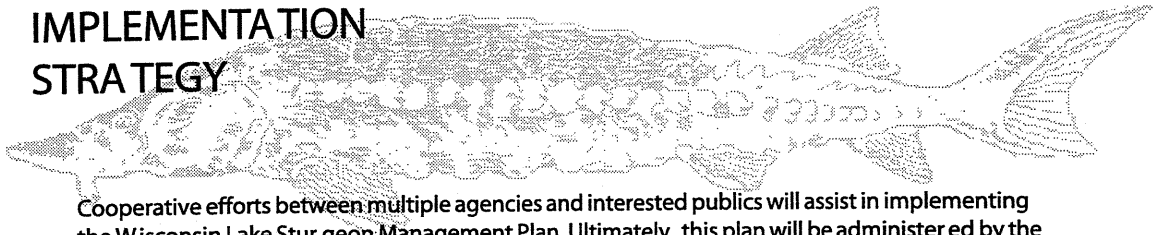
b. Develop and implement drainage and water specific management plans (H)

c. Ensure sturgeon management recommendations are addressed in WDNR watershed or basin management plans (H)

d. The Sturgeon Management Assessment Team should meet annually to assess implementation of Plan and conduct plan updates when necessary (H)

e. Central Office fisheries liaison should be responsible for overseeing the implementation of the statewide sturgeon management plan and coordinating activities of the Sturgeon Management Assessment Team (M)

IMPLEMENTATION STRATEGY



Cooperative efforts between multiple agencies and interested publics will assist in implementing the Wisconsin Lake Sturgeon Management Plan. Ultimately, this plan will be administered by the Department of Natural Resources, through the Bureau of Fisheries Management and Habitat Protection, and through joint projects and partnerships with public and private groups and other individuals interested in sturgeon management.

The Sturgeon Management Assessment Team will continue to function as a recognized team, representing a cross section of various sturgeon interests. The Department of Natural Resources or other responsible agencies, working with the public, will determine the feasibility of and develop cost estimates for implementation of various management options suggested in the Plan.

The Wisconsin Lake Sturgeon Management Plan is a management guide developed through the work of dedicated groups and individuals having a stake in the long-term management of sturgeon and other aquatic resources of the State of Wisconsin. This plan will be an ever-evolving one that will be implemented by people who enjoy and depend on the recreational, cultural, and commercial opportunities offered by Wisconsin's sturgeon resource.

THE STURGEON MANAGEMENT ASSESSMENT TEAM

Name	Affiliation
Ron Bruch	WDNR Fisheries and Habitat- Oshkosh
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Gerry Bever	WDNR Fisheries and Habitat - Park Falls
Mark Brann	WDNR Law Enforcement - Eau Claire
Bill Casper	Sturgeon for Tomorrow
Doug Cox	Menominee Tribe
Larry Damman	WDNR Fisheries and Habitat - Spooner
Steve Fajfer	WDNR Fisheries and Habitat - Wild Rose
Tim Gollon	Gollon Bait Company, Dodgeville
Steve Hewett	WDNR Fisheries and Habitat - Madison
Dennis Jones	WDNR Law Enforcement - Oshkosh
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Harold Kachur	Wisconsin Wildlife Federation
Joe Kurz	WDNR Fisheries and Habitat - Chippewa Falls
Tim Larson	WDNR Fisheries and Habitat - Poynette
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Jeremy Pyatskowit	Menominee Tribe
Henry Quinlan	USFWS - Ashland FRO
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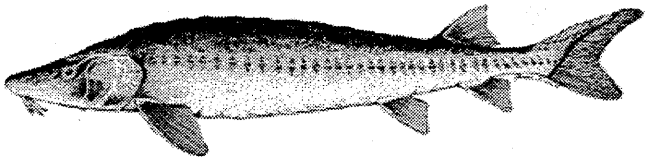
Karl Scheidegger	WDNR Fisheries and Habitat- Madison
Steve Schlimgen	WDNR Law Enforcement - Poynette
Streve Schram	WDNR Fisheries and Habitat - Bayfield
Steve Thompson	Winnebago Sturgeon Advisory Committee
Tom Thuemler	WDNR Fisheries and Habitat - Peshtigo
Larry Wawronowicz	Lac du Flambeau Tribe
Jack Zimmerman	WDNR Fisheries and Habitat - WI Rapids

BIOLOGY AND STATUS OF LAKE STURGEON IN WISCONSIN

The following biology and life history characteristic information has been taken from Becker (1983).

LAKE STURGEON

Description - . Body heavy, torpedo-shaped, angular (5-sided) in young, but round in adults. Total length of adults around 45" or more. Snout short, conical. Spiracle present. Caudal peduncle short, stout, partly naked. Lower lip with 2 lobes. Barbels on lower snout, smooth (4). Upper lobe of tail fin pointed without threadlike (filamentous) extension (compare with shovelnose sturgeon). Young gray or brown dorsally with dusky dorsal and lateral blotches. Adults gray to olivaceous dorsally , white ventrally .



Lake sturgeon , Acipenser fulvescens

Distribution and Populations Status. - The lake sturgeon occurs in the Mississippi, Lake Michigan, and Lake Superior drainage basins. In the Mississippi River drainage it occurs in the Mississippi, St. Croix, Chippewa (and major tributaries), and Wisconsin rivers. In the Wisconsin River , records place it upstream to the Castle Rock Flowage (Adams County).

In Lake Superior it is found in the comparatively shallow waters of Keweenaw Bay , in the vicinity of the Apostle Islands, and it is known to spawn in the Bad River (Ashland County). It has been occasionally taken in St. Louis Bay. In the Lake Michigan basin it occurs in Green Bay, Lake Michigan, the Menominee River upstream to the White Rapids Dam, the Fox River upstream to Lake Puckaway , and the Wolf River upstream to Shawano. This system includes Lakes Winnebago, Butte des Morts, and Winneconne, and the Embarrass River . It has been introduced to lakes where natural reproduction did not occur , among them: Big Cedar Lake (Washington County), the Madison lakes (Dane County), Chain of Lakes (Waupaca County), and Pear Lake (Washburn County).

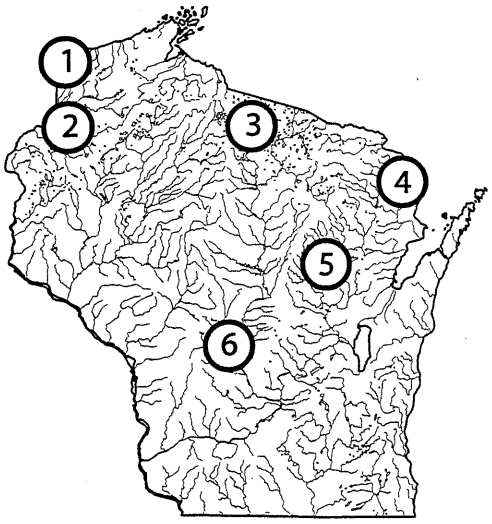
The lake sturgeon is listed as a rare species in the United States. Over most of its range in the United States, it appears to be threatened. In Wisconsin, it is common in the Menominee River , the lower Wolf River , Lakes Poygan and Winnebago, Lake Wisconsin, the St. Croix River to Gordon Dam, Namekagon River below Trego Dam, and the Chippewa and Flambeau rivers. It is uncommon to rare in the lower Wisconsin River , Mississippi River , the Madison lakes, and Lakes Michigan and Superior . The Wisconsin Department of Natural Resources has given the species "watch" status.

Distribution of lake sturgeon, Acipenser fulvescens, in Wisconsin as reported by Greene (1935)

Biology and Habitat. - The lake sturgeon is a typical inhabitant of large rivers and lakes. It lives in shoal water in the Great Lakes. Inland it shows a preference for the deepest midriver areas and pools.
Biology. - Spawning takes place during late April and early May in central Wisconsin. In the St. Croix River, spawning migrations occur in May and early June. In the Wolf River, during seasons when water flow is high and water temperatures rise slowly, spawning begins when the water temperatures reach 53 F. During other times, spawning may not occur until water temperatures reach 58-59 F.
Males are observed at the spawning sites before the females. They cruise the spawning area in groups of eight or more fish, and are frequently so close to the bank that they can be readily captured. Spawning begins as soon as a ripe female enters the group. Several males attend one female by swimming along side her in the same direction, usually against the current. Once spawning takes place, one or more males vibrate simultaneously alongside a female. The average spawning act lasts about 5 seconds. The spawning activity of one female may last from 5 to 8 hours, but may extend over a period of a day or more. Males release milt at the same time the eggs are extruded. Spawning may occur in water from 1 foot up to 15 feet. The eggs are black in color and very adhesive (3 mm in diameter). There is variation in the number of eggs produced by females - anywhere from 50,000 to 700,000 eggs may be released.

Hatching time for the eggs is a function of water temperature. Hatching may occur in 8 days at temperatures of 55-57 F., or in as little as 5 days at water temperatures in the low 60's F. Young sturgeon are nearly 8 mm at hatching and up to 21 mm (almost an inch) at 16 days post hatch.
A female lake sturgeon reaches sexual maturity when she is 24-26 years old and about 55 inches long. Thereafter, instead of spawning every spring, females spawn once every 4-6 years. Few males mature before they are 45" long. Most males spawn every other year. In Wisconsin, male and female sturgeon grow at the same rate, but females live longer than males.

Lake sturgeon travel in loose aggregations, leaving them only at the time of spawning. Occasionally they will move downstream over a dam or a series of dams outside of their home basin.



Lake Sturgeon
Restoration Areas

1. St. Louis River
2. Yellow River
3. Upper Flambeau/ Manitowish River
4. Menominee River
5. Wolf River
6. Middle W isconsin River

Restoration Opportunities. - Over the years, sturgeon populations have declined due to habitat degradation, dam construction, water quality problems, and possibly overexploitation. Efforts to manage, conserve, and restore stur geon populations have been conducted by the U.S. Fish and W ildlife Service, individual States, Tribes, interstate fisheries commissions, public agencies, universities, and private aquacultur e inter ests. W isconsin's curr ent lake stur geon management guidelines call for the "r establishment of lake stur geon in waters within their original range where there is a reasonable possibility of developing self-sustaining populations through natural reproduction", and to "cooperate with other states in their efforts to reestablish lake sturgeon populations in appropriate waters within their original range."

Curr ently, there ar e a number of ongoing restoration efforts involving lake stur geon populations in W isconsin:

- St. Louis River . - The St. Louis River has r eceived either lake stur geon fry, fingerlings, and yearlings from the WDNR and Minnesota Department of Natural Resources since the mid 1980's. Because of genetic concerns with the stocking of fish from outside the Lake Superior basin (W olf River fish, in this case), the restoration efforts were curtailed for several years. Since the mid to late 1990's sturgeon have been propagated in cooperation with the Michigan Department of Natural Resources from the Sturgeon River, an intrabasin sour ce. In 1998, almost 7,000 fingerling stur geon wer e stocked by W isconsin with an additional 7,000 fingerlins given to Michigan for their restoration efforts. In 1999, lake sturgeon were once again pr opagated and the r esultant fry wer e stocked into the St. Louis River .

- Yellow River . - The Y ellow River is a tributary to the St. Cr oix River that flows into Yellow Lake, the current location of the state hook and line record lake sturgeon (170 lbs. 10 oz. caught in 1979). In 1995, the Department r eared and stocked 10,000 fry and 13,400 fingerlings into the Yellow River . Efforts ar e still ongoing to supplement the Y ellow River/Y ellow Lake population.

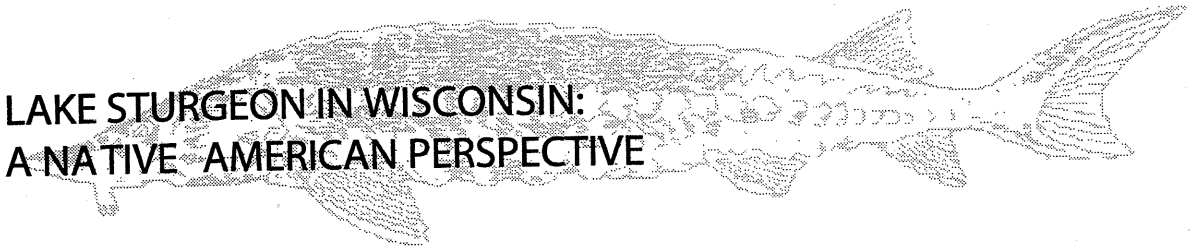
- Upper Flambeau/Manitowish River system . - Limited spawning by lake sturgeon has been documented in the Manitowish River . Consequently, attempts ar e being made to collect and spawn fish from the North Fork of the Flambeau River and stock the fry and fingerlings into the Manitowish River Brood stock were collected from the Manitowish River in 1998 and 24,000 fingerlings were stocked back into the river .

- Menominee River . - The Menominee River has been fragmented by dam construction ther eby effectively separating and isolating sturgeon populations. There is a 21-mile section of the river from Sturgeon Falls to the Chalk Hill Flowage that historically had lake sturgeon, but have since been extirpated

because of upstream pollution problems. The water quality has been restored in this section of the river but lake sturgeon have not been able to repopulate the section because of downstream dams. Restoration efforts in cooperation with the Michigan Department of Natural Resources have been ongoing in this section since 1982. Over the last five years, about 25,000 fingerlings and yearlings have been reared and stocked (9,900 fingerlings in 1995, 2,400 fingerlings in 1997, 5,000 fingerlings and 600 yearlings in 1998, and 8,000 fingerlings in 1999).

- Wolf River. - The Department is currently cooperating with the U.S. Fish and Wildlife Service and the Menominee Indian Tribe on implementing a lake sturgeon management plan for Menominee Reservation waters. The plan is an attempt to establish and maintain quality habitat and a viable lake sturgeon population on the reservation. Juvenile and adult sturgeon have been transferred since the mid 1990's.

- Middle Wisconsin River. - Efforts to restablish lake sturgeon in the middle Wisconsin River (Castle Rock and Stevens Point flowages) have been underway since 1991. About 200 juvenile and adult sturgeon (27" - 44") were initially transferred from Lake Wisconsin during 1991-1992. Adult transfers were suspended in 1993 because of concern over the population in Lake Wisconsin. Recently, WDNR crews have been able to collect and spawn sturgeon from the lower Wisconsin River, rear the fry at the Wild Rose Hatchery, and stock then back into the flowages.



LAKE STURGEON IN WISCONSIN: A NATIVE AMERICAN PERSPECTIVE

Lake sturgeon has been utilized by Native American peoples in Wisconsin for centuries prior to European settlement. Many tribes in northern and eastern Wisconsin held lake sturgeon in high esteem as an important source food each spring, and, as such, the fish also became quite religiously significant.

The Menominee Tribe of Wisconsin specifically has a long history of lake sturgeon utilization for various cultural and spiritual purposes. Each spring the Tribe would celebrate the return of Wolf River lake sturgeon to spawning grounds on the Reservation near Keshena Falls by holding a special ceremony to mark the beginning of new life. The building of hydropower dams on the Wolf River below the Reservation in the late 1800's prevented the sturgeon from reaching Keshena Falls and throughout the 20 th century few if any sturgeon were seen in the Wolf River on the Menominee Reservation. In the early 1990's the Menominee Tribe, along with the WI DNR and the USFWS developed and implemented the Menominee Reservation Lake Sturgeon Management Plan, which has since re-established sturgeon in most reservation waters and has re-established the connection between the lake sturgeon and the Menominee Tribe. This plan embodies many of the principles of the Wisconsin Lake Sturgeon Management Plan and will be a good complement to recovery efforts initiated elsewhere in Wisconsin through the statewide plan.

Adaptive Disease Management Strategies for the Endangered Population of Kootenai River White Sturgeon

Abstract

For the endangered Kootenai River white sturgeon (Acipenser Transmontanus Richardson) population, conservation aquaculture was identified as a prudent and necessary recovery tool due to the biological status of the population and the demonstrated uncertainties of other recovery efforts. Conservation aquaculture programs need to address potential impacts on the genetic variability, artificial selection, and effects of disease on the native population prior to development and implementation of the program. Available scientific information should be used to develop management strategies that minimize the transmission of disease from cultured fish to native fish and the potential severity of disease in the native population. The white sturgeon iridovirus (WSIV) is the most prevalent viral pathogen of the white sturgeon relative to its distribution and frequency of occurrence, and may be endemic to wild white sturgeon populations throughout the Pacific Northwest. This case study illustrates the importance of conservation aquaculture programs in certain fishery situations. In addition, we discuss how management strategies must remain flexible and must adapt to current available scientific information to provide maximum benefits. Management of the Kootenai River white sturgeon population represents a model cooperative effort of the professional fisheries scientists from private industry; academia; Native American tribes; and provincial, state, and federal government agencies. This cooperation is an essential prerequisite for successful achievement of the program goals. Cooperation is also necessary adaptation of management strategies as information is developed.