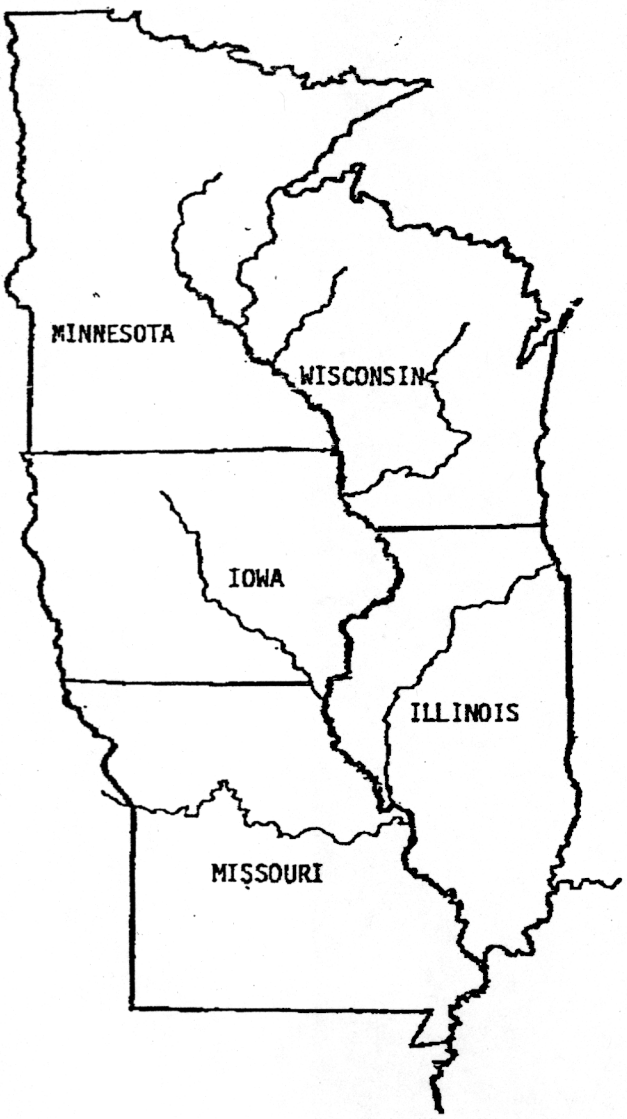

A STRATEGIC PLAN FOR THE MANAGEMENT OF THE FRESHWATER MUSSEL RESOURCES OF THE UPPER MISSISSIPPI RIVER

PREPARED BY A COMMITTEE OF THE

FISH TECHNICAL SECTION OF THE
UPPER MISSISSIPPI RIVER
CONSERVATION COMMITTEE

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prepared by:

Mussel Management Committee - Fish Technical Section

Upper Mississippi River Conservation Committee

INTRODUCTION

Since the late 1890's, the freshwater mussel resource of the upper Mississippi River(UMR) has been subjected to numerous environmental changes and extensive commercial exploitation, which have contributed to the gradual degradation of this valuable natural resource. Renewed commercial exploitation during the 1965-1972 period and again since 1978, coupled with documented evidence of extensive mortality of an unknown origin from 1982 to 1985, has caused further degradation of mussel stocks. The existence of one, and possibly two, federally endangered mussel in the UMR species may be in jeopardy because of continued heavy commercial harvest and recurring die-offs. The situation is exacerbated by the fact that so little is known about the biology and the many environmental factors which govern the existence of these animals.

Purpose of Plan

The Fish Technical Section of the Upper Mississippi River Conservation Committee (UMRCC) has developed this plan to accomplish two purposes: (1) to document the many problems which are barriers to effective mussel resource management efforts and (2) to prescribe a strategic plan of action, which if implemented, will provide resource managers the vital information and capabilities needed to effectively manage the valuable freshwater mussel resources of the Mississippi River and its tributaries.

HISTORY OF THE RESOURCE

It was not until the mid-1850's, when a large gem-quality pearl was found by a New Jersey shoemaker in his evening meal of mussel meats, that any particular attention was given to freshwater mussels. This incident set off a wave of "pearl" fever, which gradually spread south and westward. Upon the discovery of gem-quality pearls in mussels of the Pecatonica River in Wisconsin in 1889, thousands of people within the upper Mississippi River (UMR) basin began to harvest mussels in hopes of finding instant wealth. "Pearling" soon became an important industry as noted in the U. S. Fish Commissioner's report for 1891 "that pearls worth about $300,000 had been harvested from the upper Mississippi River".

In 1891, another industry was born that would have an even greater impact on the river's mussel resources. John Boepple, a German immigrant, using mussel shells as the raw material, initiated the first production of "pearl" buttons in the basement of his Muscatine, Iowa home. Within a few years, there were three button factories in Muscatine. This industry grew rapidly; by 1908 it had a capital investment of over two million dollars. By 1912, there were 196 plants involved in one phase or another of manufacturing buttons or novelty items from mussel shells

along the Mississippi River and its tributary streams.

Mussels were harvested by various methods including wading, shallow diving, hand rakes and forks, scissor tongs, hand (pole) dredges and crowfoot bars. It was soon learned that mussel beds subjected to intensive harvest were often depleted within a few years. Ten years after the first button factory began production, the mussel beds near Muscatine were severely depleted by excessive, unregulated harvest. To meet the increasing demand for shells, the mussel fishery quickly spread to other portions of the river and its tributary streams in Minnesota, Wisconsin, Missouri, and Illinois. By 1920, shell tonnage harvested from these regions also began to decline sharply. In 1925, to allow some recovery of depleted mussel stocks, Iowa and Illinois established a series of staggered mussel preserves between Dubuque and Burlington, Iowa. By this time, the majority of mussel shells supplied to button factories were being harvested from other states such as Indiana, Kentucky, Arkansas, Tennessee, and Alabama.

Concerned that the economic stability of their communities would suffer if dependable supplies of mussel shells were not maintained, industry and local businessmen sought federal and state agency assistance to restore depleted mussel stocks as early as 1905. The U. S. Bureau of Fisheries responded by establishing a biological research station at Fairport, Iowa in 1914 to conduct fish and mussel research. Mussel propagation soon became an important part of the station's work. This work continued until the early 1930's, when it became apparent that propagation techniques developed were inadequate to maintain the supply of mussels where river habitat had been extensively altered by pollution, dam construction, and navigation channel maintenance. Reflecting on the future in 1931, Dr. M. M. Ellis of the Fairport Biological Station warned that unless soil erosion and pollution problems were solved, mussels could be eliminated in some portions of the river.

Although the harvest of mussels from the UMR basin continued to decline, an adequate supply of shells from southern states within the river basin allowed the pearl button industry to flourish until about 1940. The development and production of plastic buttons caused the collapse of the pearl button industry by 1945. The loss of thousands of jobs had a devastating economic impact on numerous small river communities within the UMR basin.

Cessation of mussel harvest from the mid-40's to the mid-60's resulted in a partial recovery of mussel populations in some stretches of the UMR. However, full recovery was thwarted by the cumulative impacts of additional habitat loss and increased pollution due to domestic growth and expanded agricultural, industrial and navigational activities. Inasmuch as few people anticipated a renewed demand for mussels, concern for the welfare of these animals declined, resulting in a discontinuation of virtually all research and management efforts.

Expansion of the Japanese cultured pearl industry after World War II, coupled with the earlier discovery that mussel shells from the Mississippi River drainage basin were the finest of all pearl implant materials, lead to the resumption of intensive mussel harvest within the UMR region. Since then, thousands of tons of mussel shells have been

shipped annually to Japan. Within the last 10 years, the mussel harvest has increased sharply as a result of the Japanese having increased their production and marketing of cultured pearls. During each of the last five years (1983-1987), it has been estimated that mussel fishermen from the five UMR states have harvested shells valued at more than one million dollars.

Since 1978, several events have occurred within the UMR basin which has resulted in further degradation of mussel stocks. Depletion of commercial mussel stocks in other regions of the Mississippi River basin and higher prices being paid for shells has caused a significant increase in harvest pressure by the five state's resident and non-resident mussel fishermen. The net result was those who dove for mussels intensively scoured both old and newly-found mussel beds for all species and sizes of mussels of commercial value.

In 1982, numerous mussel fishermen and several biologists noted a large die-off of mussels had occurred during the summer. The following year, mussel divers from La-Crosse to Keokuk reported finding large quantities of shell of the commercial species which had died the previous year, far in excess of that normally found. They also indicated the die-off was still in progress based on the numerous dead mussels (meats still intact) and sick mussels being harvested. Specimens of live and dying mussels, and substrate samples from which they were collected, were sent to several laboritories to be tested for chemical contaminants and bacterial infestations. No causative agent(s) for the mortality could be identified. Die-off investigations conducted by Wisconsin and Illinois researchers indicated mussel mortality rates ranging from 20 to 40 percent.

Although no reports were received of mussel mortality during the summer of 1984, conversations with mussel fishermen later in the year disclosed that a limited die-off had indeed occurred. Reasons given for not reporting the die-off were that it was not as severe as the previous two years and they were fearful state natural resource agencies would halt mussel harvest. Inasmuch as knowledge of continued mortality was not learned until late fall, no additional mussel samples were taken for diagnostic purposes.

By the third week of June 1985, biologists from several UMR states had received reports that the die-off had resumed. Several samples of live and moribund mussels were again collected and sent to fish and mussel pathologists. Their analysis revealed that the animals appeared to have been healthy (in good body condition with normal gametogenesis in progress) right up to the time of death. No causative agent(s) could be identified in these samples or others collected and submitted to different pathology labs later during the year.

Of the UMR commercial mussel fishermen interviewed during the year, many were of the opinion that 40 to 75% of all washboard Megalonaias nervosa and three-ridge Amblema costata mussels had been killed in the beds they harvested upstream of Keokuk, Iowa. While the die-off may not have been as devastating as believed, a survey by Illinois biologists of a Pool 15 mussel bed did indicate an overall mortality rate of 17.9% for the 25 species collected. Mortality rates found for individual species were 21.9% for washboards, 25.8% for pimpleback Quadrula pustulosa, 22.8%

for three-ridge, and 28.8% for fawnsfoot Trancilla donaciformis. Since 1985, the severity of the die-offs has also been reflected in the commercial harvest; more than 60 percent of the washboard mussels harvested by Illinois mussel fishermen from Pools 12 to 19 has been recent-relic shells.

Alarmed by recurring mussel mortality, intensified harvest, and concern for endangered species, fishery managers of the five UMR states of Minnesota, Wisconsin, Iowa, Illinois, and Missouri met during the fall of 1985 to determine what action should be taken to prevent further degradation of the river's commercial mussel stocks. They recommended increasing the minumum harvest size for some commercial species, reducing the length of the harvest season, and the implementation of harvest reporting requirements. The majority of the five state resource agencies adopted the recommendations in total or part in 1986. The same year, the Fish Technical Section of the UMRCC and the U. S. Fish and Wildlife Service jointly sponsored a national mussel die-off workshop in Davenport, Iowa to share knowledge about mussel mortality and seek ways to deal more effectively with mussel management problems. Biologists from the 16 states in attendance also established an informational transfer system and agreed to seek means to call attention to the critical need for additional research and management efforts.

STATUS ANALYSIS

Currently, most UMR state natural resource agencies are ill-equipped to deal with the present mussel management crisis. They have neither adequate funding, the professional staff, nor specific on-going programs to insure the sound management of their mussel resources. The recent adoption of more stringent harvest regulations has not substantially reduced the level of harvest. The cause(s) of mussel mortality has not been identified and little is known about the biology and population dynamics of mussels or how commercial exploitations and human-induced environmental factors has impacted these animals. Also, the lack of public awareness concerning mussel resources has resulted in little support for action on the part of state natural resource agencies.

The managment of the UMR mussel resource is further complicated by the fact that it is a shared system resource. Thus, independant management efforts on the part of one or two states cannot in total safequard such a valued resource. Such requires that all states, although autonomous by nature, jointly adopt and cooperately initiate a realistic plan of action to achieve common management goals. This is such a plan. Presented herein are the major problems which must be addressed if sound management of the UMR mussel resource is to be achieved. The strategies indicate what should be done to solve the specific problems identified. The objectives are defined as recommended courses of action or tasks to be accomplished within the next ten years.

GOALS, PROBLEMS, STRATEGIES AND OBJECTIVES

PLAN GOALS

Implementation of this plan will ultimately provide resource managers with the knowledge and management capabilities to:

1. Maintain and enhance current species diversity and abundance of the freshwater mussel resources including the threatened and endangered species of the UMR and its tributaries.

2. Maintain a level of sport and commercial harvest compatible with the maintenance of healthy, self-sustaining mussel populations.

PROBLEM 1. Management of the upper Mississippi River (UMR) mussel resource cannot be addressed adequately on an agency by agency or state by state basis.

Strategy: Establish a permanent Mussel Management Coordination Committee (MMCC) within the framework of the Fish Technical Section of the Upper Mississippi River Conservation Committee (UMRCC) to foster the implementation of this strategic mussel management plan.

Objectives:

- Within three months following adoption of this plan, establish a MMCC with at least one representative from each of the five UMRCC states. - Within six months of being established, the MMCC shall determine its role in implementation of this plan, subject to approval by the Fish Technical Section and Executive Board of the UMRCC. The role of the MMCC may include, but not be limited to, such activities as establishment of priority mussel research and management needs; collection and publication of mussel harvest statistics; review of critical environmental issues; provide professional consultation services; and development of standard mussel harvest reporting procedures, uniform mussel mortality investigation procedures, uniform or reciprocal mussel regulations, and public education programs and materials.

PROBLEM 2. Funding for mussel research and management programs is inadequate or lacking.

STRATEGIES:

- State DNR/DOC agencies should allocate or seek funding to employ professional staff to develop a viable mussel management program

- Funding assistance should be sought from other state and federal agencies, such as the U.S. Fish and Wildlife Service, National Marine Fisheries Service, Environmental Protection Agencies, Public Health agencies, etc.

- Funding assistance should be sought from other sources, such as allied corporations, natural resource-oriented groups and utilization groups (mussel fishermen, shell buyers, biological supply companies, etc).

- Additional funding should be sought through the creation of a user tax, such as a tax on exported shells or those foreign products produced from mussels or mussel shells.

Objectives:

- Through the auspices of the UMRCC, urge UMR states to employ the professional staff needed to develop a viable mussel management program by 1991.

- Identify all potential sources of funding from other state and federal agencies such as the U. S. Fish and Wildlife Service, National Marine Fisheries Service, Public Health and Environmental Protection Agencies, by 1991.

- Identify potential sources of funding from natural resource-oriented groups, science foundations, and allied corporations by 1992.

- Develop a legislative bill to establish an import or export tax on mussel products and seek legislative sponsorship by 1992.

- Obtain funding commitments from sources other than state DNR/DOC agencies for three priority mussel research projects by 1994.

PROBLEM 3. Inadequate information exists about the biology and population dynamics of freshwater mussels. What information does exist is scattered throughout numerous governmental publications, in-house agency reports, and professional journals.

Strategies:

- A thorough search for and synopsis of pertinent information related to freshwater mussels should be made.

- Life history and population dynamics research projects should be initiated to obtain information vitally needed about the reproduction, recruitment, food habits, age, growth, habitat preferences, etc. of mussels.

- Determine the location, species composition and density of mussel beds within the navigation pools of the UMR.

- A Computerized informational storage system should be developed to facilitate research and management efforts.

- An information transfer system should be established to facilitate the sharing of information regarding ongoing mussel research and management efforts with other professionals within the Mississippi River drainage basin system.

Objectives:

- Design and sponsor a project to locate, review, abstract, and publish a synopsis of all available information pertinent to mussels of the Mississippi River watershed basin by 1993.

- Obtain funding to establish a computerized informational storage system and entry of reference material and known data by 1995.

- Design and encourage the initiation of life history research projects for three species of mussels by 1993.

- Design and encourage initiation of surveys to determine the location, species composition and densities of mussel beds found within each UMR pool, commencing in 1992.

- Establish an active informational transfer system within the Mississippi River watershed basin by 1992.

- Sponsor a national mussel management seminar in 1993.

PROBLEM 4. The cause(s) and extent of the 1982-1985 mussel die-off, which has varied in intensity over a 450 mile stretch of the Mississippi River, are not known.

Strategies:

- Research projects should be initiated as quickly as possible to determine the cause(s) of mussel die-offs in the UMR.

- Standard procedures for reporting and investigating mussel die-offs should be developed and adopted by UMR states.

- UMR states should establish a dedicated fund to permit the rapid assessment and diagnosis of mussel mortality as soon as it occurs.

Objectives:

- Encourage the design and initiation of a research project by 1990 to investigate the potential for bacteria and or parasites to cause sudden outbreaks of mussel mortality.

- Encourage the design and initiation of a research project by 1993 to investigate if Asiatic clams or snails might contribute to mussel die-offs.

- Encourage the design and initiation of a research project by 1992 to determine the kinds and amounts of chemicals found daily in the UMR

- Design standard procedures for reporting and investigating mussel die-offs by 1991 and encourage adoption of such procedures by UMRCC states.

- Encourage UMR states to establish a joint fund permitting the rapid assessment and diagnosis of mussel die-offs by 1992.

- By 1990, enlist the cooperation of concerned mussel fishermen along the course of the UMR to report early signs of mussel die-offs.

- Encourage the design and initiation of a research project by 1995 to develop a mussel tissue cell line to make virological studies possible.

- Establish a monetary value for mussels for the purpose of damage assessment by 1992.

PROBLEM 5. UMR states lack trained personnel and programs to adequately address all aspects of mussel management.

Strategy:

- State and federal agencies involved in the management of the UMR and its fauna should employ professional staff to

develop and initiate a program which will promote the sound management of the UMR mussel resource.

Objectives:

- Encourage UMR states to employ at least one professional malacologist and necessary technical staff to develop and implement a mussel management program by 1991.

- Encourage UMR states to develop a mussel education program for their conservation law enforcement personnel to enable them to be more effective in their enforcement of mussel laws and regulations by 1992.

- Encourage the U. S. Fish and Wildlife Service and Corps of Engineer Districts to employ a professional malacologist to coordinate and participate in mussel research, management and protection efforts by 1992.

PROBLEM 6. Lack of knowledge concerning the life histories of endangered and threatened mussels and the impacts of habitat degradation and extensive commercial harvest upon these animals has been a barrier to the implementation of plans to ensure their protection and or enhancement.

Strategies:

- Research projects should be initiated as soon as possible to obtain the essential knowledge needed to develop and implement effective management plans to insure the continued existence of endangered and threatened mussels.

- Protection should be afforded those areas found to contain populations of endangered and or threatened mussels.

Objectives:

- Encourage the design and initiation of life history research projects for each endangered mussel species by 1991.

- Commencing in 1991, encourage the initiation of surveys to determine the location and distribution of mussel beds containing populations of endangered and threatened mussels in one pool of the UMR each year.

- Recommend the establishment of mussel sanctuaries or other methods to afford protection for those UMR mussel beds found to contain populations of federally and or state listed endangered and threatened mussels.

- Encourage the continued development of propagation techniques to facilitate the restoration of populations of endangered and threatened mussels in the UMR.

- Encourage state and federal funding to implement endangered mussel recovery plans commencing in 1992.

PROBLEM 7. The physical and chemical alterations to UMR habitat caused by agricultural, industrial, navigational, mineral removal, and municipal ac-

tivities are unknown or poorly understood.

Strategies:

- Research projects should be initiated to quantify the adverse impacts to mussels created by physical modifications of UMR habitat by agricultural, industrial, navigational, domestic and mineral removal operations.

- Encourage state and federal agencies to use their regulatory authority to strengthen their enforcement capabilities to reduce or abate pollution of the UMR, by establishing more restrictive laws, substantial violation penalties, and better enforcement powers.

Objectives:

- Encourage the design and sponsorship of research projects to quantify the adverse impacts to mussels resulting from barge navigation and navigation channel maintenance operations, commencing in 1992.

- Encourage the design and sponsorship of a research project by 1991 to determine the kinds and amounts of chemicals present in the UMR on a daily basis for a one year period by.

- Encourage the design and sponsorship of a research project to document the adverse impacts of increased sedimentation resulting from agricultural and other activities by 1992.

- Seek federal cooperation by 1993 to design and sponsor research efforts to determine toxicity of chemicals to mussels found in the UMR.

- Encourage state and federal agencies to adopt and implement regulations which require critical review of all existing activities or proposed projects that have the potential to degrade the UMR aquatic habitat or its many life forms, including mussels.

- Encourage state and federal agency support to phase out the permitting of mineral removal operations by 1994.

PROBLEM 8. The magnitude of commercial harvest and the impacts of commercial exploitation and harvest methods are not well known.

Strategies:

- Develop means to accurately assess the magnitude of annual commercial harvest of mussels from the UMR.

- Determine the impacts of commercial exploitation upon the UMR mussel resource.

- Determine the impacts of various harvest methods upon the mussel resource of the UMR.

Objectives:

- By 1991, develop and encourage UMR states to adopt a uniform annual reporting system to obtain reliable statistics concerning mussel harvest and shell tonnages purchased and exported.

- Encourage UMR states to impose stiff penalties for non-compliance to report mussel harvest and utilization statistics.

- Design and recommend the initiation of a research project by 1992 to determine what impacts various mussel harvest methods have on the UMR mussel resource.

- Design and recommend the initiation of a research project to determine what levels of commercial harvest can be permitted without affecting the maintenance of self-sustaining mussel populations by 1993.

- Seek a committment from the National Marine Fisheries Service by 1991 to collect and publish statistics relative to the national annual commercial harvest and export of mussel shells.

- Develop and recommend the adoption of uniform regulatory measures where research or other conditions indicate such changes are warranted to prevent serious degradation of the UMR mussel resource.

- Develop, publish and disseminate a public version of this Strategic Mussel Management Plan by 1992 to inform governmental agencies and natural resource-oriented groups of what must be done to protect, maintain and potentially enhance the mussel resource of the UMR.

- Develop and initiate procedures to keep governmental and public interest groups aware of current or critical issues associated with the management of the UMR mussel resource by 1993.

- Seek funding to produce an educational film or slide program about the mussels of the UMR by 1995.

PROBLEM 9. There is a lack of public and governmental awareness concerning the ecological and economic worth of freshwater mussels of the UMR.

Strategy:

- A variety of educational and informational materials, such as brochures, articles, slide and film shows, etc., should be developed, distributed or made available to educate various governmental, natural resource-oriented groups, news media and the general public concerning mussels and their values.

Objectives:

- Develop and publish a booklet by 1992 concerning mussel identification, habits, values, uses, etc. for public dissemmination.