

Nonindigenous Aquatic Species Comprehensive Management Plan

New York State Department of Environmental Conservation
Division of Fish and Wildlife
Bureau of Environmental Protection

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Executive Summary

In July 1991, the New York State Legislature passed Chapter 456 of the Laws of 1991. This bill required the Department of Environmental Conservation to develop two comprehensive management plans to eliminate or reduce environmental, public health, and safety risks associated with nonindigenous aquatic species, particularly zebra mussels. One plan would identify areas and activities other than those related to public facilities where technical and financial assistance is needed to eliminate or reduce environmental, public health, and safety risks associated with nonindigenous aquatic species. The second plan is best described as a "public facility management plan." According to guidance from the federal Aquatic Nuisance Species Task Force, the public facility management plan should be a specific plan for addressing the impacts associated with nonindigenous aquatic species infestations within public facilities. That planning requires technical and engineering capabilities beyond the scope of the Division of Fish and Wildlife. This plan will only address the natural resource-related management aspects of nonindigenous aquatic species impacts.

This proposal does not outline specific management actions for remediating the impacts of zebra mussels or any other specific nonindigenous aquatic species. Instead, it describes the goals and objectives for a program to prevent nonindigenous aquatic species introductions from occurring, and for limiting the spread of nonindigenous aquatic species already introduced into New York waters. Mitigating impacts from selected nonindigenous aquatic species introductions, and control of nonindigenous aquatic species are discussed only generally. This document is essentially a plan for a program to manage nonindigenous aquatic species impacts.

The proposal identifies four specific goals. These are:

1. Reduce the potential for future introductions of nonindigenous aquatic species into New York waters;
2. Reduce the potential for nonindigenous aquatic species that have been introduced into New York waters to spread into uncolonized waters;
3. Minimize harmful economic, ecological, and social impacts resulting from nonindigenous aquatic organisms that have already been introduced, or are proposed for introduction into the waters of New York State;
4. Educate the public on the importance of preventing nonindigenous

aquatic species introductions, and how the harmful impacts of nonindigenous aquatic species can be reduced or mitigated.

It is the goal of the New York State Department of Environmental Conservation to provide assistance to groups that are experiencing harmful environmental, economic, and social impacts from nonindigenous aquatic species introductions. This assistance could take the form of information and extension, streamlined regulatory procedures, outright financial assistance, or assistance in obtaining financial help from other sources, such as the federal government. While assisting groups with managing the impacts of nonindigenous aquatic species, the state must also insure that the control measures employed do not cause as much or more environmental harm than the nonindigenous species does itself.

The federal government can also play an important role in the management of nonindigenous aquatic species in New York waters. The proposal describes several activities that the federal government could do to assist New York. While additional funding is always desirable, this proposal describes actions that the federal government could accomplish in addition to providing financial support.

New York state should encourage scientific research to provide the data required for meaningful, effective control programs. Little data is likely to be available for nonindigenous species, because they are not native to North America. Both original research as well as comprehensive reviews of foreign scientific literature are required when nonindigenous aquatic species introductions occur. The state should direct and encourage research that specifically serves the goals identified above.

Both the state and federal governments have recognized the need for additional funds for the programs to implement nonindigenous aquatic species management programs. Once this proposal is approved, New York will be eligible for federal funding. This proposal describes in detail the appropriate program infrastructure for accomplishing nonindigenous aquatic species management. The overall cost of the program described is estimated to be \$350,000. Specific objectives to be accomplished each year over a three year period are identified.

1. Introduction

The abrupt appearance of large populations of zebra mussels in the Great Lakes and the subsequent blockage of a drinking water supply in Monroe, Michigan by zebra mussels brought the issue of nonindigenous aquatic species to immediate attention. However, this was not the first time this century that human activities in and on the Great Lakes had been significantly impacted by a nonindigenous aquatic species introduction. In the 1920's, sea lampreys, and in the 1940's, alewife populations exploded into the Great Lakes, severely affecting those whose livelihood were related to the lakes, either commercially or recreationally. The Great Lakes Fishery Commission was created in 1956 specifically to control the impacts of the nonindigenous sea lamprey.

A nonindigenous aquatic species is an aquatic organism that does not occur naturally in the waters of New York State. Many aquatic species have become "naturalized" over time. That is, they were introduced a relatively long time ago, and have become fully integrated into New York aquatic ecosystems. Examples of "naturalized" aquatic species include brown trout, rainbow trout, and common carp. Eventually, every newly-introduced aquatic species will either become naturalized or go extinct. The issue is that during the introduction period, newly introduced aquatic species disrupt the natural balances and relationships existing between other species already present, and can cause significant changes to the ecosystem. Humans can also be significantly impacted if our uses of the affected ecosystem are vulnerable to changes that the newly introduced species will cause.

Eurasian watermilfoil is another example of a nonindigenous aquatic species that has had significant adverse impact after having been introduced into North American waters. Unlike the zebra mussel, Eurasian watermilfoil does not cause immediate, devastating impacts such as blocking water supply intakes or threatening power plant cooling systems. Instead, milfoil can gradually become the dominant plant in an aquatic system, and in doing so, out-compete and eliminate native vegetation. Milfoil can grow to such dense proportions in lakes that offer appropriate habitat conditions that commercial and recreational use of the lake can be significantly reduced until the milfoil is removed.

Some nonindigenous aquatic species go relatively unnoticed. Most people are unaware of the introduction of the spiny water flea, for example. Other nonindigenous aquatic introductions are perceived as very beneficial. The intentional introduction of pacific salmon into Lake Ontario served not only to bring alewife populations under control, but also provided an economically significant fishery.

Chapter 456 of the Laws of 1991, passed on July 19, 1991, required the Department of Environmental Conservation to develop two comprehensive management plans for funding of New York State activities under the Federal Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990. One plan would identify areas and activities other than those related to public facilities where technical and financial assistance is needed to eliminate or reduce environmental, public health, and safety risks associated with nonindigenous aquatic species, particularly zebra mussels. The other plan is described as a "public facility management plan." This legislation was passed in order to mitigate the adverse impacts resulting from the introductions of nonindigenous aquatic species, particularly zebra mussels; to prevent similar problems from future introductions of other nonindigenous aquatic species; and to generate the mechanism for New York State to be eligible for federal funding that would become available for mitigating adverse impacts of nonindigenous aquatic species.

The purpose of this document is to fulfill the legislative requirement for a comprehensive management plan identifying activities other than those related to public facilities for reducing or eliminating environmental, public health, and safety risks associated with nonindigenous aquatic species. This plan, promulgated by the Division of Fish and Wildlife, is ecologically oriented, and addresses nonindigenous aquatic species impacts and control from a natural resource management perspective. The public facility management plan is a separate document that would describe protection and control techniques and technologies within such public facilities such as municipal drinking water intakes or power plant cooling systems. That type of plan requires an engineering orientation. The preparation of such a plan is beyond the capability of the Division of Fish and Wildlife.

This document describes the comprehensive management plan proposal developed by the Division of Fish and Wildlife for managing adverse impacts from the introduction of nonindigenous aquatic species into New York waters. The plan identifies and discusses four nonindigenous aquatic species goals, which are: preventing future introductions; responding to future introductions that might occur despite preventative measures; limiting the harmful impacts of introductions that have already occurred (or are proposed, in the case of intentional introductions); and educating the public about the issues and concerns relating to nonindigenous aquatic species introductions. A discussion of the staff requirement for accomplishing the goals and objectives identified in this plan is also included. This proposal does not outline specific, detailed actions to be taken to prevent and control introductions of nonindigenous aquatic species introductions. This proposal provides the goals and objectives for a program, and identifies a program infrastructure. That program would develop and implement activities to

accomplish the goals and objectives identified herein.

Proper management of the introduction of nonindigenous aquatic species and their potential impacts will require the commitment of staff and resources. In light of the past history of nonindigenous aquatic species introductions, both harmful and beneficial, the cost and benefits of this activity must be evaluated and prioritized against current activities, existing staff and resource commitments, and the likelihood of achieving identified objectives. Long term, effective prevention and control of nonindigenous aquatic species introductions as well as managing the abundance of and impacts of those nonindigenous species already introduced will require state and federal funding support beyond current levels in order to implement the plan described herein.

When considering a nonindigenous species prevention and control program, it is important to weigh the program costs against the costs of not having a program. The overall costs of the zebra mussel introduction into the Great Lakes has been estimated as 5 billion dollars. The estimated cost of the proposed nonindigenous species prevention and control program is \$350,000 per year. The 5 billion dollars spent remediating the impacts of the zebra mussel alone would have paid for a nonindigenous species prevention and control program for 14,000 years.

Nonindigenous aquatic species can be introduced either intentionally or unintentionally. The purposeful introduction of a nonindigenous species of aquatic life to achieve some specified goal - such as enhanced fishing opportunities, or to control large populations of forage species - has been a management tool for centuries. Unintentional introductions are accidental or inadvertent releases of nonindigenous aquatic species into uncolonized waters. Not all introductions can be clearly classified into these two categories. Some nonindigenous aquatic species can be introduced naturally, either piggybacking on some other species, a wayward migration, or through the opening of a link between waterways. An unintentional introduction can accompany an intentional introduction. For example, a purposefully introduced fish might be harboring symbiotic mussel larvae in its gills, or a stocking of out-of-state fish might result in the introduction of nonindigenous parasites.

This plan is directed primarily at addressing the impacts of unintentional, un-sanctioned introductions of nonindigenous aquatic species. Environmental Conservation Law prohibits intentional fish introductions (ECL §1 1-0507) unless permitted by the Department of Environmental Conservation. While nonindigenous aquatic species have been intentionally, lawfully, introduced into New York State waters to achieve specific management goals, environmental impact statements

have usually been required before such an introduction could occur.

The program personnel tasked with implementing this plan could be assigned the role of researching the ecological impacts of a proposed intentional introduction of a nonindigenous aquatic species and participate in the review of the environmental impact statement relating to the proposed introduction. Formal production of the environmental impact statement should be the task of the party proposing the introduction. Existing law and regulation does not clearly prohibit all introductions of nonindigenous aquatic species. The program staff in close coordination with the Bureau of Fisheries and the Division of Marine Resources could additionally propose regulations to better regulate intentional introductions, require environmental impact statements, and specify minimum data requirements for assessing the impact of an intentional introduction of a nonindigenous aquatic species.

11. Program Goals and Objectives

Four specific goals have been identified for a nonindigenous aquatic species management program. Each goal is listed below. Along with each goal, supporting objectives are listed. The problems associated with achieving the objectives, and actions to overcome the problems are discussed. This format is in accordance with the Division of Fish and Wildlife comprehensive management methodology.

A. 1st Goal: Reduce the potential for future introductions of nonindigenous aquatic species into New York waters.

1. Related objectives are:

- a. Identify aquatic organisms that could potentially have adverse impacts if introduced into the waters of New York State;
- b. Identify measures to prevent the introduction of specific nonindigenous aquatic species into New York waters that have already been introduced to other U.S. or Canadian waters.
- c. Determine the pathways and mechanisms through which nonindigenous aquatic species can be introduced into New York waters.
- d. Provide for detection and early warning of new introductions of nonindigenous aquatic species.

2. Problems Related to Accomplishing the Goal

It is highly probable that nonindigenous aquatic species have been brought

into the United States or New York waters in the ballast water of transoceanic shipping. Responsibility for managing ballast water and other related methods of transport associated with transoceanic ships lies with the federal government, specifically the Coast Guard. New York State does not have the capability of enacting and enforcing regulations to insure all transoceanic vessels traversing New York waters have exchanged ballast water at sea. New York must rely on the Coast Guards of the United States and Canada for appropriate protective measures to be taken.

Nonindigenous aquatic species with potential adverse impacts could be introduced from other parts of the United States. Water used for many applications, including food processing, bait industry, aquaculture, aquatic pet trade, and state and federal fish stocking could all be sources of introduction of nonindigenous aquatic species, or methods of distributing nonindigenous aquatic species to uncolonized waters.

State and federal hatcheries and stocking programs are potentially a means of introducing and spreading nonindigenous aquatic species throughout New York waters. Private hatcheries and aquaculture activities could also do the same. Both aquaculture activities and stocking programs could introduce nonindigenous fish parasites and disease organisms. Although there is a rapidly expanding interest in aquaculture in New York State, it is currently a very loosely regulated industry with few controls on the source and distribution of aquaculture materials and products, health regulations, etc.

Similarly, the bait industry has enormous potential to introduce nonindigenous aquatic species. Unless bait minnows are carefully screened, nonindigenous fish such as the river ruffe or the tube-nosed goby could be directly introduced. Nonindigenous parasites or disease organisms could also be introduced. Microscopic larvae such as zebra mussel veligers, or nearly microscopic zooplanktors such as the spiny water fleas could be transported in the water accompanying bait minnows.

New York State has a variety of laws and regulations in different agencies that serve to limit the introduction and distribution of nonindigenous aquatic species under different circumstances. Two examples are shellfish regulations, and controls on the importation of nonindigenous plants. These laws and regulations are not well publicized outside of the communities directly regulated, such as

shell fishermen, for example. Most people in the state are probably not aware of the existing regulations, and the impacts of ignoring those regulations. These regulations are probably not vigorously enforced.

3. Actions to Overcome Problems

New York State should endorse federal legislative proposals that would require ballast water exchange for all international ship traffic, whether cargo, recreational, or military. Ballast water is certainly not the only way for nonindigenous aquatic species to be brought into New York waters. Other potential mechanisms for exotic aquatic species to enter New York waters must be thoroughly evaluated, and actions considered, including legislative, to limit nonindigenous aquatic species introductions.

Research should be encouraged to identify: sources of nonindigenous aquatic species; nonindigenous aquatic species that if introduced, could potentially have adverse impacts; characteristics, habitat requirements, potential adverse impacts of these organisms; and possible methods of detection and control. All possible routes, pathways, and mechanisms should be thoroughly elucidated. Greatest emphasis should be placed on studying nonindigenous aquatic species that have already been introduced to the United States or Canada, but are not yet in New York waters. Introduction pathways for these species must be completely evaluated in particular.

A routine monitoring program should be established near potential introduction sites. Routine, systematic sampling of fish, pelagic and benthic invertebrates, phytoplankton, and water chemistry should be conducted in and near sensitive ecological areas, and areas identified as being likely ports of entry for nonindigenous aquatic species (Port of New York, Port of Albany, Rochester, Buffalo, canal sites, St. Lawrence waterway, Oswego, etc.). The purpose of this type of standardized sampling would be for detecting nonindigenous aquatic species as soon as they enter New York waters; detecting changes in ecosystem characteristics that may be indicative of a nonindigenous aquatic species presence; and providing baseline ecological data in and near ports of entry or ecologically sensitive areas. The possibility of detecting a nonindigenous aquatic species through changes in ecosystem characteristics may be small. However, a database of baseline ecological data would be useful and necessary for comparative purposes when assessing impacts if a nonindigenous aquatic species introduction does occur. If the habitat and ecological requirements of a potential introduction were known, specific sampling protocols could be developed to attract and detect that species if introduced. This type of monitoring would again be particularly useful for, and should focus primarily upon, detecting nonindigenous aquatic species that

have already been introduced to U.S. or Canadian waters, but are not known to be present in New York waters.

The State Legislature should pass a comprehensive aquaculture bill that includes provisions for inspections and standards to protect waters from the

introduction of nonindigenous aquatic species through aquaculture-related activities. This legislation should insure that state and federal hatcheries and stocking programs are not a source of nonindigenous aquatic species or a route for their re-distribution. Carefully crafted guidelines for the bait industry need to be developed and communicated to prevent introductions of nonindigenous aquatic species into New York waters through bait. The public must be educated about the regulations and possible impacts, and recruited to actively, voluntarily, prevent nonindigenous aquatic species introductions.

B. 2nd Goal: Reduce the potential for nonindigenous aquatic species that have been introduced into New York waters to spread into uncolonized waters.

1. Related objectives are:

a. Identify methods to limit the spread of the specific nonindigenous species that have already been introduced into some New York waters;

b. Monitor the distribution of the nonindigenous aquatic species in New York waters;

c. Analyze the potential for harmful impacts from the nonindigenous aquatic species that have been introduced.

2. Problems Related to Accomplishing the Goal

Once a nonindigenous aquatic species has been introduced into a water of New York, it can be further distributed by uninformed people performing routine activities. Simply removing a boat from one water body and launching it in another can help disperse nonindigenous aquatic organisms. When people are not aware of how their routine activities can cause the dispersal of nonindigenous aquatic species, the likelihood increases that the nonindigenous aquatic species will be spread to other waters.

Any particular nonindigenous aquatic species may behave quite differently in a different waterbody. Predicted impacts may not occur, or problems might result that never occurred at other locations. Each time a nonindigenous aquatic species colonizes a new water it faces a different habitat, different predators, different food supply, etc. The results are not always predictable.

People don't know what to look for regarding a nonindigenous aquatic species. Usually only the adult form of the nonindigenous aquatic species is

publicized. People interested in monitoring for or reporting the presence of new introductions do not know what to look for, and are not well prepared to do this successfully. Because a nonindigenous aquatic species is something new, it is usually not easily recognized.

Communities may not be prepared to deal with impacts of nonindigenous aquatic species. Although this plan is not intended to focus on zebra mussels, the zebra mussel introduction provides a dramatic example of how a nonindigenous aquatic species can significantly impact a community. Because of the zebra mussel's propensity to accumulate in water intake structures, a community's drinking water supply can be impacted if measures are not taken to keep them out. Protective measures require engineering design, permit approvals, and possibly lengthy construction processes. Few if any communities are prepared in advance for a zebra mussel colonization of their drinking water supply. Aside from zebra mussels, the potential impacts of any other nonindigenous aquatic species must be assessed so potentially impacted groups and communities can prepare for the impacts of an introduction if it should occur.

Communities may over-respond to a potential nonindigenous aquatic species introduction. Unnecessary or unenforceable regulations that are not well thought out might be enacted that do not necessarily prevent the nonindigenous aquatic species from being introduced, but also exact a price in terms of lost or reduced utilization of aquatic resources.

3. Actions to Overcome Problems

If an introduction of a new nonindigenous aquatic species occurs, efforts should be taken immediately to slow its spread. That would allow groups and facilities that could be affected the opportunity to prepare for possible adverse impacts. Potential routes of dispersion should be carefully reviewed and identified. Reasonable, achievable, systematic methods of limiting the spread of nonindigenous aquatic species need to be determined and implemented.

There are many simple, common sense measures that people involved with aquatic-related activities can do to help slow the distribution of nonindigenous aquatic species. Some proposals that would be useful for limiting the movement of nonindigenous species that we are currently aware of, such as zebra mussels, watermilfoil, and river ruffe would include:

a. Boating:

Fill and empty live wells only within the same waterbody;

Drain all water from a boat completely before removing it from a waterbody;

Clean and remove vegetation from boats, particularly outboard engines or drive units;

Steam clean boats and trailers, or wash with very hot water between trips to different waters. Steam, or water heated to at least 140°F should be used to insure organisms are killed;

Flush and clean engines with steam or hot water (140°F or hotter). Do this away from waterbodies or sewer systems to avoid washing surviving organisms into the water;

Remove boats from the water when they are not being used.

b. Fishing:

Release fish only in the water in which they were caught;

Don't dump bait water into open water;

Only purchase as much bait as can be used on one trip. If possible, purchase bait captured from the same water in which fishing will take place. Observe DEC rules and regulations when releasing unused live bait. Don't release baitfish into water if that species is not already present. Observe regulations regarding the types and species of live bait used.

C. General Public:

Do not release aquarium animals into open water;

When cleaning aquariums, don't flush water down the drain. Instead, dump the water out on the ground so it will not drain into a stream or lake;

Do not collect zebra mussels or other nonindigenous aquatic species from the wild for aquariums;

Do not move animals, particularly fish, clams, mussels, turtles, or crayfish, from one waterbody to another. Nonindigenous aquatic species could hitch-hike on the organism being transferred;

Do not assume that any waterbody is already colonized with a nonindigenous aquatic species. Observe the above practices routinely and systematically regardless of whether or not a waterbody is thought to be colonized with a particular nonindigenous aquatic species.

These types of measures will be most effective when they become ingrained into habit, and are undertaken as a natural part of aquatic recreational activities.

There are also a number of pragmatic measures that could be taken by public and private marina owner/operators, to encourage public awareness and participation. One measure is simply to post a warning sign at all boat launch sites to remind people of the need to be aware of nonindigenous species concerns and prevention practices. A second measure would be to provide water hoses at boat launch sites to allow boaters to rinse vegetation and other materials off their hull when removing a boat from the water.

Mandatory restrictions, requirements, and limitations should be avoided. The excessive, arbitrary, and widespread use of mandatory restrictions diminish their effectiveness because they become very difficult to enforce. They also mislead the public, because the assumption is implicit that the imposition of restrictions will guarantee the protection of the waterbody, and such a guarantee cannot be made. Mandatory restrictions may appear to be discriminatory. Variable fee structures for cleaning boats (e.g. residents versus non-residents) could be viewed as discriminatory by the group that has to pay the higher fee. While the policy of the Department of Environmental Conservation has been not to contest municipal regulations, the effectiveness of local regulations to control nonindigenous aquatic species introductions should be discussed and reviewed with municipal officials, and alternatives considered.

Monitoring of waterbodies both colonized and uncolonized by specific nonindigenous aquatic species of concern should be conducted to document the distribution and spread of a newly introduced nonindigenous aquatic species across

the state. Monitoring uncolonized waters for specific nonindigenous aquatic species can provide communities around the waterbody with opportunity to prepare for a possible introduction. Monitoring can also provide an early warning if an introduction occurs; an opportunity to estimate the size and scope of the

introduction; and the best chance to contain or eliminate it. This type of monitoring can also demonstrate the effectiveness of measures employed to prevent nonindigenous aquatic species introductions.

Once a nonindigenous aquatic species has colonized a new waterbody, it should still be monitored. The ecological impacts of a nonindigenous aquatic species introduction will vary with location and characteristics of the colonized waterbody. The impact on human communities may vary similarly. Monitoring of a colonized water needs to be conducted to evaluate factors such as rate of growth, distribution, impacts on native species, impacts on human communities, and so on. This data needs to be collected and correlated with habitat data in order to develop predictive models of potential impacts in other waters. Data collected from monitoring both colonized and uncolonized waters can be used to develop models for predicting where and how nonindigenous aquatic species introductions might occur, and strategies for preventing and controlling them.

In order to involve the general public in monitoring activities, the Department of Environmental Conservation could develop and make available "identification kits" for nonindigenous aquatic species. For example, a zebra mussel identification kit would contain: pictures of the various zebra mussel life stages; actual shells; prepared microscope slides of various veliger stages; information on when, how, and where to look for zebra mussels; information how to build collecting systems from household materials; how to examine water samples for veligers (assuming a microscope is available); and what to do and who to call if zebra mussels are positively identified. The kit would also contain information on how to handle the sample to preclude spreading the mussels to other waters, and what handling was allowable under the law requiring a permit for zebra mussel possession. A similar kit could be developed for any nonindigenous aquatic species. To assist public monitoring efforts, the Department of Environmental Conservation should provide a facility to evaluate samples submitted by the public and verify the identification of a nonindigenous aquatic species of interest. Regional fish and wildlife biologists and ecologists must be trained to recognize and identify nonindigenous aquatic species of special concern or interest.

Monitoring programs must be planned very carefully if they are to accomplish their purpose. The Department of Environmental Conservation should consult closely with Sea Grant, New York Power Pool, U.S. Fish and Wildlife Service, Delaware River Basin Commission, universities, and other agencies with

demonstrated competence and experience in developing and conducting these types of monitoring programs. The costs of monitoring large numbers of sites or waterbodies can quickly become prohibitive. A good monitoring program will be linked to a ecological model that can identify waters vulnerable to colonization

because they have appropriate habitat conditions, or are along likely routes of dispersion. These waters would be the priority waters for monitoring. Other waters could also be monitored randomly in case the modeling predictions were wrong.

C. 3rd Goal: Minimize harmful ecological, economic, and social impacts resulting from nonindigenous aquatic organisms that have already been introduced or are proposed for introduction into the waters of New York State.

1. Related objectives are:

a. Identify and make available environmentally safe control methodologies;

b. Provide technical, scientific, financial, or educational advice and assistance to communities, industries, or groups affected by a nonindigenous aquatic species introduction;

c. Develop alternative management strategies based on the potential ecologic or economic impacts that could occur;

d. Review and assess the potential impacts of proposed intentional introductions of nonindigenous aquatic species.

2. Problems Related to Accomplishing Goals

To minimize the impacts of a nonindigenous aquatic species infestation, the nuisance species must be controlled. Control activities are those aimed at reducing or eliminating nonindigenous aquatic species from a water body, a facility, or an area within a water body. Control can be accomplished by: using pesticides to kill the organism or disrupt its life cycle; by mechanically harvesting, scraping, picking, or physically removing the organism; by making the environment unsuitable or hostile for the organism; or by introducing a parasite or predator to attack the organism. Problems related to the control of nonindigenous aquatic species, regardless of the method employed, are:

The control method must not create problems greater than those related to the nonindigenous aquatic species itself;

A control methodology must not have serious, long term impacts to the environment or non-target organisms;

There must be a need to control the nonindigenous aquatic species. It

must cause or have a real potential of causing adverse impacts;

The control methodology must not reduce the human utilization of the water body or threaten human health;

Control efforts should be directed against the areas significantly impacted, and not be broad and general in nature.

The control method must have a reasonable likelihood of succeeding.

Management plans have been developed for many waterbodies. In New York, this planning has been done by international organizations, the federal government, the state, or even local lake federations. The management plans do not take into account the impacts of a nonindigenous aquatic species introduction. The proposed management activities may exacerbate the impacts that the nonindigenous aquatic species is causing.

3. Actions for Overcoming Problems

Nonindigenous aquatic species must not automatically be targeted for control. First they should be classified based on the level of impacts that have occurred or are likely to occur. Impacts from nonindigenous aquatic species can be placed in one of four categories - beneficial, innocuous, nuisance, or detrimental. Descriptions of the four categories of nonindigenous aquatic species impacts are:

a. Beneficial - the species provides a specific benefit to the colonized water body, and has either beneficial or innocuous economic or social impacts;

b. Innocuous - the species is present but is either present in very low densities, or has no discernible impact on the colonized water body or economy;

c. Nuisance - the species causes annoyances to human populations that uses the colonized water body, or has minor adverse ecological impacts, but does not threaten health, safety, or economic utilization of the water;

d. Detrimental - The species has the potential to seriously upset the ecological balance of the colonized water body. It could impose long term undesirable changes, pose a risk to human health and safety, or significantly impact the economic utilization of the water body.

The category of impact resulting from any single nonindigenous aquatic species could change from one water body to another. Likewise, within the same water body the same nonindigenous aquatic species could have a detrimental impact on one component of the public, and an innocuous impact on another. The overall level of impact of a nonindigenous aquatic species in a particular water body should be determined by the Department of Environmental Conservation after reviewing all of the available data. State funding for control and remediation should primarily be directed at waters where detrimental impact conditions exist. Control of nuisance impacts should be undertaken under more limited circumstances, and should primarily be the responsibility of an impacted community. State resources should be committed to remediating nuisance impacts when it is likely that without remediation a detrimental impact would result. Control in the wild should be considered only when public health or safety is threatened, when severe economic impacts could result, and if environmentally safe control methods are available.

Control methodologies must be carefully evaluated for adverse environmental impacts. No control method is without impact to non-target species. If control is not necessary, it should not be initiated. For example, the mere presence of Eurasian milfoil, a nonindigenous aquatic plant species, does not constitute a need for control in some waters. Some herbicides used to control milfoil will also kill native vegetation. Milfoil is a very resilient plant, and experience has shown that it can grow back quickly after an herbicide treatment. Without the competition of the native vegetation that was also killed by the herbicide, it can grow back more abundantly than it was before the treatment. Some attempts to control milfoil have had the end result of promoting conditions for milfoil growth and expansion. Control should only be implemented when it has a reasonable chance of success. In regards to this example, it must be stated that under some circumstances, herbicides can provide effective control of milfoil as well as other nonindigenous aquatic plants. Control measures must be carefully evaluated. Herbicides should neither be dismissed out of hand, nor applied without a careful assessment of alternative methods of control.

The most desirable control methods will target a specific impacted community or facility, and have minimal impact on the aquatic environment in general. Engineering techniques or habitat modifications that create a hostile environment for a nonindigenous aquatic species are probably less environmentally harmful than pesticides. These methods discourage a nonindigenous aquatic species from

occupying the area where it causes an adverse impact. The least desirable control methods are usually pesticides that are released to kill the nonindigenous aquatic species. Few if any of these pesticides are specific enough to insure that non-target organisms are not affected. Disposing or removing the organisms killed by

the pesticide could also be an important issue. There will be situations, however, when the use of pesticides is the best means of control available.

The term "management" refers primarily to plans, policies, and programs to achieve some specified natural resource-related goal, such as improve fishing, or protect an endangered species. The impact of a newly introduced nonindigenous aquatic species must be factored into existing aquatic management plans. The first step is to assess the potential impact. This assessment will require careful evaluation of selected parameters of the aquatic ecosystem, and comprehensive modeling to anticipate what long term impacts could result. Once the long term impacts are estimated with reasonable certainty, management actions can be devised to mitigate the adverse impacts. Multiple courses of action must be developed when assessing each possible impact, so that alternative responses can be devised.

Once several alternative courses of action have been determined, much of the preliminary work can begin. Such preliminary work might include scoping possible environmental impact statements, and holding public information meetings to assess public opinion. The public must be fully informed and involved with the decision regarding which management policies to adopt, once the real impacts start to become apparent. Management decisions and actions must not be deferred until an adverse impact occurs. The management actions in response to that impact must be identified before the adverse impact occurs in order to prevent avoidable economic, recreational, and social impacts.

The impacts of nonindigenous introductions on endangered or threatened species must be considered. Zebra mussels could potentially change the processes by which drinking water is purified. Zebra mussel colonies can also obscure and bury significant underwater historical or archeological materials. Zebra mussel shells could accumulate on beaches. Zebra mussel shells ground to sand could change the hydrogeological character of beaches, and affect erosion. Other nonindigenous aquatic species such as the river ruffe, tube-nosed goby, and round goby could change the population dynamics and fish community structures within New York waters. The spiny water flea could compete with native zooplankton species and change the feeding dynamics of fish. For all of these potential impacts, management responses should be prepared before impairments actually occur.

Many strategic management plans have been developed for the Great Lakes and other waters of the state. Some have been prepared in cooperation with Canada, others have been prepared jointly with other states (e.g. Lake Champlain, Delaware River). Most of these plans were prepared without taking into consider-

ation the potential impacts from nonindigenous aquatic species introductions. Existing plans need to be reviewed in light of introductions that have occurred since they were written. The goals, objectives, and conclusions may need to be re-evaluated.

D. 4th Goal: Educate the public on the importance of preventing nonindigenous aquatic species introductions, and how the harmful impacts of nonindigenous aquatic species can be reduced or mitigated.

1. Related objectives are:

a. Establish an information, extension, and distribution network for reaching interested and impacted groups and individuals, to provide them with information and other materials;

b. Provide the public with a warning of potential adverse impacts from a newly introduced nonindigenous aquatic species;

c. Communicate appropriate measures to control the spread of newly introduced nonindigenous aquatic species.

2. Problems Related to Accomplishing Goals

The level of public awareness and interest regarding a nonindigenous aquatic species introduction depends on the level of perceived impacts. There was relatively little public attention paid to the tube-nosed goby introduction because the impacts were not considered harmful to human communities. However, the introduction of the zebra mussel was well publicized, because the impacts were widespread and perceived to be adverse.

The first source of information for the general public will probably be the newspapers. Newspapers provide people with information that is generally of immediate, short term interest. If detrimental type impacts are anticipated, they would probably be highlighted. Newspapers may not provide continuous coverage over time. If adverse impacts are not realized, they probably will not report that information extensively. Newspapers can play an important role in informing people initially about a nonindigenous aquatic species, but can only be counted on doing so if the potential impacts are classified as detrimental or highly beneficial.

The right audience must be matched to the most appropriate distribution system and information material. It is possible to overwhelm an audience either

with too much material or by overloading any one distribution system. The materials must be attractive, and be neither too complex or simplistic. The information disseminated widely to the public should serve primarily to alert them to the issue of nonindigenous aquatic species introductions, provide any immediate precautions necessary to reduce potential impacts, and refer them to sources of reliable, in-depth information. A feedback mechanism, should be identified so that the public can request further information and express concerns.

With an environmental issue such as nonindigenous aquatic species impacts, information must be constantly updated. When an introduction first occurs, little may actually be known, and much of what is communicated is hypothesis and conjecture. As time goes on, more and better information becomes available, and what has been hypothesized can be refined. Information made available to the public must be frequently updated in order to insure that the appropriate message is being delivered.

3. Actions to Overcome Problems

The Department must identify what segments of the population will be affected when an introduction of a nonindigenous aquatic species occurs, what the potential impacts will be, and what the impacted public should do in response. This information should be rapidly disseminated to the public. Even if the anticipated impacts are not classified as detrimental, information should be made available to the public.

Several good information distribution systems exist within the state for reaching impacted groups. New York Sea Grant is a Federal Institute involved with education and research about coastal issues, including the Great Lakes and tributaries. Sea Grant works very closely with the Cornell Cooperative Extension. Sea Grant and Cornell Cooperative Extension have excellent outreach programs for developing educational materials and reaching groups that could be impacted by nonindigenous aquatic species.

Other means of reaching potentially impacted populations are also available. Boaters can be reached through the boat registration system, and safe boating classes. Sportsmen can be reached through DEC regional staffs, and fishing and hunting license materials. Short messages regarding nonindigenous aquatic species can be added to fishing hot lines. Information for the general public could

be distributed along with motor vehicle registration materials. DEC regional offices can provide an outlet for printed materials and pamphlets. Lakeshore property owners can be reached through the state Federation of Lake Associations. Other organizations with educational distribution systems include youth groups such as

Boy and Girl Scouts, 4-H, and the DEC SAREP (State Aquatic Recreation Education Program). Materials can also be produced and made available to science teachers in New York schools.

III. Research

A good research program is essential to accomplishing all four of the goals. One of the problems with nonindigenous aquatic species is that because they are not native, there are generally less scientific data and literature available regarding their biology, ecology, or control methods. These particular species may not be considered as nuisances in their home ranges. There is always a great need for original research on nonindigenous aquatic species once they have been identified as potentially causing harmful impacts.

The Department should identify specific research needs pertinent to the impacts of a particular nonindigenous aquatic species. These needs should be communicated to the academic community, and every effort should be made to support the accomplishment of identified research goals. New York State can encourage and assist the accomplishment of specified research needs by offering incentives to researchers willing to undertake them. These incentives might include:

- Direct grants, or assistance in obtaining funding;

- Access to state facilities, and use of state-owned laboratories, boats, equipment, waters, etc. while conducting research;

- Publication and distribution of literature produced from the research;

- Tuition deferments or waivers to graduate students conducting specific research tasks.

There is a precedence for these methods of financial assistance. The Department already provides funds to support research through such contract programs as the Cornell Warmwater Fisheries Unit, and the St. Lawrence River Muskellunge Management program.

All pertinent research on nonindigenous aquatic species issues should be encouraged. Any research support program should be based on providing positive incentives for filling identified research needs. The incentives should be based on research goals, not results. For example, consider a research program to investigate a new control technique. Incentives should be provided on the basis that research is being conducted into a control technique to mitigate adverse impacts

from an exotic species. The incentives should not necessarily be based upon the eventual employment and success of the control technique. Likewise, a project in which only a portion deals with an identified research need should be given consideration for some partial incentive. The incentive should not be awarded only to projects wholly committed to specified research needs.

Close coordination should be made with professional organizations that are actively involved with conducting and supporting research. New York Sea Grant, U.S. Fish and Wildlife Service, Empire State Electrical Energy Research Consortium, Great Lakes Research Consortium, Great Lakes Panel on Exotic Species, and the Great Lakes Fisheries Commission are a few agencies that would be involved in research relating to the impacts of nonindigenous aquatic species. Coordination with these agencies would be useful to insure unnecessary duplication of effort did not occur, that results were rapidly disseminated, and conflicts in research needs, goals, and directions did not occur.

IV. Governmental Roles and Responsibilities

A. Federal Government

Achieving the goals and objectives identified in this plan can be assisted by the federal government. The Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 (P.L. 101-646) calls for the development of state nonindigenous aquatic species management plans, and provides a grant mechanism for funding activities identified in those plans. Furthermore, P.L. 101-646 requires that approved state plans identify federal activities that may be needed for environmentally sound prevention and control of aquatic nuisance species.

Of primary importance is federal assistance in limiting introductions through transoceanic shipping ballast water. New York State government lacks the ability, resources, and authority to require ballast water exchange before a vessel enters U.S., or New York waters. The Great Lakes Water Quality Agreement of 1978 between the United States and Canada states that enforcing efforts to limit the introduction of nonindigenous aquatic species through transoceanic shipping was a responsibility of both nations Coast Guards. Since the introduction of the zebra mussel, additional introductions have already occurred; the tube-nosed goby and the round-nosed goby.

The federal government must pass legislation to prevent introductions from occurring through ballast water. The Coast Guard needs to be empowered to regulate and enforce a ballast water exchange requirement, and any other measures deemed necessary to further hinder the introduction of nonindigenous aquatic species.

The federal government could authorize funding to assist large municipal areas with protecting vital water supply facilities from zebra mussel infestation. New York City is ready to invest as much as \$10,000,000 to protect the city drinking water supply from zebra mussels. The health and economy of large cities such as New York City are vital to the national economy as well as the state's. It is in the national interest to provide additional assistance for protecting the waters and industries of large municipalities such as New York City.

Monitoring is a significant component of New York's comprehensive management plan. The state could be greatly assisted in accomplishing the ambitious monitoring goals identified above by access to federal facilities on both fresh waters, the great lakes, and marine waters. Some federal facilities may be very strategically located for collecting samples and monitoring species. U. S. Fish and Wildlife Service (USFWS), Coast Guard, U.S. Geological Survey (USGS), U.S. Army Corps of Engineers (ACoE), and other federal agencies routinely operate in New York waters. Coordination could be made for New York agencies to perform monitoring and sampling activities aboard federal vessels. Additionally these same federal agencies could also collect monitoring and sampling data for New York.

USFWS fish hatcheries and the New York Bureau of Fisheries can develop procedures to insure zebra mussel larvae are not transported or introduced during fish stocking activities. Federal laboratories could process samples to identify nonindigenous aquatic species. Sea Grant, a federal agency, could be provided with funding to support research and education requirements determined by New York State. Sea Grant has taken the lead in developing excellent and timely educational materials regarding zebra mussels.

B. State Government

An important source of nonindigenous aquatic species introductions and means of spreading them are commercial shipping and recreational boating. The state must evaluate the potential for nonindigenous aquatic species to be redistributed within New York and Great Lakes waters by commercial shipping and recreational boating, particularly along commercial routes under New York State jurisdiction.

New York State should provide assistance to groups that are experiencing harmful environmental, economic, and social impacts from nonindigenous aquatic species introductions. This assistance could take the form of information and extension, streamlined regulatory procedures, outright financial assistance, or assistance in obtaining financial help from other sources (federal government). New

York State should also identify research priorities, and provide funding or other forms of support for researchers working on nonindigenous aquatic species related problems.

The state can provide a regulatory environment that encourages innovative, experimental approaches. A simplified, streamlined review process would encourage impacted industries to experiment with alternative control techniques. If a lengthy regulatory review process is required before implementing a new, or experimental control technique, impacted facilities might not investigate these methods. Instead, they might defer to "tried" methods, such as chlorine or other pesticides for which they can obtain a permit more easily. Some risks must be taken to determine if innovative control methods might be more effective than current methods. Any simplified review process however, must still provide thorough protection to the environment as a whole, and insure full compliance with environmental regulations and water quality standards.

A compendium of "cookbook" recommendations for mitigating impacts from nonindigenous aquatic species should be developed by the state for smaller groups that cannot afford to develop their own unique proposals. Smaller utilities, municipalities, and other such groups may not have the resources to hire consultants to develop mitigation solutions. The nature of impacts experienced by smaller users may be similar. The cookbook approach will at least provide a start for smaller impacted facilities to develop their own solutions to impact related problems. A variety of "cookbook" approaches could be developed; for homeowners, for drinking water suppliers, for industries, for hydropower plants, and other power generating stations.

The Department of Environmental Conservation can assist impacted groups and facilities in identifying grant programs that could serve as sources for funding nonindigenous aquatic species control projects. Several federal agencies will provide funding for control, mitigation, and remediation of adverse impacts from nonindigenous aquatic species, under the provisions of the Federal Nonindigenous Aquatic Nuisance Species Control Act. Once the mechanisms for approving grants through this source are finalized, the Department of Environmental Conservation should assist applicants in filing for these grants.

New York State should take an active role in educating the public. Topics related to nonindigenous aquatic species include: identification, characteristics, habitat, potential impacts (ecologic, economic, and social), methods of control, methods of slowing the distribution, and pertinent laws and regulations. An important component of the overall task of educating the public is determining who will be impacted by a particular nonindigenous aquatic species, and how they can

best be reached. Organizations such as New York Sea Grant function primarily as an information and education resource. The Department of Environmental Conservation should coordinate closely with Sea Grant in the development and implementation of the education component of this plan.

C. Local or Municipal Government

Local governments have the most significant responsibilities relative to nonindigenous aquatic species. This is the level of government that must actually respond to the immediate problems of impacts. Some of the problems facing local governments include: blockages in municipal water supplies; maintenance of municipal aquatic recreation facilities, to include weed or mussel removal; irate citizens; and raising funds to respond to the impacts, just to name a few.

The local government must also take the initiative in prevention and control activities also. Municipalities with waterfronts can post signs, provide information, monitor, coordinate with state monitoring, accomplish localized control, removal, or elimination of nonindigenous aquatic species, and sponsor and coordinate information meetings. Since a local government only has to focus on a limited volume of water and waterfront area, they are in a position to propose very specific strategies for dealing with very specific impacts.

The Public Works Department of municipal governments can develop public facility management plans to reduce or remediate impacts in facilities such as water works. These plans can be submitted to the state and federal government for funding assistance under the provisions of P.L. 101-646.

It is imperative that state and federal governments respond promptly and appropriately to the needs and concerns of local governments. Without the support and cooperation of local governments, state and federal programs for nonindigenous aquatic species management are not likely to succeed.

V. Recommendations for Implementation

Implementation of a nonindigenous aquatic species prevention and control plan will require additional staff and resources in the Department of Environmental Conservation. No existing unit in the Department currently has responsibilities

distinctly related to those activities described in this plan. Implementing this plan could be accomplished by a new unit either within the Division of Fish and Wildlife or the Division of Water. While the Division of Fish and Wildlife typically is responsible for biologically-oriented concerns, the Division of Water has already acquired considerable background and experience in managing eurasian water-

milfoil, a nonindigenous aquatic species, in Lake George. The Division of Water also works routinely with the State Federation of Lake Associations. Regardless of the Division in which a "Nonindigenous Aquatic Species Prevention and Control Unit is headquartered, both divisions will need to work closely together.

For a nonindigenous aquatic species management program to be effective, close coordination with neighboring states and Canada would be imperative. Prevention and monitoring programs must overlap if they are to be successful. Maintaining this close coordination will be an important responsibility. An excellent coordinating body already exists in the Great Lakes Panel for Exotic Species. Adjacent states and Canada are already organized into a body for the exchange of information and coordination of efforts. The leader of a new Nonindigenous Aquatic Species Prevention and Control Unit should participate on the Great Lakes Panel for Exotic Species.

The new unit would be composed of a broad spectrum of participants, to include permanent and temporary (seasonal) DEC staff, contracted workers, volunteers, representatives of groups impacted by nonindigenous aquatic species, and interested members of the public.

The permanent staff of the Nonindigenous Species Prevention and Control Unit would ideally consist of a Biologist 2 (Ecology) or a Research Scientist 11, and a Biologist 1 (Ecology). The responsibilities of the Biologist 2 would be to conduct literature research to identify potential nonindigenous aquatic species introductions, and to determine how their introduction could be detected and prevented. The Biologist 2 would also develop detailed species-specific plans for nonindigenous aquatic species control, coordinate with other agencies as required, and assume overall responsibility for the program. The Biologist 1 would assist the Biologist 2 as required, screen samples submitted by the public for nonindigenous aquatic organisms, and assist in planning and accomplishing monitoring programs. In addition, two seasonal Fish and Wildlife Technicians would be hired. Seasonal technicians would primarily screen samples and accomplish monitoring related tasks during the summer months. All staff members would participate in educational programs.

The Biologist 2 will be responsible for generating an annual report to the public of the activities of the unit and the status of nonindigenous aquatic species

of concern. Another primary responsibility of the unit within its first year of operation would be to generate a set of standard operating procedures (SOP) to be followed by state agencies. This SOP would insure that state activities in and around waterbodies were not introducing or spreading nonindigenous aquatic species.

A second component of the Nonindigenous Species Prevention and Control Unit would be an advisory council made up of representatives from impacted, or potentially impacted, groups and interested members of the public. This council would serve to keep the unit leader informed of public concerns, needs, and issues. Information would be exchanged about the control of nonindigenous aquatic species already introduced. (Most control-related activities of nonindigenous aquatic species will be accomplished by impacted groups and local governments.) Participation on such a council would include universities, involved agencies such as Sea Grant and the U.S. Fish and Wildlife Service, New York Power Pool, Federation of Lake Associations, and municipalities, for example. Participation would probably vary, as different species issues became the subject of focus. The council would meet periodically with the unit to insure activities were coordinated.

The proposed plan calls for more monitoring and survey work than could possibly be accomplished by two biologists and two seasonal technicians. Some survey and monitoring work could be contracted out. Universities would be ideal sources of workers, in the form of graduate and undergraduate students, to accomplish routine monitoring as described in this plan.

A third component and source of monitor and survey information would be volunteers. Landowners of lakefront property could be mobilized to collect a limited quantity of information regarding the presence or absence of nonindigenous species. Fishing clubs and sportsmen's federations may also be excellent sources of volunteers. This activity would have to be very carefully directed by the unit staff.

To create, staff, and equip a Nonindigenous Aquatic Species Prevention and Control Unit as described herein would require an estimated \$350,000 per year. Section 1204(b) authorizes the federal government to fund 75% of the program identified in an approved state management plan. The New York State portion required to achieve a fully funded program would be \$87,500 per year. Because of the unpredictability of program costs, this estimate would be re-assessed and refined at the end of the first year of operation.

VI. Implementation Schedule

Section 1204(a)(2)(C) requires that for approval, a state management plan must include a schedule for implementing the plan, including a schedule of annual objectives. It is difficult to develop a detailed implementation schedule because of funding ambiguities in this program. Full implementation of the plan is dependent upon federal aid. If New York implements the program without federal assistance, the program would be considerably scaled back if implemented at all, and it would take much

longer to accomplish the defined objectives.

Federal assistance is authorized by P.L. 101-646 for five fiscal years, beginning in 1991 and ending in 1995. For planning purposes, the assumption is made that federal funding will be available until the end of FY 1996, which is September 30, 1996. The following list of annual objectives should adequately describe the proposed implementation schedule over the period April 1 1994 to April 1 1997. Objectives for this period are described even though funding is not authorized beyond FY 1995.

Annual Objectives

April 1994 - October 1994 (Federal FY 1994):

1. Hire staff and establish necessary contracts;
2. Complete review of state and federal regulations, laws, and rules for redundancies and inconsistencies;
3. Identify sites and procedures for inland water monitoring program;
4. Identify sites and procedures for Port of Entry surveys (monitoring for undetected introductions);
5. Establish contract for development of "cookbook remediation methods" for selected nonindigenous aquatic species;
6. Determine short and long term requirements for educational materials;
7. Establish a procedure for receiving, reviewing, and screening research proposals for funding recommendations;
8. Begin development of standard operating procedures for all state agencies that conduct activities on or around water to prevent the spread of nonindigenous aquatic species;
9. Investigate control and remediation techniques, methods, and proposals. Disseminate observations to the public. Encourage innovative approaches to nonindigenous aquatic species control and remediation.
10. Begin development of a "vulnerability" model for various nonindigenous aquatic species of concern in New York waters;

October 1994 - October 1995 (Federal FY 1995):

1. Conduct first year monitoring of inland waters. Evaluate and revise protocols as required;
2. Conduct first year monitoring of port of entry waters. Evaluate and revise protocols as required;
3. Establish site for evaluating samples submitted by the public for the presence of selected nonindigenous aquatic species;
4. Complete production and initial distribution of "identification kits" for selected nonindigenous aquatic species;
5. Complete development of a standard operating procedure for state agencies regarding the prevention and control of nonindigenous aquatic species.
6. Review and finalize "cookbook remediation methods" manual(s);
7. Propose legislative and regulatory changes for resolving legal gaps and inconsistencies;
8. Complete waters vulnerability model;
9. Complete review of state management plans for waters and watersheds, to identify modifications needed because of nonindigenous aquatic species;
10. Continue to review nonindigenous aquatic species literature and research, update educational materials as required.
11. Continue to investigate control and remediation techniques, methods, and proposals. Disseminate observations to the public. Encourage innovative approaches to nonindigenous aquatic species control and remediation.

October 1995 - October 1996 (Federal FY 1996)

1. Complete reports of first year monitoring and survey studies;
2. Conduct second year monitoring of inland waters. Evaluate and revise protocols as required;

3. Conduct second year monitoring of port of entry waters. Evaluate and revise protocols as required;
4. Complete abbreviated report of second year monitoring and survey studies;
5. Distribute "cookbook remediation methods" manual;
6. Evaluate vulnerability models;
7. Draft recommendations for modifications for state water and watershed management plans;
8. Identify additional needs for nonindigenous aquatic species identification kits.
9. Continue to review nonindigenous aquatic species literature and research, update educational materials as required.
10. Continue to investigate control and remediation techniques, methods, and proposals. Disseminate observations to the public. Encourage innovative approaches to nonindigenous aquatic species control and remediation.

October 1996 - April 1997 (Remainder of NY FY 1996) Because the New York fiscal year runs from April to April, limited state funding would be available until April 1997.

1. Complete second year monitoring and survey reports.
2. Complete final project report.
3. Recommend ways of continuing monitoring and survey programs without nonindigenous aquatic species activity funding;
5. Seek continued funding from alternative sources.

VII. Responsiveness Summary

On November 12, 1993, the draft Proposal for a Nonindigenous Aquatic Species Comprehensive Management Plan was made available for public review

and comment. Notice of the availability of the plan was announced in a state-wide press release, and in the State Environmental Notice Bulletin (ENB). Five hundred copies of the plan were printed, and approximately three hundred were subsequently distributed. Comments were received from the following individuals or organizations:

A: Gary Edwards, Federal Aquatic Nuisance Species Task Force (US Fish and Wildlife Service); David Cottingham, National Oceanic and Atmospheric Administration.

B: Nancy Beard, NYDEC, Hudson River Program

C: Max Herrington, Lake Kiwassa Shore Owners Association

D: Kenneth C. Pickering, US Fish and Wildlife Service, Lower Great Lakes Fisheries Resource Center

E: Alexander C. Gabriels, Mary-Arthur Beebe, The Lake George Association

F: Michael Gann, NYDEC Bureau of Fisheries

G: Coalition of Lakes Against Milfoil

H: Wayne Elliot, NYDEC, Region 3, Fisheries

I: Sharon Neuman, New York City Department of Environmental Protection

J: Larry Richardson, Upper Delaware Council; John Hutzky, National Park Service, Scenic and Recreational River

K: J. Joseph Homburger, Otsego County Conservation Association

M: Richard A. Smith, Great Lakes Sport Fishing Council

N: Timothy Preddice, NYDEC, Hale Creek Field Station

O: L.R. Tuttle, New York State Electric and Gas Corporation

The comments received were excellent, and have played an important role in improving the proposed plan. The comments have been summarized below, and following each summarized comment, is a response as to how that comment was addressed. Following each comment in parentheses, is a letter which identifies the

commentor from the list above. If the comment was integrated into the text of the document, the page number where the comment was addressed or included follows the response, in brackets. Neither the commentors above or the comments themselves are placed in any particular order.

1. COMMENT: There is inadequate discussion or differentiation between intentional and unintentional introductions of nonindigenous aquatic species. (A, I)

RESPONSE: This plan is intended to address only unintended, unsanctioned introductions. This point has been clarified in the text. A discussion of what constitutes an intention introduction vs an unintentional introduction has been added. The role of assessing risks from intentional, proposed introductions has also been assigned to the proposed program. [31]

2. COMMENT: There is no discussion on the need to coordinate with Canada and adjacent states. (A, M)

RESPONSE: The plan now indicates the need to coordinate with Canada and other states. Furthermore, the Great Lakes Panel on Exotic Species is proposed as the appropriate channel for that coordination to occur. [22]

3. COMMENT: Additional measures for limiting the spread of nonindigenous aquatic species that have been introduced into New York waters were proposed. These were:

- a. Tracking boat launches at marinas; (A)
- b. Make high pressure wash hoses available at boat launches; (A, C)
- c. Reports and records of private stockings; (A)
- d. Distribute literature through boating registration channels; (A, F)
- e. Use volunteer for monitoring. (A, G)

RESPONSE:

a., c. Both a and c require establishing an extensive record-keeping system that does not exist at present, These measures seem to be re-active instead of proactive. They might be useful in determining when and how an introduction occurred, but not particularly useful in preventing or controlling

introductions. It was decided not to attempt to establish these systems at this time.

- b. This comment has been included in the plan, for launch sites where it can be practicably accomplished. [10]
- d. This comment has been included in the plan. [17]
- e. This point was addressed in the plan originally, but the wording has been strengthened. [11, 24]

4. COMMENT: The two plans described in the Aquatic Nuisance Species Prevention and Control Act of 1990, and the New York State Chapter 456 of the Laws of 1991 are distinctly different and cannot be addressed by the single plan. (A, D).

RESPONSE: Federal government commentors explained more clearly the intended differences between the two plans. This plan is intended to be solely the comprehensive management plan. Wording has been revised to reflect that single role. It is beyond the capability of the Division of Fish and Wildlife to develop the public facility management portion of the two plans. [2]

5. COMMENT: There is too much focus on zebra mussels, particularly for examples of nonindigenous aquatic species issues and concerns. (A, E, G)

RESPONSE: Several examples that used zebra mussels have been deleted or changed.

6. COMMENT: Change the phrase "toxic chemicals" to pesticides. Only registered pesticides can be used to control any "pest", and it is misleading to suggest that simply "toxic chemicals" would also be used for control. (A)

RESPONSE: Changed. [14]

7. COMMENT: The plan should be re-organized. State and federal governmental roles and responsibilities should be consolidated in one section. A section on local governments should be added. Research should be described with a goal and objectives. Everything pertaining to each goal should be consolidated; the discussions should not be in a separate section from the goals and objectives. The discussions of goals contain a mixture of problems and actions. They should be re-organized into separate blocks. (B)

RESPONSE: The plan was been re-organized as recommended, except that the section on research has not been re-defined as a goal with objectives. Research is foundational to everything else in the plan. It will be up to the proposed program to recommend specific research goals.

8. COMMENT: Consolidate references to regulating transoceanic shipping into one section, and provide stronger emphasis on the need for federal and state legislation. (B, H, I)

RESPONSE: References to transoceanic shipping are separate because they focus on two different aspects. Under Goal 1, Prevention, the need for regulation of transoceanic shipping is expressed. Under Section IV, Governmental Roles and Responsibilities, the point is made that the state government needs to encourage and support federal legislative initiatives. It is not necessary that this plan express the need for federal regulations in stronger terms. It would be more appropriate and effective for the program staff to actively promote this concern.

9. COMMENT: The "objectives" in the implementation schedule are not really objectives, and a different word should be used. (B)

RESPONSE: The term annual "objectives" is required under P.L. 101-646.

10. COMMENT: Goal 1 (Prevention) should be limited to species already introduced into other U.S. and Canadian waters, but not yet in New York. (D)

RESPONSE: The wording has been changed to stress that the priority and emphasis should be placed on this class of nonindigenous aquatic species, without precluding limited research into others. [6]

11. COMMENT: Good programs are already in place for preparation and distribution of educational materials. Maximum interaction with the existing systems should be made. (D)

RESPONSE: The intent has always been to maximize the coordination with other existing education/distribution systems. The wording has been strengthened to emphasize this. Every possible education/distribution system has not been identified in the plan. It will be up to the program to accomplish this coordination. The word "system" has been changed to "network", to further imply coordination with existing systems. [16]

12. COMMENT: The cookbook approach to providing recommended mitigation methods to the public cannot be produced quickly enough to be meaningful to the public, and cannot meet all of the highly diverse public needs. An information

distribution center would be a better approach. (D)

RESPONSE: The proposed program would certainly function as an information distribution center. Several excellent information distribution centers already exist (e.g. Sea Grant, USFWS). However, calls are still received at DEC offices from individuals, groups, and communities with no knowledge or experience with zebra mussel issues. It is the belief of this office that the "cookbook" approach would provide a meaningful way of distributing information for mitigating present and future nonindigenous aquatic species impacts. It is expected that the "cookbook" would be an item made available for an information distribution center to provide. The "cookbook" would also describe regulatory guidelines and limitations.

13. COMMENT: NYDEC's program outreach, identification, habitat, potential impacts, etc. should be coordinated with the U.S. Fish and Wildlife Service's activities that are parallel. (D)

RESPONSE: This type of coordination is called for in the plan. [11, 18, 20, 23]

14. COMMENT: It may be necessary to decrease or temporarily terminate some human uses of waterbodies to ensure the utilization by a greater section of the society. (D)

RESPONSE: The termination of existing human uses of New York waterbodies must be considered very carefully. Any such decision should not be made without full public participation and consent. Temporary termination of human use of waterbodies should always be a possible alternative, but that alternative should be implemented only when the public is fully informed of the costs and benefits, and consents to the decrease or termination.

15. COMMENT: Regarding management plans, it is questionable whether management actions should be taken before adverse impacts occur. (A)

RESPONSE: This plan does not advocate specific management actions be taken before there is evidence of impacts. This plan calls for a review of existing management plans, an analysis of potential adverse impacts, and the identification of alternative courses of action, so a strategy is available if a certain set of adverse impacts appear to be imminent.

16. COMMENT: Research should be coordinated through the Great Lakes Panel on Exotic Species. (D)

RESPONSE: This comment has been added to the plan. [18, 22]

17. COMMENT: The plan should include more provisions for public participation. (E)

RESPONSE: More opportunities for public involvement have been included. [22]

18. COMMENT: Adverse impacts of herbicides are unfairly emphasized. Herbicides can provide effective, reliable control of nonindigenous aquatic plant species. (E)

RESPONSE: The plan did not specifically criticize herbicides. It gave an example where herbicide use can lead to an increase in milfoil abundance. This example was clarified, and statements added to state that herbicides can be useful for controlling nonindigenous aquatic plants. [14]

19. COMMENT: The Division of Fish and Wildlife may not be the best agency for implementing the nonindigenous aquatic species management plan. Perhaps the Division of Water would be a better lead agency. (E)

RESPONSE: Division of Fish and Wildlife concurs. While this division was tasked with developing this plan, other divisions may be in a better position to implement it. The possibility of involving Division of Water is discussed. [22]

20. COMMENT: Priorities should not be limited to situations with detrimental impacts. It may be more beneficial to make some nuisance-level impact situations the highest priority, in order to prevent them from becoming detrimental. (E, I)

RESPONSE: This comment has been added to the plan. [13]

21. COMMENT: The plan is contradictory when it comes to mandatory restrictions. The plan recommends against mandatory restrictions, then provides an example of when and how to implement them. (F)

RESPONSE: The example for mandatory restrictions has been dropped. The wording has been strengthened to reflect the opposition to mandatory restrictions. [9]

22. COMMENT: There should be much more information in the plan on the biological/chemical/physical factors which limit zebra mussel colonization of new waters. (F)

RESPONSE: That type of detail would be found in the species-specific control plan, that would be developed by this program. It is not appropriate in a general nonindigenous aquatic species management plan to go into detail on any one species.

23. COMMENT: The plan should be more explicit in detailing the many ways in which zebra mussels may be transported from one water to another. (F)

RESPONSE: Again, this would be a more appropriate topic for a species specific control plan.

24. COMMENT: Develop a universal informational sign that can be posted at all boat access facilities in the state. (F)

RESPONSE: This comment has been added to the plan. [10]

25. COMMENT: Add information about prevention of nonindigenous aquatic species introductions to safe boating class materials, and on fishing hot lines. (F)

RESPONSE: These comments have been added to the plan. [17]

26. COMMENT: The Management Plan comes to the conclusion that milfoil should not be controlled because there isn't a reasonable chance of success. (G)

RESPONSE: The commentor is taking a general principle and applying it too stringently. In general, control methods that will not work should not be tried. This is certainly not the case for milfoil. Successful control plans are in operation all around the lake. The plan is intended to imply that the control strategy must be adapted to the waterbody and the species of concern. For example, in Chautauqua Lake, at the very best only very localized control of milfoil could be achieved by hand pulling. However at Lake George, hand pulling is an effective control method in some embayments. The real concern is that large-scale attempts to eradicate whole populations of a nonindigenous aquatic species in a natural waterbody be very carefully contemplated, with a very thorough comparison of the costs and benefits of such a potentially devastating control proposal.

in some embayments. The real concern is that large-scale attempts to eradicate whole populations of a nonindigenous aquatic species in a natural waterbody be very carefully contemplated, with a very thorough comparison of the costs and benefits of such a potentially devastating control proposal.

27. COMMENT: Objectives under Goal 1 should include an assessment of pathways and mechanisms by which potential adverse nonindigenous aquatic species could gain entry to New York waters. (H)

RESPONSE: This comment has been added to the plan. [4]

28. COMMENT: Objects under Goal 2 should add the concept of prioritizing

potential harmful impacts. Control methodologies need only be developed for the most harmful. (H)

RESPONSE: The priority for addressing a potential harmful impact may stem from ease of implementation rather than the degree of harm. Also, the impacts of a nonindigenous aquatic species may not occur at low population densities, but control might still be desirable, to prevent a problem from happening. The act of prioritizing impacts is best relegated to the species-specific plans that the described program unit would develop.

29. COMMENT: Avoid making commitments of existing DEC staff to accomplish monitoring tasks described in the plan. (H)

RESPONSE: There is some level of data collection in association with nonindigenous aquatic species monitoring that could be accomplished by existing staff. However these tasks should not be imposed upon existing staff and current work plans. Extensive comments have been added to this plan to make the point that a good, thorough program with any chance of succeeding is dependent upon the availability of new staff and funding support. [2, 22]

30. COMMENT: There should be a greater focus on the prevention of additional nonindigenous aquatic species introductions into New York waters. (I)

RESPONSE: Prevention is always better than control. However, prevention must be balanced against public right of access. As long as preventative measures do not unduly restrict public access to and enjoyment of New York waterbodies, they are acceptable. The best preventative measure is an educated public with an interest in protecting their waters that is as great as their interest in enjoying them.

31. COMMENT: Is the projected staff and budget large enough? (I)

RESPONSE: Staff size and cost estimates were based on reasonable expectations of what the program should be able to accomplish, balanced against the anticipated funding levels that might possibly be available. The cost of the program was increased slightly from the original draft. [2, 24]

32. COMMENT: What method is the state currently using to insure that exotic introductions are not occurring during current fish stocking operations? Is the state currently involved in any precautionary measures to guard against transport of nonindigenous aquatic species introductions into uncolonized waters? (I)

RESPONSE: Currently no statewide standard operating procedure across all state agencies exists to prevent nonindigenous aquatic species introductions. The

development of such a standard operating procedure has been added to the list of annual objectives. [23, 26]

33. COMMENT: To control the introduction of exotic species through the sale of aquarium fish, tax incentives could be offered to "home growers". Additional tax could be levied on importers of exotic aquarium varieties to offset the cost of the incentives. (I)

RESPONSE: Introduction of nonindigenous aquatic species through aquarium fish trade should be thoroughly assessed. Tax incentive programs must be promulgated by the state legislature.

34. COMMENT: No experimental control may be used that can have an adverse effect on public health. (I)

RESPONSE: This plan endorses that concern. Any experimental control methods must be in full compliance with environmental and health regulations as well as water quality standards. [12]

35. COMMENT: The Delaware River Basin Commission monitors Delaware River waters and should not be excluded from participation in nonindigenous aquatic species prevention and control activities. (J)

RESPONSE: The DRBC has an excellent monitoring program. This organization has been added to the list of agencies that should be coordinated with. The list of coordinating agencies in the previous draft was by no means all inclusive, and the identification of additional interested agencies was very welcome. [11]

36. COMMENT: Additional attention is warranted for water bodies which are not connected to established commercial and recreational navigational routes. (K)

RESPONSE: This comment is absolutely correct. Monitoring is primarily directed first, at waters that are routes (or ports) of introductions; second, at waters that are vulnerable because they offer suitable habitat; and third, all others. Monitoring by the program unit would be primarily directed at categories 1 and 2, for economy of force reasons. Volunteers would be increasingly essential for monitoring waters in the second and third categories. That certainly does not minimize the importance of monitoring category three waters. [11, 24]

37. COMMENT: The beginning and ending of the second paragraph on page (ii) seem contradictory. (L)

RESPONSE: The paragraph has been re-worded. [iii]

38. COMMENT: The proposal doesn't go far enough, it is too little and too late [referring to the large number of nonindigenous aquatic species that have already been introduced to Seneca Lake. (L)

RESPONSE: The commentor is correct in stating that a program to control nonindigenous aquatic species introductions should have been put in place years ago. Whether or not the proposed program is too little remains to be seen.

39. COMMENT: The canal system is the primary route for introductions of many nonindigenous aquatic species introductions. There is not enough boat traffic to justify keeping the canal open. It should be closed to Seneca Lake. (L)

RESPONSE: Such a proposal is beyond the scope of this plan and should be proposed directly to the state legislature.

40. COMMENT: Education only goes so far, and is a proven failure here. (L)

RESPONSE: The commentor provides examples where someone was "told by a friend, that . . .". These examples illustrate the need for education, not that education doesn't work.

41. COMMENT: If you are serious about stopping the introduction of spiny water fleas, for example, bans on live bait and fish stockings are a must. (L)

RESPONSE: These rather stringent measures must be considered in the context of a species specific control plan, and be weighed against larger fisheries management objectives state-wide. Both of these ideas may have some merit in some waters under certain circumstances.

42. COMMENT: Was additional funding set up under the provisions of Chapter 456 of the Laws of 1991? If so, where from? (M)

RESPONSE: Chapter 456 of the Laws of 1991 only mandated the production of the plan, not its implementation, so no funding was allocated. The source of funds for the state portion of this plan has not yet been identified.

43. COMMENT: In western New York, it was agreed that Sea Grant would be the coordinating agency for distribution of funds, research, educating the public, and assisting in interstate projects. (M)

RESPONSE: Any successful nonindigenous aquatic species program must coordinate closely with Sea Grant. New York Sea Grant has been doing an

excellent job in producing educational materials related to zebra mussels. However Sea Grant's mandate does not allow them to do much of the resource management work identified in this plan. NYDEC and Sea Grant must act as partners in achieving the goals identified here. [17,20]

44. COMMENT: Fish stocking programs should have an environmental impact statement done prior to implementation. Planting diseased fish must also be avoided. (M)

RESPONSE: Some fish stockings do require environmental impact statements. The introduction of nonindigenous grass carp, for example, can only be done in accordance with an EIS. When ponds are reclaimed and restocked, the whole action is usually covered by an environmental impact statement. The hatcheries operate under a State Fish Health Management Plan, to insure disease-free fish are stocked.

45. COMMENT: Local fishing clubs and federations should be on a mailing list to ensure they are well informed. (M)

RESPONSE: Local fishing clubs and federations could well be a good source of volunteers for monitoring and data collecting. This comment has been added to the plan. [24]

46. COMMENT: The public must use only local live bait. (M)

RESPONSE: This action should be considered in the context of species specific control plans. It might be a good idea for some waters, but not possible for others. [6]

47. COMMENT: Monitoring of all inland waterbodies within New York would be cost prohibitive unless a spot check system is implemented. (M)

RESPONSE: The commentor is correct. The only way large numbers of waterbodies can be monitored to train volunteers to accomplish much of the monitoring. [11, 24]

48. COMMENT: Prevention is better than remediation. We should be preparing for an introduction of river huffer now, and not wait until it happens. (M)

RESPONSE: The commentor is correct. The purpose of this plan is to implement a program to prevent nonindigenous aquatic species introductions.

49. COMMENT: Sources of funding should be determined only after the goals are in place. (M)

RESPONSE: The federal government can fund up to 75% of the activities identified in this plan. The source of state funding must be determined.

50. COMMENT: The plan should include a brief section listing New York's nonindigenous aquatic species, when and how they may have been introduced, and their potential effects. (N)

RESPONSE: Such a section is beyond the scope of this plan. Several good reports of this nature are available in the scientific literature. A recent report of this nature was produced in 1992 by Dr. Edward Mills of Cornell University.

51. COMMENT: The commentor would favor a plan which is under the direct control of DEC staff, but supported by a consortium of representatives. (O)

RESPONSE: This comment has been added to the plan. [23]