FINAL REPORT

of the

NEW YORK STATE INVASIVE SPECIES TASK FORCE

Fall 2005

New York State Department of Environmental Conservation

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New York State Department of Agriculture and Markets

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The New York State Invasive Species Task Force

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Special Thanks

to the Steering Committee for their hard work and continuing contributions to the work of the Invasive Species Task Force:

Steve Sanford, Leader	NYS DEC
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Ken Carnes	NYS DAM
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EXECUTIVE SUMMARY

Chapter I. OVERVIEW

The Task Force

In response to the growing problem of invasive species, in 2003, Governor Pataki signed legislation sponsored by Senator Marcellino and Assemblyman DiNapoli. Chapter 324 of the Laws of New York of 2003 called for an Invasive Species Task Force to explore the invasive species issue and to provide recommendations to the Governor and the Legislature by November 2005. The statute describes the intended membership of the Task Force and directs that it be co-led by two New York State agencies:

Department of Environmental Conservation (DEC)
Department of Agriculture and Markets (DAM)

Other members of the Task Force include:

New York State Department of Transportation
New York State Thruway Authority (and Canal Corporation)
New York State Museum (and Biodiversity Research Institute)
New York State Office of Parks, Recreation and Historical Preservation
New York State Department of State
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New York Sea Grant
Cornell University
Invasive Plant Council
The Nature Conservancy
New York State Natural Heritage Program
New York State Farm Bureau
Empire State Marine Trades Association
New York State Nursery and Landscape Association

The Task Force has taken numerous steps toward accomplishing its mission. It first established a Steering Committee to oversee the day-to-day work of the Task Force. Early on, it arranged for the whole Task Force to consult with the Executive Director of our federal counterpart, the National Invasive Species Council. The next task was to design and conduct an in-depth survey of all Task Force member organizations to assess concerns, capabilities, and needs. Then, the Task Force established several smaller teams to investigate in detail, to analyze existing efforts, to identify needs, and to develop recommendations. Each team was designed to pull together organizations that share a common area of interest or expertise. The Task Force reached out to numerous stakeholders to invite them to participate as members of these teams.

The Task Force has met at various locations around New York State. These

meetings were open to the public and dates, times and locations were announced in the *Environmental Notice Bulletin*. At most meetings, members visited sites of on-going invasive species management projects. Formal public review of the *Draft Report of the Invasive Species Task Force* will be accomplished through a combination of both in-person public meetings and internet communication. It will be completed during the summer of 2005.

Definitions

Invasive species are non-native species that can cause harm to the environment or to human health. The Invasive Species Task Force adopted the definition of invasive species contained in the federal Executive Order 13112, signed in 1999. Thus, for the purpose of this *Report*, an invasive species is a species that is: 1) non-native to the ecosystem under consideration, and; 2) whose introduction causes or is likely to cause economic or environmental harm or harm to human health. In the latter case, the harm must significantly outweigh any benefits.

Many of New York's species of plants and animals are non-native. Most experts agree, for example, that about one-third of our plants are native to places other than New York. However, only a small fraction - perhaps ten to fifteen percent - of these cause the harm necessary to be deemed invasive. To the contrary, many provide numerous benefits and enrich the lives of New Yorkers every day. Most of the species we know as food crops, livestock, pets, landscaping and garden plants cause no significant harm to our economy, environment or health.

Pathogens - disease-causing organisms like viruses, bacteria, and even prions - present a challenge in defining the scope of the invasive species issue. Most would concede that West Nile Virus - an African disease brought here in the 1990s and affecting both birds and humans - has all the characteristics that define an invasive species. Other diseases, though, like HIV/AIDS in humans or foot-and-mouth disease in domestic cattle, are regarded differently by society. One ready distinction is that these diseases are managed by longstanding health care systems, whether for humans or for livestock. This report does not attempt to include these pathogens within the scope of findings or recommendations.

The Problem

Invasive species are a form of biological pollution. They have caused many problems in the past, are causing problems now, and pose threats to our future. A wide variety of species are problematic for many sectors of our world: our ecosystems, including all natural systems and also managed forests; our food supply, including not only agriculture but also harvested wildlife, fish and shellfish; our built environments, including landscaping, infrastructure, industry, gardens, and pets. Invasive species have implications, too, for recreation and for human health. Clearly, all New Yorkers hold a stake in the invasive species issue.

Since the Invasive Species Task Force first convened in 2004, at least six new organisms have invaded New York: three from Europe - the European Crane Fly, the European Wood Wasp, and the Swede Midge; one from Africa - the Southern Bacterial Wilt; one from China - the Brown Fir Long-horned Beetle; and one from the western United States - Chronic Wasting Disease.

The costs associated with invasions are substantial. Although we do not have estimates for New York State by itself, others have calculated the economic impact to the United States as a whole. Studies at Cornell University estimate that annual costs exceed $ 120 billion. Some examples from our state give a sense of the costs. The annual bill thus far for trying to eradicate Asian Long-horned Beetle from New York City and Long Island has ranged between 13 and 40 million dollars. Each year, New York State spends about one-half million dollars to control Sea Lampreys in the Great Lakes. There is no end in sight for this expenditure.

Strategic Need

Existing management efforts are limited. Although the invasive species issue is recognized by professionals as a major threat to our natural resources, limited resources have been allocated toward solutions. The National Invasive Species Council was established by Executive Order to coordinate efforts among federal agencies, but there is no overarching federal legislation that recognizes the magnitude of invasive species as an issue. Thus, there is no dedicated federal funding stream available for their management.

Chapter II. THE PROBLEM

A longstanding problem is growing.

Invasive species are not a new problem. The increase in globalization is increasing - dramatically - the rate of invasion.

Familiar Invasives

Many species have been in New York for so long that many have forgotten that they are not native. Such species as the Norway Rat, Water Chestnut, Watermilfoil, Carp, Mute Swans, Dutch Elm Disease, House Sparrow, Starling, and the Golden Nematode are familiar to most.

Recent Arrivals

More newsworthy have been those invasive species coming to New York in recent decades. Zebra and Quagga Mussels, the Fishhook and Spiny Waterfleas, Round Goby, West Nile Virus, Hemlock Woolly Adelgid , Asian Long-horned Beetle are causing many millions of dollars of damages each year.

Imminent Threats

We know of numerous species poised to invade New York. The agricultural threats are best known. Swede Midge, Southern Bacterial Wilt, Soybean Rust and Plum Pox Virus. Ecological threats include the Bighead and Silver Carps, Emerald Ash Borer, Sudden Oak Death, and Chinese Mitten Crabs. Chronic Wasting Disease has been found here in 2005.

Why do they do so well?

Invasive species are opportunists from out of town who rely on “unfair”

competition. Most come without the predators, pests, parasites and pathogens that keep their populations in balance in their native ecosystems. Without these limitations to reproduction and survival, they often thrive. They have an enormous advantage over native species because they can live largely untaxed by natural forces. Because natives co-evolved with a suite of predators, pests, parasites, and pathogens, they cannot compete with the unencumbered invaders.

It's easy to travel to New York.

The potential for invasive species introduction, establishment, and dispersal within our State is high. It is a major point of entry for passengers, cargo and mail entering the United States.

"Hitch-hikers"

The "vector" is the means by which invasives move around the globe. Invasive species may arrive in New York State as freight proper, or they may just come along "for the ride". Diseases or pest organisms may travel on or inside imported foods, plants, livestock or pets - and they may come in human travelers and their luggage. Others may be purely incidental, such as insect pests in wooden packing crates or snakes or animals inadvertently entrapped within shipping containers. Smuggling and "black market" trades avoid most of the mechanisms intended to preclude invasive species from entering New York State. Ballast water is likely the major means of aquatic species invasions worldwide. Water taken on by a ship in one port, along with whatever is in it, can be later released thousands of miles - or a hemisphere - away.

Protecting New York's resources is critical.

Agriculture, forestry, parks, tourism and a richly diverse abundance of natural resources are at risk from invasive species. For example, New York's 37,000 farms cover about one-quarter of the State. Our residents enjoy over 4,000 freshwater lakes, major portions of the Great Lakes Erie and Ontario, 70,000 miles of rivers and streams, and over 2 million acres of freshwater wetlands. Recreational boaters with boats registered in New York State spent an estimated $2.1 billion in 2003 on boating-related expenses. A recent study of 183 State Parks and Historic Sites found that New York's parklands harbor many rare species of plants and animals as well as significant natural communities. The survey found 504 separate populations of state endangered or threatened species

Our food supply must be protected.

Our food supply, whether harvested from conventional farms or from our waters or woods, has always been at risk from pests and diseases. Farmers have had to manage Colorado Potato Beetles, Corn Rootworm, and Oriental Fruit Moth for many years. Other invasives threatening our agricultural crops are Swede Midge, Plum Pox Virus and Southern Bacterial Wilt. Both MSX and Dermo spread through proximity to infected oysters and toxic algae such as "red tide" pose threats to human health and to marine organisms. They are known to have been transported around the world in ballast water and can also be transported through aquaculture, baits or other avenues.

Invasive species may offer opportunities for bioterrorism. Our food supply is most vulnerable if pests or disease organisms are loosed upon major crops. This potential has been reflected in the fact that the inspections of imported fruits, vegetables, and other plant materials has been placed under the federal Department of Homeland Security in recent years.

Invasives threaten New York's biodiversity.

Most scientists regard invasive species as second only to habitat loss as a threat to our biodiversity. It is one of the leading causes of endangerment. On a nationwide basis, about half - 46 percent species of plants and animals listed as federally Endangered or Threatened are at risk because of invasive species; for eighteen percent, invasive species are the principal cause of endangerment and for 24 percent they are a contributing factor.

The Great Lakes have had a long history dealing with invasive species. Many of the nearly 170 non-indigenous species currently in the Great Lakes were transported to these waters from local, regional, and global sources. Recent invaders include Zebra and Quagga Mussels and Round Gobies - which together aid the growth of Type E Botulism.

Other well-known invasives that have reduced New York's biodiversity are the European Starling, Purple Loosestrife, Eurasian Watermilfoil, Sea Lamprey, and Common Reed (*Phragmites*).

Some invasives follow unusual pathways.

In addition to commerce and tourism, invasive species reach New York State by many other ways. Landscaping and nurseries use mostly non-native species. Captive and ornamental wildlife, pets, live food, live bait, aquaculture, and recreational boating can all introduce invasive species.

Our "built environs" are at risk, too.

We humans have made "improvements" to the landscape through our building, landscaping, and gardening. We have created urban and suburban parks that require maintenance and we build elaborate infrastructure. Each of these endeavors is threatened - and made more costly - by invasive species. Ships, docks, water intakes, and bathing beaches are under constant attack by invasive fouling and boring organisms. Parks, yards and gardens are invaded by Norway Maple, Giant Hogweed, Kudzu, Oriental Bittersweet, and Japanese Knotweed.

Chapter III. EXISTING EFFORTS

The perfect system does not yet exist.

A complete system for addressing invasive species would include fully-developed programs to ensure: prevention; early detection; rapid response and eradication; control and management; and restoration. Each of these programs would require: funding; coordination; information management; research; and education and outreach.

Some systems are well-established and have dedicated funding.

Agriculture has the most well-developed systems. The systems are not without problems but they have most of the program elements and the supporting activities listed above. The vulnerability of agriculture to invasive species has been recognized for a long time. The Plant Quarantine Act of 1912 and subsequent statutes and interpretations have given rise to today's system of safeguarding American animal and plant resources. While this patchwork of laws has served us reasonably well, it has failed to keep pace with emerging challenges resulting from trends in technology, commerce, and travel.

USDA's Foreign Agricultural Service (FAS) and Programs of APHIS-PPQ provide a first-line defense. They provide early detection and rapid response capability when coupled with the Cooperative Agricultural Pest Survey (CAPS) through DAM. The federal government also provides taxonomic and diagnostic support to identify invasive pests and also maintains pest databases. Coordination and public outreach are key components of this system.

Plant pests provide some examples.

Such invasives as Golden Nematode, Late Blight, Plum Pox Virus, Asian Long-horned Beetle, Sudden Oak Death have been quarantined, controlled, or prevented through the application of these federal-State partnerships.

We have learned some useful lessons.

Experience has shown that the most effective tools for invasive species management include: careful monitoring, rapid response, basic research, public outreach, meaningful restoration, sustained funding, industry cooperation, and best management practices.

Other efforts are independent, have no reliable funding streams, and frequently rely upon volunteers.

Some examples of effective programs in terrestrial habitats are undertaken by: the Brooklyn Botanic Garden, American Museum of Natural History, New York Flora Association, New York State Invasive Plant Council, New York Natural Heritage Program, New York State Parks, and New York City Parks. Voluntary industry standards provide great promise. Weed Management Areas coordinate numerous partners for a single purpose. "Linking Girls to the Land" involves Girl Scouts in the detection of invasive plants.

Some successful programs that deal with aquatic invasive species include: Adirondack Park Invasive Plant Program (APIPP), biological control of Purple Loosestrife; and the Great Lakes Fishery Commission. The revised New York State Aquatic Nuisance Species Plan is being held in abeyance to be incorporated into a more comprehensive plan for all invasive species. The National Aquatic Nuisance Species Clearinghouse and the Invasive Plant Database enable the sharing of accurate and current information. An educational partnership involving the pet and aquarium hobby and industry is called "Habitattitude". "Aquatic Hitchhikers" is a similar effort aimed at recreational boaters.

Success is incomplete.

Some of the shortcomings of existing programs can be seen in efforts to manage Eurasian Watermilfoil, the ship vector, and Common Reed (*Phragmites*). Recent Sea Grant Surveys have found numerous marine invasives previously undetected. And fish and wildlife laws and regulations provide limited ways to prevent introductions.

Chapter IV. SURVEY OF TASK FORCE ORGANIZATIONS

Between July and September of 2004, the Task Force surveyed its seventeen member organizations to assess who is doing what to combat invasive species. The goal was to capture information on a significant majority, but not all, of the State, Federal, local and private invasive species program activities in the State. The questionnaire also started the process of identifying other interested organizations and collecting possible recommendations.

Conclusions

Based on the survey responses, the problems and threats of invasives are well understood by the experts. There are a number of dedicated State staff and excellent programs that exist to address various specific invasive problems, but there is no dedicated capacity charged with providing overall strategic coordination.

The members of the New York State Invasive Species Task Force appear to be more reactionary than proactive with regard to the invasive species problem, with a growing but still inadequate degree of inter-agency and public-private coordination and cooperation. There is a clear need for a stronger federal role in preventing invasive species problems, and providing states such as New York with Federal funds to assist in this effort.

The survey identified some of the greatest successes regarding invasive species in New York today at the local level and indicated that these are the result of local or regional coordination and cooperation among a combination of local, state, federal and private parties. Such strategic coordination at the statewide level, and additional funding and support for regional coordination, is key to a successful New York State invasive species program.

There exists both opportunity and support for establishing dedicated invasive species funding. A public-private partnership should invest proportionately more resources in overall strategic planning, coordination and communication. As available funds increase, by looking more at prevention and early detection and rapid response as priorities for those funds, future invasive species problems and costs can be more effectively contained and minimized.

Chapter V. RECOMMENDATIONS

1. Establish a permanent leadership structure to coordinate invasive species efforts.

An Executive Council should be established to address and pursue the preliminary recommendations of the ISTF. The Executive Council would be comprised of select state agencies and authorities engaged in the prevention, control and eradication of invasive species. The group should include State agencies and authorities whose missions relate to invasive species: the Departments of Agriculture and Markets; Education; Environmental Conservation; Health; Parks, Recreation and Historic Preservation; and Transportation. The Adirondack Park Agency, the Thruway Authority and Canal Corporation should also be considered

The Executive Council should identify resource needs and allocate staff and other resources to facilitate the advancement of goals and objectives. It should also possess the ability to establish ad hoc teams comprised of public and private sector representatives to assist in the pursuit of stated goals and objectives.

The New York State Invasive Species Task Force should continue as a permanent body and serve as the overarching advisory group, paralleling the Federal model. The full breadth of stakeholders should be represented. Industry, especially, should be given an opportunity to participate. Arborists, the turfgrass trade, contractors, pesticide manufacturers, utilities, tourism, and recreation should have voices, perhaps through trade associations. The Task Force should serve as an advisory committee to the Executive Council.

2. Prepare and implement a comprehensive invasive species management plan.

New York State should have a "Comprehensive Plan for Invasive Species Management". Such a plan should address all taxa of invasive species. The Comprehensive Plan should, at a minimum: establish interagency responsibilities; describe coordination among different agencies and organizations; recommend approaches to funding invasive species work; address prevention, early detection and rapid response; identify opportunities for control and restoration, including research needs; and describe effective outreach and education. Responsibilities for different agencies need to be clearly defined and contradictory or conflicting procedures need to be resolved. The Comprehensive Plan should identify needs for additional staff positions at State agencies. It should also identify needed New York State or federal legislation.

3. Allocate appropriate resources invasive species efforts.

Adequate funding should be allocated to invasive species management activities, including: coordination; prevention; eradication; control and management, including research; and public education. In the near-term, sufficient staff should be allocated to invasive species management. The development of a comprehensive plan should begin as soon as possible but should not delay on-going efforts that are of obvious value.

4. Establish a comprehensive education and outreach effort.

New York State should develop a comprehensive outreach and education program for invasive species. It should do so by coordinating existing efforts but also utilizing opportunities to incorporate invasive species messages into the full variety of educational opportunities.

5. Integrate databases and information clearinghouses.

New York State should establish a state-wide database clearinghouse for all taxa of invasive species that incorporates existing data from agencies and organizations in the state, as well as from nearby states, provinces, Canada, and our own federal government. Such a database would provide the aggregate data on-line in a GIS so the information can be easily accessed and visualized and it would also allow users to interactively create their own maps and do their own queries of the database.

6. Convene a regular invasive species conference.

The permanent coordinating body should organize and convene a regular (annual or biennial) invasive species "summit" to focus and maintain attention on New York's comprehensive invasive species program. The conference should attract and include representatives from all stakeholder groups and should cover a broad array of topics. At its inception, it should be integrated with the development of the comprehensive invasive species management plan.

7. Formalize New York State policy and practices on invasive species.

A Governor's Executive Order should be issued to direct all State agencies and authorities to: 1) phase out uses of invasive species; 2) expand use of natives; 3) promote private and local government use of natives as alternatives to invasives; and 4) wherever practical and where consistent with watershed and Weed Management Area Plans, prohibit and actively eliminate invasives at project sites funded or regulated by New York State.

8. Establish a center for invasive species research.

New York State should establish a regional Center for Invasive Species Research to serve the region and the State, stretching from the Great Lakes to the Mid-Atlantic to New England and southeastern Canada. It should be independent and not be under the umbrella or direction of State government; it should be a research arm that closely collaborates with the Invasive Species Task Force and State agencies as well as with other federal and regional entities involved in invasive species management.

9. Coordinate and streamline regulatory processes.

New York State should reform relevant regulatory processes to remove unnecessary impediments to the restoration of invaded ecosystems. Processes should facilitate the efficient application of best management practices.

10. Encourage nonregulatory approaches to prevention.

New York State should encourage the broad array of stakeholder industries to develop and or adopt voluntary codes of conduct like the "St. Louis Protocols." The State should explore ways to award some form of official recognition of such efforts.

11. Influence Federal actions to support invasive species prevention, eradication and control.

New York State should work with its Congressional Delegation, National Governors Association, Environmental Commissioners of States, federal agencies, and other bodies to influence federal actions.

12. Recognize and fund demonstration projects.

New York State should begin funding efforts that would clearly demonstrate the possibilities for successful invasive species management. Such demonstration projects should include the full range of activities: prevention; monitoring and detection; information management; eradication and control; applied research; and education and outreach. Funding, whether through competitive grants or other mechanisms, should be aimed at multi-year projects with durations sufficient to generate meaningful results.

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Chapter I.

OVERVIEW

Introduction

Early in the twentieth century, Chestnut Blight arrived in North America and, within a couple of decades, killed virtually all American chestnuts, one of the most valuable trees in New York's forest. Zebra Mussels arrived here from their native Caspian Sea in the late twentieth century and have altered ecosystems, clogged pipes, and ruined bathing beaches in some of our largest waters. Near the start of the present century, West Nile Virus came here from Africa and has sickened and even killed both birds and humans. Asian Long-horned Beetle arrived within the lumber used for packing crates and has forced us to cut down thousands of prized shade trees in our cities and suburbs - in the hope that it does not spread to our forests. Swede Midge, discovered in recent surveys, could decimate our broccoli and cabbage crops. Chronic Wasting Disease has been moving eastward from its origins in Rocky Mountain elk and mule deer. It could harm our white-tailed deer now that it has entered New York. Eurasian Watermilfoil and Water Chestnut choke many of our waters, impeding boating and swimming and crowding out our native species. On land, two invasive milkweeds - both Black Swallowwort and Pale Swallowwort - are smothering plant communities. Although numerous agencies and organizations across New York are combating the threats posed by these invasive species, our State does not yet have a fully coordinated or comprehensive defense against them.

The Task Force

In response to this growing problem, in 2003, Governor Pataki signed legislation sponsored by Senator Marcellino and Assemblyman DiNapoli. Chapter 324 of the *Laws of New York, 2003* (see Appendix A), called for a team to explore the invasive species issue and to provide recommendations to the Governor and the Legislature by November 2005. The statute describes the intended membership of the Task Force and directs that it be co-led by two New York State agencies:

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The Task Force met at various locations around New York State. These meetings were open to the public and dates, times and locations were announced in the *Environmental Notice Bulletin*. The initial meeting was convened in Albany at the DEC Headquarters in April of 2004. At that meeting, the Task Force organized itself and created and charged the Steering Committee, which is composed of staff from member organizations. The Task Force next met in July of 2004 at the Adirondack Park Agency Headquarters in Ray Brook. The featured speaker was Lori Williams of the National Invasive Species Council. Task Force members also learned about numerous invasive species management efforts within the Adirondack Park. In October of 2004, the Task Force assembled at The Nature Conservancy's Mashomack Preserve on Shelter Island. Topics focused on Weed Management Areas and invasives in the marine environment. The January 2005 session was convened at the Brooklyn Botanic Gardens and focused on invasive species prevention activities at the Port of New York and also local management efforts for Asian Long-horned Beetle. The fifth gathering of the Task Force was held at the Cornell Laboratory of Ornithology in Ithaca in May of 2005. There, the Task Force members focused on reviewing a preliminary draft of this report and also learned about a wide array of invasive species efforts from Cornell staff.

Formal public review of the *Draft Report of the Invasive Species Task Force* was accomplished through a combination of in-person public meetings and internet communication completed during the summer of 2005. The Task Force met for the sixth time at the DAM Headquarters in Albany in October 2005. They reviewed public comments and decided on changes needed to make the Draft Report a Final Report. For more details about the work of the Task Force, visit its website at www.dec.state.ny.us/website/dfwmr/habitat/istf.

Definitions

Invasive species are non-native species that can cause harm to the environment or to human health. Terminology frequently confuses discussions of invasive species because most terms used to describe invasive species are not rigorously-defined scientific terms, so no set of definitions is universally recognized. For example, the terms *non-native*, *alien*, and *exotic* generally refer to organisms that come from other political jurisdictions, usually other nations. *Nonindigenous* has more scientific roots and refers to organisms that come from other environments or ecosystems but not necessarily from other nations or even states. In fact, many species *indigenous* to some parts of New York State are *nonindigenous* elsewhere within our borders. *Introduced* clearly connotes human intervention. Whereas some organisms may expand their ranges, even to new continents, in response to natural forces, *introductions* happen only when humans play a role, usually purposefully.

Other related terms include *naturalized*, *nuisance*, and *noxious*. *Naturalized* means species that can form self-sustaining populations; they do not need continued introduction to persist. *Nuisance* and *noxious* are largely synonymous; they both mean that a species causes a problem, but the species is not necessarily nonindigenous. Many native animals can become *nuisances* and are then known as pests or vermin (or even the more vernacular "varmints"); *nuisance* plants are deemed either *noxious* or simply "weeds".

The Invasive Species Task Force adopted the definition of invasive species contained in the federal Executive Order 13112, signed in 1999 (see Appendix C). Thus, for the purpose of this report, an invasive species is a species that is: 1) non-native to the ecosystem under consideration, and; 2) whose introduction causes or is likely to cause economic or environmental harm or harm to human health. In the latter case, the harm must significantly outweigh any benefits.

Many of New York's species of plants and animals are non-native. Most experts agree, for example, that about one-third of our plants are native to places other than New York. However, only a small fraction - perhaps 10 to 15 percent - of these cause the harm necessary to be deemed invasive. To the contrary, many provide numerous benefits and enrich the lives of New Yorkers every day. Most of the species we know as food crops, livestock, pets, landscaping and garden plants cause no significant harm to our economy, environment or health.

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Invasive species are a form of biological pollution. They have caused many problems in the past, are causing problems now, and pose threats to our future. A wide variety of species are problematic for many sectors of our world: our ecosystems, including all natural systems and also managed forests; our food supply, including not only agricultural products but also harvested wildlife, fish and shellfish; our built environments, including landscaping, infrastructure, industry, gardens and pets. Invasive species have implications, too, for recreation and for human health. Clearly, all New Yorkers hold a stake in the invasive species issue.

Invasives come from all around the world. Although they were brought to the New World with the first explorers and settlers, the rate of invasion is increasing along with the increase in international trade that accompanies globalization. Since the Invasive Species Task Force first convened in 2004, at least seven new organisms have invaded New York: three from Europe - the European Crane Fly, the European Wood Wasp, and the Swede Midge; one from Africa - the Southern Bacterial Wilt; two from China - the Brown Fir Long-horned Beetle and the Snakehead Fish; and one from the western United States - Chronic Wasting Disease.

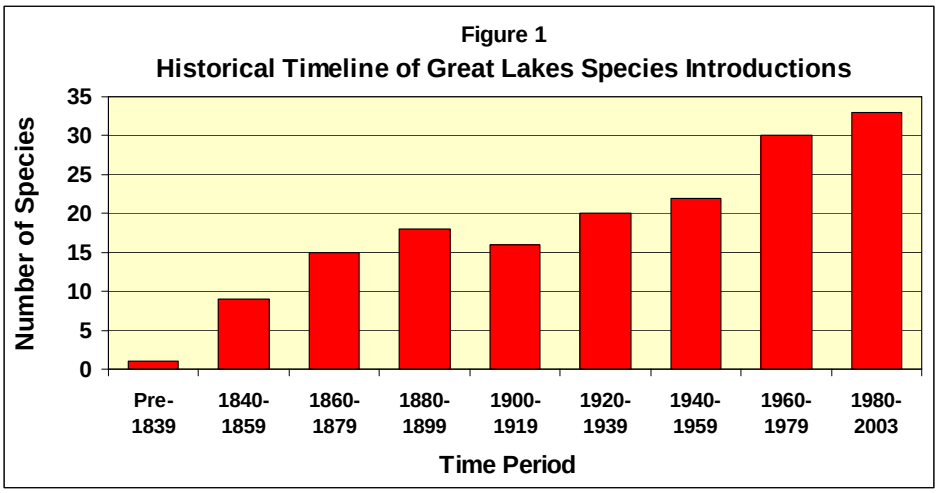

Figure 3 (Table courtesy of New York Sea Grant)

Many problems caused by invasive species are permanent. Like letting the genie out of the bottle, there is no turning back the clock for many species. Familiar examples like Gypsy Moth, Dutch Elm Disease, Zebra Mussels and Golden Nematodes will probably be with us for the foreseeable future.

Costs associated with species invasions are substantial. Although the Task Force does not have estimates for New York State by itself, others have calculated the economic impact to the United States as a whole. Studies conducted by Cornell University estimate that annual costs exceed $120 billion. Some examples from our state give a sense of the costs. The annual bill thus far for trying to eradicate Asian Long-horned Beetle from New York City and Long Island has ranged between 13 million and 40 million dollars. Each year, New York State spends about one-half million dollars to control Sea Lampreys in the Great Lakes and there is no end in sight for this expenditure.

Strategic Need

Existing management efforts are limited. Although the invasive species issue is recognized by professionals as a major threat to our natural resources, limited resources have been allocated toward solutions. The National Invasive Species Council was established by Executive Order to coordinate efforts among federal agencies, but there is no overarching federal legislation that recognizes the magnitude of invasive species as an issue. Thus, there is no dedicated federal funding stream available for the overall management of invasive species.

The Final Report

The *Final Report of the Governor's Invasive Species Task Force* is intended to be a comprehensive strategic document that considers the following approaches:

Prevention - Arresting invasive species before they are released to our environs is clearly the best solution. However, we cannot always know which species pose threats. So, the worldwide adoption of best management practices to preclude introductions could be the most effective preventative. The federal government plays a fundamental role in prevention but there are numerous opportunities for New York to act to protect our State.

Early detection - Effective monitoring would enhance awareness of a problem before it becomes widespread and unmanageable. Public and private partnerships could provide useful networks to enhance monitoring.

Rapid Response - Systems are needed that can facilitate early eradication of problem species. Access to funds and expertise are necessary elements of such systems. In some cases, more efficient regulatory processes may be needed.

Control/Management - Some existing invasives can be controlled or even eradicated. Others appear to be beyond any meaningful control but could be managed to confine or control them at tolerable levels under particular circumstances.

Education - Education can support each of the above components of a comprehensive solution. Public awareness is growing but the invasive species issue has not yet reached the "critical mass" needed for comprehensive public engagement.

This report does not address every invasive species or every public or private effort to manage them. Rather, it includes numerous illustrative examples, which, taken together, are intended to give the reader a broad understanding of the invasive species issue in New York State. It is also not a plan for the management of the myriad invasive species problems in our State. Such a comprehensive planning document is necessary and is among the recommendations offered in Chapter V.

* * *

Chapter II.

THE PROBLEM

This chapter describes the nature and extent of the invasive species problem. It outlines what is at stake in New York, such as agriculture, our rich and varied aquatic and forest resources, and special features like the Adirondack Park. It describes many of the ways species invade New York and the many kinds of harm they cause to numerous sectors of our society. The species discussed below were selected to illustrate particular concepts and do not include all of the invasive species of concern to New York State.

A longstanding problem is growing.

Invasive species are not a new problem. Some were likely brought here by Native Americans - just as they have moved maize and other crops from Central America throughout this continent - before Europeans first came to the lands now known as New York. Others have come more recently and still others are likely to come in the near future.

Familiar Invasives

Many species have been in New York for so long that most people have forgotten that they are not native. The Black Rat probably came with Henry Hudson and the other early explorers; it was later supplanted by the Norway Rat. They thrive around humans to whom they spread a host of diseases. Water Chestnut was first discovered in Collins Pond in Schenectady County - it still chokes many of our lakes, ponds and slow-moving rivers. Watermilfoil, Carp and Mute Swans were all brought here from Eurasia and all despoil New York's waters. Dutch Elm Disease allows few American elms to live to adulthood; the streets of our small cities and villages are no longer graced by their grandeur. Two small birds, the House Sparrow and Starling, were brought here from Europe in the 1800s. Ever since, they have competed with bluebirds and tree swallows for nesting cavities. The Golden Nematode, a minute roundworm in some of our farmland soils, has required a strict quarantine on the movement of crops and soils since it arrived on Long Island after World War I.

Recent Arrivals

More newsworthy have been those invasive species coming to New York in recent decades. Zebra Mussels - and later their close relatives the Quagga Mussel - have

dominated the Great Lakes and other large waters. They have recently been joined by the Round Goby and the Fishhook and Spiny Waterfleas. West Nile Virus arrived here probably by airplane, likely carried within a bird or human passenger; it has spread throughout the nation and kills millions of birds - and scores of humans - each year. The Woolly Adelgid is an insect pest to eastern hemlocks, in both wild and nursery stock. The Asian Long-horned Beetle probably traveled to New York within wooden crating. Tens of thousands of shade trees have been sacrificed and tens of millions of dollars have been spent in an effort to confine this lethal pest - to keep it from decimating our forests' signature sugar maples and other hardwoods.

Imminent Threats

We know of numerous species poised to invade New York. The agricultural threats are best known. Swede Midge, which arrived just last year from Canada, could decimate our broccoli, cauliflower and cabbage crops if it becomes established. Southern Bacterial Wilt, from both Africa and South America, could contaminate our soils and dramatically reduce the yields of tomatoes, potatoes, eggplant and peppers. Soybean Rust and Plum Pox Virus are two more invasive species to watch carefully in New York. The Bighead and Silver Carp can come to New York a number of ways but an electrical barrier on the Chicago River is currently keeping them from the Great Lakes. The Emerald Ash Borer, another beetle from Eurasia, has killed millions of ash trees in Michigan; lumber or firewood could bring it here. Sudden Oak Death has been found in nursery stock in California, Oregon and Washington; it could threaten many species of trees and shrubs, in both our landscaped and natural woodlands, if imported to New York. Chinese Mitten Crabs can be found for sale in the live food markets in Manhattan. If this species is released to the Hudson River, it could change the estuary's ecology. Chronic Wasting Disease is a fatal disease of deer and elk in the western United States. It has been found more recently east of its original range in herds of captive and wild deer. Its presence in New York - first found here in 2005 - could affect our wild deer populations.

Why do they do so well?

Invasive species are opportunists from out of town who rely on "unfair" competition. Most come without the predators, pests, parasites and pathogens that keep their populations in balance in their native ecosystems. Without these limitations to reproduction and survival, they often thrive. They have an enormous advantage over native species because they can live largely untaxed by natural forces. Because natives co-evolved with a suite of predators, pests, parasites and pathogens, they cannot compete with the unencumbered invaders.

It's easy to travel to New York.

The potential for invasive species introduction, establishment and dispersal within our State is high. It is a major point of entry for passengers, cargo and mail entering the United States. With almost 19 million people, New York State is served by 13 airports, 6 shipping ports and 800 miles of intrastate canal systems. It shares an international border with Canada 450 miles in length, including 85 miles of contiguous land and 17 border crossings. The Peace Bridge and Champlain crossings monitor 4 million passenger vehicles and 1.1 million commercial trucks annually. Interstate roadways span more than 113,252 miles across the state's 49,579 square miles. Three dozen freight railroads haul 16 percent of the nation's cross border trade over 83,000 route miles. More than 70 million tons of freight are transported annually in more than 1.7 million car loads.

"Hitch-hikers"

The "vector" is the means by which invasives move around the globe. Invasive species may arrive in New York State as freight proper, or they may just come along "for the ride". Diseases or pest organisms may travel on or inside imported foods, plants, livestock or pets - and they may come in human travelers and their luggage. Other invasions may be purely incidental, such as insect pests in wooden packing crates or snakes or other animals inadvertently entrapped within shipping containers.

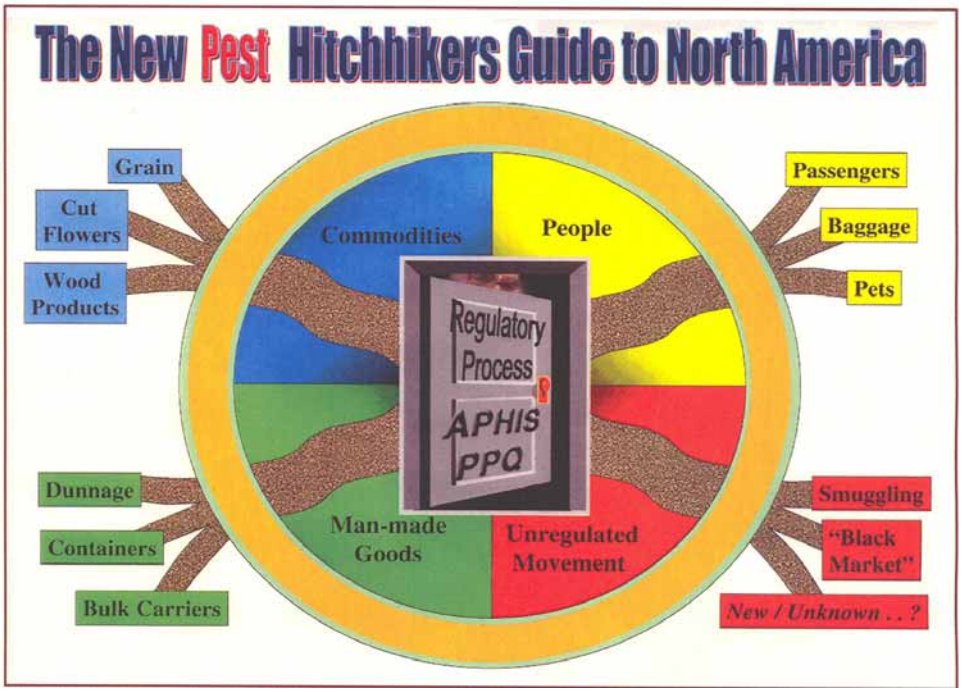

Figure 4 (Image courtesy of USDA -APHIS)

Most commerce is legal and therefore subject to inspection and other preventive measures. Of course, there is illegal commerce as well. Smuggling and "black market" trades avoid most of the mechanisms intended to preclude invasive species from entering New York State.

Ballast water is likely the major means of aquatic species invasions worldwide. Water taken on by a ship in one port, along with whatever is in it, can be later released thousands of miles - or a hemisphere - away. Species such as the Zebra Mussel and the Asian Shore Crab appear to have arrived in the United States in this manner. Ballast water has the potential to release a wide range of harmful organisms, including bacteria, toxic algae, plants and animals as either larvae, adults, spores or eggs. Even though there are some mandated best management practices required by the U.S. Coast Guard and proposed in recently developed international conventions, some amount of ballast water discharge is still allowed, particularly from ships with cargo originating in United States waters. Mid-ocean ballast water exchange is required for ships entering United States waters from outside the 200-mile exclusive economic zone, but this open-ocean exchange is not required for interstate shipping. Even with ballast water exchange, a certain amount of organisms remain in the water and residual sediment of the tanks. Ships can also carry invasive species on the outsides of their hulls or on anchors, fishing gear and the like.

The New York State Canal System offers one example of how transportation networks can facilitate invasions. Since their beginnings in the early nineteenth century, the Erie and other canals connected aquatic ecosystems that had been isolated since the last glaciers more than 10,000 years ago. The locks that enabled the exchange of barges and goods across North America also enabled the exchange of species. The Great Lakes and Finger Lakes, the Hudson River and Mohawk River, and Lake Champlain all became one interconnected ecosystem.

Protecting New York's resources is critical.

Agriculture

New York's 37,000 farms represent an important resource to the state. Approximately one-quarter of the state's 7.65 million acres are used to produce a true cornucopia of food products. With milk production ranking third in the nation, dairy leads New York's farms with almost $2 billion in receipts each year; meat and poultry net an additional $400 million. Field crops, fruits and vegetables returned another approximately $1 billion to New York farmers. The apples we grow along the southern shore of Lake Ontario, the Hudson Valley and in the upper Lake Champlain Valley place New York second among states in apple production. The grapes for wine and juice are grown along Lake Erie, the Finger Lakes, the Hudson Valley and the eastern end of Long Island. Other fruits grown in New York State include tart cherries, pears and strawberries. New York's leading vegetable crops are cabbage, sweet corn, and onion. Field crops like corn, oats, wheat and soybeans, grown in support of our dairy industry are steadily increasing in importance.

The growing of flowers and other nursery plants is the second largest agricultural sector in New York State. Bedding and garden plants are produced under 24 million square feet of glass, and we are the fifth largest producer in the nation.

The landscaping business - the planting and care of these and other plants- is also a major industry.

Aquatic Habitats

Surface waters are abundant in New York State. Our residents enjoy more than 4,000 freshwater lakes, major portions of the Great Lakes Erie and Ontario, 70,000 miles of rivers and streams, and more than 2 million acres of freshwater wetlands. New York's waterways are used extensively for recreation and have a tremendous impact on New York's economy. For example, recreational boaters with boats registered in New York State spent an estimated $2.1 billion in 2003 on boating-related expenses. In 2003, boating as a consumer-driven industry in New York had a total economic impact of $1.8 billion, accounting for 18,700 jobs and contributing $728 million in labor income. Fishing, too, is a major industry in New York. In addition to our 900,000 resident licensed anglers, 100,000 others travel to New York to pursue their sport. The trout and salmon fishery on Lake Ontario is regarded as "world class".

Parks

The biodiversity of our State Parks is at risk from invasives. New York's State Park system was recognized in 2004 as the Number One state park system in America. An important part of that recognition is scenic and natural resources. A recent six-year study of 183 State Parks and Historic Sites found that New York's parklands harbor many rare species of plants and animals as well as significant natural communities. Scientists from the New York State Natural Heritage Program conducted this first-ever survey of living things in the nearly 300,000 acres of the Park system. They found 504 separate populations of state endangered or threatened species; seven species and natural communities that occur only within the State; and 191 species and communities that are "globally rare" - meaning fewer than twenty occurrences in the world.

Some highlights of biodiversity are the Old Growth Hemlock forest in Allegany State Park; the American hart's-tongue fern in Clark Reservation; Leedy's roseroot found growing on the cliff in Watkin's Glen State Park; goldenseal and butterwort - two rare wildflowers in Letchworth State Park; seabeach amaranth at Jones Beach State Park; the post oak-blackjack oak barrens in Clay Pit Ponds State Park Preserve; the slender blazing-star within Whirlpool State Park; the timber rattlesnake in Sterling Forest State Park; the Indiana bat in Thacher State Park; the Blanding's turtle at James Baird State Park; and the short-eared owl in Robert Moses State Park. One of the most important finds was the Allegany Woodrat in Palisades State Park. This species had not been seen in nearly twenty years and was thought to be extirpated from New York State altogether.

The Adirondack Park - the largest publicly protected area in the United States - is larger than Yellowstone, Everglades, Glacier and Grand Canyon National Parks put together. Its six million acres of Constitutionally-protected "forever wild" forest preserve and privately-owned properties are vulnerable to invasions for

numerous reasons. Neighbor to both Lake Champlain and Canada, it has an international exposure. Tourists carry species from other areas on their boats and other recreational vehicles and hikers carry seeds in their clothing and other gear. Homeowners import new species for private gardens. The stress that acid rain puts on aquatic and terrestrial systems renders them especially vulnerable.

Urban and suburban parks, open space, and forests are an often overlooked but vital asset in our urbanized world. There are over 60,000 acres of parkland in five of the largest cities in New York State. If the smaller cities and vast suburban landscapes are added, the immensity of the resource is apparent.

The economic value of this resource can be seen by examining two statistics. The National Arbor Day Foundation estimates that, nationwide, each street tree has an average value of $525. Therefore the nearly half million street trees in New York City have a value of more than $260 billion and the 60,000 street trees in Rochester have a value of $31.5 billion. Alternatively, one can examine the cost to replace some of the services street trees provide. These critical services include air pollution abatement, storm water treatment, reducing the "heat island" effect (and thereby saving energy costs), and their obvious aaesthetic value, which adds to home value. About one-fourth of City of Rochester, for example, is covered by trees. They provide at least $50 million in air quality benefits each year.

Our food supply must be protected.

Our food supply, whether harvested from conventional farms or from our waters or woods, has always been at risk from pests and diseases. Farmers have had to manage Colorado Potato Beetles, Corn Rootworm and Oriental Fruit Moth for many years. Other invasives threatening our agricultural crops are Swede Midge, Plum Pox Virus and Southern Bacterial Wilt.

Asian Soybean Rust

Asian Soybean Rust was first found in the United States in November of 2004. Transported via commerce to South America around 2001, the wind-borne fungus has been spreading by air currents throughout South American countries since that time. By August of last year it was found north of the equator in Colombia. It appears that rust spores were transported directly to nine of our southern states from South America by the September 2004 hurricanes.

Asian Soybean Rust has the potential to dramatically reduce the yield and profitability of soybeans and other beans, including those grown in New York. All current commercial soybean cultivators in the United States are susceptible to Asian Soybean Rust. When this Rust attacks soybeans during early stages of development, yield losses can be as high as 80 percent.

The Rust fungus is expected to survive long-term on more than 90 species of living host plants in frost-free regions of North America and the Caribbean; in

mild winters, it may survive even further north. Spores blown northward from these over-wintering sites each growing season could initiate annual epidemics in U.S. soybean fields, weather conditions permitting.

The long-term solution to Asian Soybean Rust will be the development of cultivars with partial resistance or tolerance to Rust. Most experts agree that it could take 5 to 10 years for resistant cultivars to become available to farmers. In the meantime, soybean farmers will be forced to apply expensive pesticides repeatedly throughout each growing season. This will add significant costs. The currently available products would cost about $15 per acre per application; it may take several applications to be effective. Emergency use labels for additional fungicide products are still pending EPA review. Estimates of nationwide added costs range to $2.4 billion each year. Eastern states like New York may be more susceptible to Rust infestation than other states because of temperature, relative humidity, and rainfall during the growing season.

Oyster Diseases

MSX (*Haplosporidium nelsoni*) and Dermo (*Perkinsus marinus*) are parasitic diseases of the eastern oyster (*Crassostrea virginica*), a commercially important bivalve shellfish. The two diseases have severely decimated oyster harvests from the north shore of Long Island. Dermo was first documented in the Gulf of Mexico in 1940 and has been found in New York and the rest of the northeast since the 1990s. It was most likely introduced to the northeast through the importation of eastern oyster seed for aquaculture and restocking. MSX was first documented in Delaware Bay in 1957 - possibly through the experimental release of Japanese oysters - and came to our state by 1960. Both MSX and Dermo spread through proximity to infected oysters.

On the north shore of Long Island, the public oyster beds from Huntington Bay to Port Jefferson Harbor produced as many as 40,000 bushels per year - worth over $ 1 million to the commercial shellfish industry - as recently as 1997. In 1998, DEC began receiving reports of dead or dying oysters from Huntington Bay. Subsequent sampling showed that both MSX and Dermo were present. By 1999, oyster harvest dropped to 1500 bushels and have not risen above 4500 bushels since. The oyster harvest in Oyster Bay Harbor, the site of the last remaining large-scale shellfish aquaculture operation in New York, was affected to a lesser extent, probably due to the use of some MSX-resistant strains and harvests timed to avoid periods of greatest mortality. New York does not have a routine monitoring program for MSX and Dermo.

Phytoplankton

Toxic algae such as “Red Tide” that pose a human health threat or a threat to marine organisms are known to have been transported around the world in ballast water and can also be transported through aquaculture, baits or other avenues. They can cause severe human health impacts and great economic harm through the closure of shellfishing areas or by causing fish kills. It is not known whether

Brown Tide, which decimated the Bay Scallop industry on Long Island is an invasive species, but it provides an example of the potential impact of toxic or nuisance phytoplankton.

Pathogens

Bacteria, viruses and parasites that can cause human illness or infect marine organisms can easily be transported to New York waters. Of particular concern are bacteria of the genus *Vibrio*, which can cause cholera or other severe human diseases or have marine animal health implications. *Vibrio parahaemolyticus* has been found in ballast water in ships entering New York waters. Non-native *Vibrios* are suspected of causing a food-borne illness outbreak from shellfish harvested in Oyster Bay Harbor.

Three Crabs

Many New Yorkers enjoy crabs and clams as shellfish delicacies. Our native blue crabs and both hard clams (quahogs) and soft clams are threatened by three species of invasive crabs. Two species of non-native crabs, the Green Crab (*Carcinus maenas*) and the Asian Shore Crab (*Hemigrapsus sanguineus*) are already in New York's marine waters. A third species, the Chinese Mitten Crab (*Eriocheir sinensis*) is likely to invade.

The Green Crab was probably introduced from Europe in the 1800s. It competes with native species and has been implicated in the decline of soft clam harvests in Maine. Its impacts in New York are not well-documented, but the species is found in all marine waters. It is possible that this species has become naturalized, but there is insufficient historic and current survey information to be sure.

The Asian Shore Crab is a recent invader to the east coast and was probably introduced through ballast water. It competes with native species and tolerates a wide range of environmental conditions. It is omnivorous and can prey on shellfish and other marine organisms as well as native vegetation. It is potentially very disruptive due to its long breeding period and densities as high as 50 to 100 individuals per square meter.

The Chinese Mitten Crab is not currently found in New York, but has a high potential to cause environmental and economic harm. It has disrupted fishing operations and clogged water intakes on the west coast and has led to stream bank destabilization from its burrows. The Chinese Mitten Crab may have been introduced through ballast water, but may also have escaped or been released from live food markets. This invasive Crab may also be a health threat because it carries a human parasite.

Homeland Security

Invasive species may offer opportunities for bioterrorism. Although the effects would never approach the violence or suddenness of bombings or other quasi-

military attacks, purposeful introductions of invasive species could have dramatic economic consequences. Our food supply is most vulnerable if pests or disease organisms are loosed upon major crops. In some circumstances, simply the perception of danger - as the world has seen with "mad cow disease" - is enough to create economic havoc. This potential has been reflected in the fact that the inspections of imported fruits, vegetables, and other plant materials has been placed under the federal Department of Homeland Security in recent years.

The Public Health Security and Bioterrorism Preparedness Response Act includes a subpart known as the Agricultural Bioterrorism Protection Act; it was signed into law by President Bush in 2002. The law is designed to improve the ability of the United States to prevent, prepare for, and respond to bioterrorism and other public health emergencies that could threaten public safety or American agriculture. A list of agents and toxins deemed to pose a severe threat to animal or plant health or products was developed to regulate their possession, use and transfer.

The "Agricultural Select Agents and Toxins" list was published in 2002 and amended in 2005. In developing the list, the United States Department of Agriculture considered the following: the effect of an agent or toxin on animal or plant health or products; the virulence of an agent or degree of toxicity of the toxin, and the methods by which the agents or toxins are transferred to animals or plants; and the availability and effectiveness of medicines and vaccines to treat and prevent any illness caused by an agent or toxin. The list includes viruses, bacteria, and other pathogens, as well as toxic plants. Each poses significant threats to our food supply.

Invasives threaten New York's biodiversity.

> "On a global basis...the two great destroyers of biodiversity are, first habitat destruction and, second, invasion by exotic species."
>
> - E. O. Wilson

Biodiversity is the variety of all living things - species, natural communities, and ecosystems - that inhabit New York's landscape. Although at first blush, one might deduce that bringing more types of organisms to our state would increase its diversity, the opposite is generally true. Most scientists regard invasive species as second only to habitat loss as a threat to our biodiversity. The issue of invasive species is one of the leading causes of endangerment. On a nationwide basis, about half - 46 percent of species of plants and animals listed as federally Endangered or Threatened are at risk because of invasive species; for eighteen percent invasive species are the principal cause of endangerment and for 24 percent they are a contributing factor. Loss of biodiversity is felt not only in the ecological realm but also such losses affect recreation, tourism, and food supply.

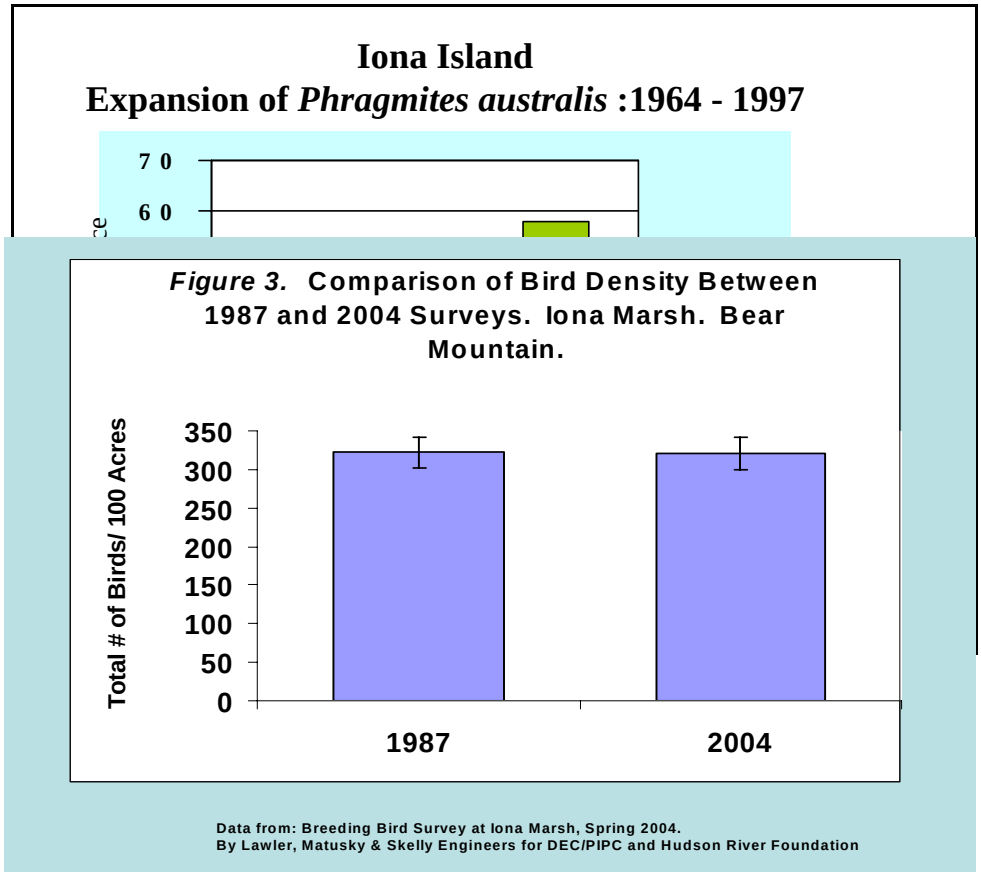

Figure 3 Invasion of Common Reed over time.

As a local example of the loss of biodiversity, consider the impacts of invasive species at Iona Island, a part of Bear Mountain State Park in the Hudson River. From near one percent in 1964, the Common Reed - also known by its Latin name, *Phragmites* - has expanded to almost sixty percent of what had been a rich emergent ecosystem. While the number of individual birds has stayed about the same over the ensuing forty years, the number of bird species has dropped to less than half.

Figure 4 Bird abundance over time.

Figure 5 Bird diversity over time.

The Great Lakes

The Great Lakes have had a long history dealing with invasive species. Many of the nearly 170 non-indigenous species currently in the Great Lakes were transported there from other places. Earlier on, the Great Lakes were invaded by other North American species. Migration through canal systems, like New York's own Erie Canal, enabled some North American species to inhabit the Great Lakes ecosystem for the first time. Over time, other vectors such as intentional release or escape from aquaculture, aquaria, baitfish, or live food have been joined by transoceanic shipping, especially in fresh ballast water.

Managing Exotics with Exotics

By the 1970s, Lake Ontario's major native fish stocks had been pushed near extinction. Atlantic salmon, lake trout, deepwater sculpins, burbot, and whitefishes had all disappeared or seriously declined in abundance, whereas non-native fish like Alewife, Rainbow Smelt and White Perch proliferated. At this time, windrows of dead Alewives accumulated on Lake Ontario's beaches each spring. Efforts by state, federal, and provincial agencies to control nuisance levels of alewife, establish a sport fishery and restore native lake trout led to accelerated stocking of non-native, Pacific salmonid species to function as fish predators. The desire for greater survival of non-native trout and salmon led to an expansion of hatchery stocking programs in both New York and Ontario and the dawn of a multimillion-dollar recreational fishing industry. While naturalized salmon in Lake Ontario have been a boon to local economies, managers and stakeholders currently must: rely solely on hatcheries to sustain their fishery; foster predator

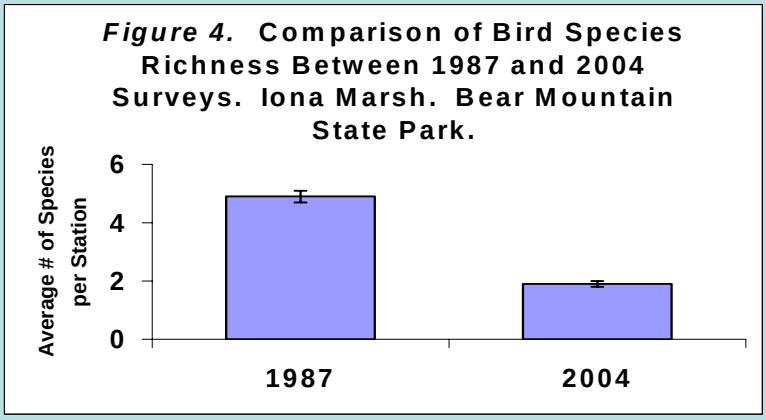

Figure 4. **Comparison of Bird Species Richness Between 1987 and 2004 Surveys. Iona Marsh. Bear Mountain State Park.**

Data from: Breeding Bird Survey at Iona Marsh, Spring 2004.
By Lawler, Matusky & Skelly Engineers for DEC/PIPC and Hudson River Foundation

(salmon) and prey (alewife) fish communities that have had little time to co-evolve; now manage for the invasive alewife to ensure the health of the introduced salmon fishery; and accept a high level of uncertainty in managing a fish community dominated by non-native species.

Mussels, Gobies and Botulism

Transoceanic shipping has been the primary route of invasion of the Great Lakes over the last four decades. Many invasive species originate from the Black Sea-Caspian Sea region of Europe and, when brought here, proliferate in North America because they are without their natural predators. The "poster children" of aquatic invasive species in New York are the Zebra and Quagga Mussels; they have invaded many of the State's prime waters. They have transformed the Lake Erie and Ontario ecosystems from pelagic systems - where fish and other organisms live and thrive throughout the water column - to benthic systems - where life forms are concentrated on the lake bottoms. Because these invasions are fairly recent, though, many impacts may not become evident until some future time. The most obvious effect has been an increase in water clarity and an increase in aquatic vegetation beds because the Mussels have filtered most of the free-floating algae and other food particles out of the water column. When these two Mussels were joined by the Round Goby in Lake Erie, another ecological effect was observed. Although Type E Botulism may or may not be an invasive pathogen, the bacterium that causes the disease thrives in beds of these Mussels, especially the Quaggas. The Round Goby eats the Quaggas and then passes the botulinum on to waterbirds like gulls, ducks, loons and even bald eagles. Tens of thousands of birds - and uncounted quantities of mudpuppies (large aquatic salamanders) - have died in recent years as a result.

Emerald Ash Borer

Just as American chestnut trees are now all but extinct throughout their historic range in eastern North America because Chestnut Blight found its way to this continent, our ash trees are at risk of a similar fate because of the Emerald Ash Borer (*Agrilus planipennis*), a beetle from Asia. Labeled the "Green Menace" by United States Department of Agriculture's Plant Prevention and Quarantine office, this invasive was first discovered in Michigan, Ohio and Ontario in 2002. It has been traced back to nursery stock and firewood moved from Maryland, Virginia and Indiana.

The half-inch long, metallic green adult insects lay their eggs under the bark. The larvae remain beneath the bark and bore throughout the tree. Their effects are visible when the leaves turn yellow or brown and the canopies die back. Emerald Ash Borers have destroyed tens of millions of ash trees in Michigan, Indiana, Ohio and the Canadian Province of Ontario. It could invade our forests and parks if transported in firewood with out-of-state campers or along with industrial packaging at one of our many international ports. Our ash species are significant contributors to wetland and flood plain management, helping stabilize creek banks and filter water. Ash species are favorite neighborhood street trees in many of our

urban areas. Ash is perhaps best known as a common source of wood for baseball bats. Michigan Department of Natural Resources estimates that this insect could wipe out their ash trees within 20 to 30 years. A Canadian environmental risk report on this insect predicts a similar fate for their ash. Loss and cost estimates from Ohio Department of Natural Resources suggest that, over a 10-year period, removing Ohio's ash trees that fall victim could cost private property owners $1 billion and the forest industry $2 billion. New York's ash forests represent more than $2 billion in liquidation value alone and virtually all of our urban centers rely on ash species to provide street shade and aesthetic values.

Sudden Oak Death

Sudden Oak Death is a lethal disease with a misleading name. Although *Phytophthora ramorum* does affect oaks, it has also been found in numerous other shrubs and trees, such as *Rhododendron* and *Viburnum.* It is known to infest forests in California and nurseries in California, Oregon, Washington and British Columbia. Wholesale distribution of broadleaf evergreens, lilacs, viburnum and other nursery stock nationwide has the potential to spread Sudden Oak Death exponentially.

European Starling

The European Starling is now one of the most abundant birds in North America. It was brought from its native Europe to Manhattan's Central Park in 1890 by a man who wanted to surround himself with every species of bird ever mentioned in the works of William Shakespeare. The Starling is a threat to native cavity-nesting birds like the bluebird, the flicker and the tree swallow because it competes with them for nest sites. Being especially aggressive, it will commonly remove these natives from disputed holes or nest boxes. Starlings are also important agricultural pests.

Purple Loosestrife

Purple Loosestrife, a wetland perennial plant from Europe, has a 200+ year presence in the northeast region of the United States and has now spread to all of the Lower 48 states except Florida. Initially introduced in ship ballast, the plant became popular with gardeners and beekeepers. Purple Loosestrife spread rapidly through the Hudson and Mohawk River Valleys and, aided by the Erie Canal and the rail and highway systems, this plant was able to move across virtually the entire state. Only wetlands in the central Adirondacks have remained out of reach of the "purple plague".

Purple Loosestrife invades most marsh and meadow types of freshwater wetlands and can grow in water up to 18 inches deep. The obvious effect is the outcompeting of native marsh plant communities that provide food and cover for wildlife; they are often replaced with a loosestrife monoculture that provides little in the way of food. Native wetland wildlife such as ducks, rails, bitterns, and terns have lost important breeding and foraging habitat as a result. More subtly,

recent evidence shows that Purple Loosestrife exudes chemicals that preclude survival of several amphibian species' larvae.

Control measures include water level manipulations and herbicide use, but neither provides long-term success. There are no figures for the costs of purple loosestrife to New York's economy, neither in lost revenues, due to reductions in game populations or hunting and fishing opportunities, nor in terms of overall ecological costs. Cost estimates from Washington State show that annual control of the single largest purple loosestrife infestation (20,000 acres) would require $800,000.

Eurasian Watermilfoil

Eurasian Watermilfoil is the most widespread aquatic nuisance across North America and is problematic in hundreds of lakes throughout New York State. The beds of this submergent species often support more than 300 stems per square meter. Such high densities harm wildlife and fish populations and make recreational uses difficult or impossible. Direct financial damages to recreation such as boating, swimming and fishing have not been assessed, but control efforts are costly. Applying herbicides or using mechanical harvesters, rototillers, cultivators, barriers, dredges and other physical control techniques have typically resulted in short term, localized reductions of populations. These methods are often disruptive, costly, and labor intensive, and need to be maintained long-term.

Sea Lamprey

Sea Lampreys pose threats to the ecosystem, recreation, and commercial fisheries in our Great Lakes, Finger Lakes and Lake Champlain. In fact, the Great Lakes Fishery Commission (GLFC) was created in 1954 to deal with this invader. Adult Sea Lampreys, which are shaped like eels, feed by attaching onto other fish with their suctorial mouths and extracting blood and other body fluids from the fish. Each Sea Lamprey may destroy as much as 46 pounds of fish during the 12 to 20 months of its adult life.

Sea Lampreys are susceptible to control during their breeding cycle. Mechanical barriers can exclude them from the streams and rivers they need for spawning. Larval Sea Lampreys can be killed with pesticides in the muddy sediments they inhabit before they transform to adults. The GLFC expends in excess of $20 million annually on its Great Lakes Sea Lamprey program; about $1.2 million of these dollars are spent annually on control measures on Lake Ontario alone. Lesser amounts are spent elsewhere in New York. With no control, Sea Lampreys would flourish in Lake Ontario, the salmonid and other fisheries would be decimated, and a multimillion dollar fishery supporting economies at the local and the state levels would not exist.

Common Reed

Common Reed, often called by its Latin name *Phragmites*, invades both freshwater and saltwater wetlands. It is probably the most harmful invasive species in the marine district. It grows from 6 to 12 feet in height in dense monocultures that frequently displace native wetland vegetation. *Phragmites* commonly gains its initial foothold following physical disturbances, such as ditching or dredge spoil deposition, or from changes in water or soil chemistry, such as when tidal flows are restricted or road salt enters a wetland. Although there is a form of *Phragmites* native to North American wetlands, the aggressive, non-native genotype from Europe has displaced the less aggressive native.

Common Reed's most profound harm is caused in estuarine systems. It reduces the nutrient exchange between the marsh and the rest of the estuarine system so that the saltmarsh can no longer fulfill its critical role as the nursery of the marine ecosystem. Its dense mat of undecayed leaves and stems raises the elevation of the marsh and thereby reduces tidal innundation and salinity. These changes foster even more *Phragmites* growth and survival. Its tall, dense growth robs native plants of light. These changes in physical structure and plant community lower habitat quality for the marine and terrestrial organisms that depend upon them directly for food, shelter and reproduction.

Common Reed causes similar problems in freshwater systems. Recent research has shown that American toad tadpoles living amongst *Phragmites* grow less than half as much as they do among native marsh plants.

Macroalgae

Codium fragile, or Dead Man's Fingers, is a green seaweed native to the Asian Pacific that probably was introduced from Europe to the east coast and New York through ballast water around 1957. In fact, it is also called "Sputnik Weed" because it arrived in our waters about the same time that Russia launched the first satellite. Since that time, *Codium* has spread rapidly and is found in all major estuaries in the Northeast. In some areas on the east coast it is implicated in the displacement of native seaweeds or eelgrass. The ecological impacts and the extent of displacement of native plants have not been documented

Some invasives follow unusual pathways.

Landscaping and Nurseries

The "green industries" in New York State - plant nurseries and landscaping - are large and growing; they also support other peripheral industries. The movement of nursery stock is recognized as one of the major pathways for facilitating the spread and distribution of invasives domestically and abroad. The New York State Nursery/Landscape Association, the New York State Turfgrass Association and the New York State Arborists have begun a dialogue about invasives with private sector organizations like the Invasive Plant Council of New York and The Nature Conservancy and through the New York State government CAPS Program.

The importance of this industry in serving as first line detectors of invasive species cannot be underestimated. As a result, the DAM includes the mailing of various Pest Alerts in its licensing renewal process for nursery grower and plant dealer establishments. In addition, CAPS outreach has successfully assisted in the identification of target pests to the green industry with the result being the green industry's assistance in the early detection and reporting of *Ralstonia solanacearum* and the European Cranefly.

The recognition of the green industry as a primary stakeholder of critical importance in the control and management of invasives must be acknowledged to effectively safeguard American plant resources. The industry itself is focusing on predictive models to identify and assess the risks from potential invaders. Industry representatives have expressed concern with respect to the passage of legislation in Connecticut that regulates the sale by nurseries of 81 species of plants, but has no provisions for preventing the species from entering the state. Although members of the nursery industry in Connecticut participated in the development of the regulatory list, they feel the legislation has damaged the state's relationship with the industry.

Captive Wildlife

Chronic Wasting Disease (CWD) was first found in New York in 2005. It is a fatal neurological disease that affects the deer family. It is a "transmissible spongiform encephalopathy," which is a class of diseases that includes scrapie in sheep and "mad cow disease" in cattle. Recognized in deer and elk populations in the western United States since the 1960s, it is not yet known how it came to New York. It has been moving eastward in captive and wild populations in recent years. New York has about 400 licensed deer farms and an extensive wild white-tailed deer herd.

If Chronic Wasting Disease becomes common in New York's wild white-tailed deer, it could have ramifications beyond the deer themselves. Currently, Chronic Wasting Disease poses no known risk to humans. However, if public perceptions result in a decline in deer hunting, it could affect big game hunting, our forest ecology, and deer-caused problems such as crop and landscaping damage, and collisions with automobiles.

State and federal agencies have undertaken aggressive steps to detect and then eradicate infected deer in captive herds; they are also intensively monitoring wild herds.

Ornamental Wildlife

The familiar Mute Swan is native to Europe and Asia. It was brought to New York in the late nineteenth century as ornaments on estate ponds in Westchester County. They have since become naturalized in eastern North America and have posed both ecological and human safety problems. They outcompete native waterfowl for nesting territories and, weighing up to 25 pounds each, they uproot

large quantities of aquatic vegetation and also cause turbidity as they dig through bottom sediments. In recent years, eastern states, in partnership with conservation organizations, have begun a coordinated effort to control this invasive species by preventing reproduction. This effort was suspended for several years when a judicial decision accorded this non-native species protection under the North American Migratory Bird Treaty. This status was amended in early 2005 and management efforts will likely resume.

Pet Trade

The term "snakehead fish" refers to a group of closely related fish species whose native range includes much of Asia and parts of Africa. They are a very aggressive predator and, because they can survive out of water, possess exceptional invasive characteristics. They are imported alive as food, as pets, and for medicinal purposes. They garnered a lot of public attention in recent years when they were found, apparently reproducing successfully, in ponds in Maryland. Evidently, a fish that had been secured for its medicinal qualities was released when the patient was cured through more conventional means. In order to prevent their spread, the State of Maryland drained and depopulated a numbers of ponds of all fish. In the summer of 2005, Snakeheads were found in the wild in New York City.

The pet trade poses a threat not only from the pets themselves but also from their shipping practices. Frequently, invasive aquatic plants such as Fanwort, Brazilian Elodea, and Hydrilla are used to provide oxygen to tropical fish when being transported or in aquaria. Disposal of these plants into New York's waters could lead to successful invasions.

Live Food Trade

Markets offering live food are found across New York State but are especially prevalent in New York City. The demand is supported by immigrant cultures who wish to enjoy foods from their native lands. Fish and shellfish predominate. A variety of Asian Carps and the Chinese Mitten Crab are available and, if released alive into local waters, could threaten estuaries and other aquatic systems.

Live Bait

It is common practice for anglers to empty their bait buckets and boat bait wells into natural waters when done fishing. Invasive species of bait fish and extraneous organisms such as plankton, invertebrates, aquatic plants and fish diseases can be contained in bait water. Unfortunately, many anglers believe they are doing a good thing by saving the bait and at the same time fortifying the forage fish supply in their favorite "fishin' hole". Alewife, Golden Shiner, Rudd and Smelt are some invasive bait fishes that are moved around this way. White Perch are not generally used as bait, but are often transferred with live-caught bait fish.

Alewife predation upon pelagic larvae of native species, in particular walleye and yellow perch, has been documented as a source of decline in walleye populations and a contributor to lower yellow perch populations. Alewife also prey on larval whitefish and compete with juvenile whitefish. This has led to declines in Great Lakes whitefish populations. Alewife also affects the health of certain salmon and trout species as well as walleye. When those species consume Alewives, they ingest high levels of an enzyme that breaks down thiamine, also known as Vitamin B. A diet of Alewives also causes early mortality syndrome, a cause of death in younger fish.

Golden Shiner, although native to certain watersheds in New York State, have expanded their range by way of bait buckets. They compete with brook trout and the endangered round whitefish in Adirondack lakes. DEC has reclaimed numerous ponds to restore these species by removing Golden Shiner (and also yellow perch).

Rudd, a European fish, are finding widespread use in the bait fish industry as they are readily cultured and have bright orange fins which seem to attract anglers, if not gamefish. Rudd have been established in certain Hudson Valley streams for decades with little apparent harm to native fauna. However, those who manage fish populations and their watersheds are concerned about the increasing use and availability of Rudd as bait fish. Similarly, in the marine bait trade, worms from Maine that are packed in seaweed have historically been imported into New York. There is no known harm even though the seaweed is often discarded in the water. The potential exists for baits from other areas to be similarly handled; these may bring invasives along with them.

Aquaculture

Aquaculture is the raising of aquatic organisms under controlled conditions, usually for food. There is potential for release of invasive species during aquaculture operations, not only of the "crop" species, but also undesirable animals, algae or pathogens that may come in shipments of seed organisms. For example, there has been recent interest in the introduction of a non-native Asian oyster, *Crassostrea ariakensis,* into Chesapeake Bay as a replacement species for the native Eastern Oyster. Another Asian oyster, *Crassostrea gigas*, has been experimentally tried in the Chesapeake and Delaware Bay and is suspected of being the source of the oyster disease MSX on the east coast.

Recreational Boating

Recreational boats are widely recognized as vectors for aquatic invasive species. Aquatic weeds like Eurasian Watermilfoil draped over trailers and propellers, microscopic Zebra Mussel "veligers" surviving within baitwells or cooling systems, or Spiny Waterfleas coating fishing nets and other gear, all have a strong potential to move invasive species to uninfested waters.

Our "built environs" and managed landscapes are at risk, too.

We humans have made "improvements" to the landscape through our building, landscaping and gardening. We have created urban and suburban parks that require maintenance and we keep as pets a host of animal species. Each of these endeavors is threatened - and made more costly - by invasive species.

Water Intakes and Bathing Beaches

The same Zebra and Quagga Mussel invasion that has upset the ecology of the Great Lakes and other prime waterbodies throughout New York State, has also escalated the costs for drinking water and electricity. Any water intake pipe, whether for a lakefront cabin, the lower unit on an outboard motor, or a massive power plant, is viewed by Zebra and Quagga Mussel larvae as a suitable place to come to rest and spend their adult lives. As they multiply, they can readily clog these intakes and treatment is required to keep the water flowing. Treatment options include mechanical, thermal and chemical means. Nationally, it is estimated that these mollusks cost $200 million annually in damage and control. New Yorkers pay their share of these costs. Because the utility industry acted quickly to find ways to manage mussel fouling on water intake structures, much economic damage has been prevented and they have avoided major losses to power production and of drinking water supply. This success, of course, has come with the price of increased maintenance and operations costs which are still being budgeted by utilities today.

These same Mussels shed shells which can cover shorelines and lake and river bottoms by the untold billions. The shells are very sharp - sharp enough to cut the feet of humans and their pets. Bathing beaches are rendered unusable at times as a result.

Sea Squirts and other Fouling Organisms

Non-native tunicates known as sea squirts and other fouling organisms like barnacles and bryozoans cause problems in marine waters. They are a bane to aquaculture operations and other activities that require gear to be placed in the water for long periods of time. They usually demand labor-intensive cleaning, can displace native species, and frequently cause increased fouling on boat hulls, bulkheads and water intakes. Several species of non-native tunicates, barnacles and bryozoans have been documented in New York's marine waters. Their range, population size and impacts are not known.

Boring Organisms

While fouling organisms generally require extra maintenance efforts, animals that bore into wooden structures such as piers, bulkheads and boat hulls can demand not only increased maintenance but also replacement. A shipworm (*Teredo bartschi*) and a small crustacean known as gribble (*Limnoria tripunctata*) have

invaded marine waters in New York and other northeast states. They have caused extensive structural damage in New York Harbor.

Hemlock Woolly Adelgid

The Hemlock Woolly Adelgid (*Adelges tsugae*) is an aphid-like plant pest. A 1920's introduction from Asia established it in Virginia, from where it spread to attack eastern and Carolina hemlocks. Extensive decline and mortality of hemlocks occurred in Virginia, Pennsylvania, New Jersey and Connecticut within ten years of the first detection. This invasive insect is now affecting hemlock stands in southern New York and has recently been detected in Buffalo and Rochester. This insect seems to be killing every tree it infests. Over 90 percent of the hemlocks are dead in the most heavily infested stands in Connecticut and New Jersey.

Eastern hemlock plays an important ecological role in New York's forests. As critical components of sensitive riparian ecosystems, hemlock trees provide shelter and temperature abatement for a variety of aquatic and terrestrial wildlife. In northern New Jersey, 96 bird and 47 mammal species are associated with hemlock forests. Many amphibians, small mammals and at least 152 species of terrestrial invertebrates depend on the particular habitat provided by these forests. According to the National Park Service, the decline of hemlock in the Delaware Water Gap Natural Resource Area is likely to have "massive adverse effects on the ecological, aaesthetic and recreational values of the park." It is estimated that overall species diversity would decline by 35 percent or more following the loss of hemlocks in these ecosystems.

It is difficult to assess the full extent of the economic costs of damage from introduced or "exotic" pests and especially so when timber assets are not a principal component of the forest values. Hemlock is not a preferred timber species, however, stream productivity, riparian diversity and sediment retention and stream bank stability will be dramatically reduced when the surrounding hemlocks die from Hemlock Woolly Adelgid infestations. Decaying and downed trees would increase debris flow, interfere with water flow, and cause channel scouring that would raise the chance of extreme flood damage. Nutrient cycling would also be disturbed with higher levels of organic pollutants entering streams following a Hemlock Woolly Adelgid outbreak. It seems likely that the resources of New York's hemlock forests will be dramatically altered as they become increasingly infested by this invasive. For the past four years we have been conducting experimental releases of an adelgid predator, *Sasajiscymnus tsugae*, with marginally successful results to date.

Norway Maple

Norway Maple was introduced from Europe and widely planted as a shade tree and as a street tree. It is an invasive species that affects the environment and soils in a way that makes it much more difficult to restore native species. Norway Maple shades out forest-floor plants. The resulting bare soils are rendered highly

susceptible to erosion. This is a significant problem in Prospect Park, Brooklyn, for instance, where topsoil has been lost.

Current research at Cornell University should lead to a better understanding of how Norway Maple invades a site. It appears that its seeds have an advantage when blown into wooded areas, whereas in open or grassed landscapes they are unsuccessful invaders. This may be due to selective herbivory in open habitats. If this proves true, it may provide a mechanism to control the spread of Norway Maple invasion by creating clear zones around uninvaded wooded areas from where seed is unlikely to be blown.

Giant Hogweed

Giant Hogweed (*Heracleum mantegazzianum*) is a native of the Caucasus mountains and southwestern Asia. A member of the parsley family, its most obvious characteristic is its massive size. It reaches heights of 10 to 15 feet when in flower and its hollow stems can be up to four inches in diameter. Planted in gardens for its impressive physical presence, it has spread throughout the northeastern United States and escaped to the wild. During two years of survey, New York's Cooperative Agricultural Pest Survey has located 152 Hogweed sites in 22 counties throughout the State. Giant Hogweed is considered a noxious weed. It poses a threat to human health because its sap can cause a burn reaction known as photo-phytodermatitis upon contact with the skin and exposure to sunlight.

Kudzu

Kudzu is one of the more famous invasive plant species. In the southern United States, this exceptionally aggressive vine can be found covering vegetation and abandoned homes and smothering everything beneath it. Typically, Kudzu grows in disturbed habitats such as are commonly found in urban areas. Its presence can change soil nitrate levels. Because the species is a short-day plant - flowering in the fall when the days become shorter and setting fruit in October - it generally does not set fruit in New York State except in the areas warmed by "urban heat islands".

Oriental Bittersweet

Oriental Bittersweet is a vine that has been grown in this country since the 1860s, but the first reports of this species spreading from cultivation were made in 1919 in New York City. Beginning in the 1950s, Oriental Bittersweet has spread explosively throughout the New York City region and well beyond. It alters community structure and composition by overtopping and shading vegetation. It prevents photosynthesis, constricts stems, and uproots plants. It reproduces by seeds, by above ground stems (stolons), by below ground stems (rhizomes), and by shoots from the roots (root-suckering). Once established, Oriental Bittersweet is very difficult to control. In fact, Oriental Bittersweet has expanded its range over the past century more than any other plant.

Japanese Knotweed

Japanese Knotweed is also known as False Bamboo. Its hollow stems can grow quickly to more than ten feet in height. It invades many habitats and is especially aggressive along waterways. In uplands, its rapid and dense growth can pose safety hazards on our highways when it obstructs sightlines at intersections.

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Chapter III.

EXISTING EFFORTS

What's being done? This chapter describes existing efforts to manage invasive species. It starts with overviews of statewide - including federally-supported - programs. It includes successes but also obstacles to success. As in the preceding chapter, it uses species accounts to illustrate concepts.

The perfect system does not yet exist.

A complete system for addressing invasive species includes fully-developed programs to ensure:

Prevention
Early Detection
Rapid Response & Eradication
Control & Management
Restoration

Each of these programs requires:

Funding
Coordination
Information Management
Research
Education & Outreach

Some systems are well-established and have dedicated funding.

Agriculture has the most well-developed invasives management systems. The systems are not without problems but they have most of the program elements and supporting activities listed above.

The vulnerability of agriculture to invasive species has been recognized for a long time. The Plant Quarantine Act of 1912 and subsequent statutes and interpretations have given rise to today's system of safeguarding American animal and plant resources. While this patchwork of laws has served us reasonably well, it has failed to keep pace with emerging challenges resulting from trends in technology, commerce, and travel.

A Strategy of Prevention

All who have contemplated solutions to the invasive species problem have quickly concluded that preventing introductions must be the primary element of any comprehensive strategy. Numerous programs provide some level of effective prevention of invasive species ever entering New York State.

USDA's Foreign Agricultural Service (FAS) and Programs of APHIS-PPQ

The Research and Scientific Exchanges Division of USDA's Foreign Agricultural Service promotes international cooperation on sustainable agricultural and forestry systems to help secure a safe and adequate food supply. It supports cooperation between American and foreign researchers through activities directed at potential threats to American agriculture and forestry, development of new technologies, and enhancement of agribusiness and trade in foreign markets. Participating countries benefit through a variety of activities including both short and long-term visits of United States and foreign scientists, collaborative research projects, and technical workshops.

The Food Safety and Inspection Service (FSIS) is the public health agency in the U.S. Department of Agriculture responsible for ensuring that the nation's commercial supply of meat, poultry, and egg products is safe, wholesome, and correctly labeled and packaged.

The Animal and Plant Health Inspection Service (APHIS) is responsible for protecting and promoting American agricultural health, administering the Animal Welfare Act, and carrying out wildlife damage management activities.

Plant quarantine and inspection is a shared responsibility. The federal government regulates international and interstate commerce and State authority governs intrastate movement. In 2000, the Plant Protection Act emerged from a consolidation of federal plant health laws. The Plant Protection Act grants the Secretary of Agriculture the ability to prohibit or restrict the importation, exportation, and the interstate movement of plants, plant products, certain biological control organisms, noxious weeds, and plant pests. Article 14 of the NYS Agriculture and Markets Law grants the Commissioner of DAM broad

authority with respect to the prevention, control and eradication of injurious insects, noxious weeds and plant diseases at the State level.

Plants, plant products and non-agricultural commodities shipped in association with solid wood packing material are targets for inspection by federal and State agricultural officials. The primary objective of these inspections is to detect and intercept invasive species that may inadvertently gain entry into the country or State through their association with a commodity and/or its packaging. If an actionable species is discovered, the shipment is rejected and returned to its point of origin, destroyed, or treated in a prescribed manner to eliminate the species.

The negotiation of entrance requirements with foreign trading partners is a complicated process; the federal government works within strict international protocols and guidelines. It develops plant health standards governing inspection and certification criteria attesting to a commodity's pest-free status. The challenge is confounded by the United States' status as the world's leading exporter of agricultural commodities. The USDA's Foreign Agricultural Service estimated the total value of agricultural exports of $51.5 billion in 2003.

The International Plant Protection Convention (IPPC) establishes international standards for phytosanitary - plant health - measures affecting trade. The Convention provides a framework and forum for international cooperation, harmonization, and technical exchange in collaboration with regional and national plant protection organizations. One hundred thirty-two (132) governments, including the United States, contract to the International Plant Protection Convention.

The World Trade Organization Agreement on the Application of Sanitary and Phytosanitary Measures (SPS) addresses criteria for the protection of plant life and health. It clarifies rules pertaining to the development of plant quarantine measures that impede international trade to ensure that: they are based on scientific principles and justified risk assessments; provide a level of protection appropriate to the risk posed; and do not unduly restrict trade. Member countries agree that quarantine actions are developed to meet standards of harmonization, equivalence and transparency.

A deepening integration of the world economy continues to blur the lines between what would earlier have been considered "domestic" versus "international" measures to restrict imports. The Sanitary and Phytosanitary Measures Agreement seeks the middle ground between allowing protection while disallowing protectionism. Transparency will become more important as countries continue to complain that phytosanitary measures represent non-tariff barriers to trade.

The North American Plant Protection Organization (NAPPO) is a Regional Plant Protection Organization created under the authority of the International Plant Protection Convention described above. NAPPO was formalized through the signing of a Cooperative Agreement by representatives of Canada, Mexico and the

United States to encourage cooperation in the field of plant inspection to prevent the entry, establishment, and spread of regulated plant pests, while facilitating intra-regional and inter-regional trade in plants, plant products, and other regulated articles.

The USDA's Animal and Plant Inspection Service (APHIS) and the Department of Homeland Security's Custom and Border Protection (CBP) inspect agricultural products arriving at United States ports of entry. This first line of national defense against the entry of invasives is challenged by the magnitude of passenger baggage, mail and cargo entering the country. It is estimated that less than two percent of incoming baggage, mail and cargo is examined. Furthermore, with the creation of the new Department of Homeland Security, the transfer of agricultural port inspection activities from APHIS Plant Protection and Quarantine to Customs and Border Protection has raised concerns with respect to Homeland Security inspection priorities which include the detection of weapons of mass destruction and illegal drug trafficking. The possible compromise of agricultural priorities among these competing objectives has been identified as a major concern.

Early Detection and Rapid Response

Exclusion of invasive species from our shores is the goal of the inspection programs. However, should these exclusionary tactics fail, a system of domestic monitoring and surveillance has been created to detect invasives before they become established and spread.

The traditional focus of plant inspections at the State level has been the nursery and ornamental industry. The movement of plants and plant products has long been recognized as a critical pathway capable of vectoring plant pests and facilitating their rapid dispersal. Nursery grower and plant dealer establishments are inspected, certified, and licensed at the State level. In New York State there are approximately 2,200 nursery grower and 4,500 plant dealer establishments comprising 33,370 acres and 25,947,334 square feet of glass in production. DAM has 19 Horticultural Inspectors situated across the State that are responsible for the oversight of the movement of plants and plant products pursuant to federal and State phytosanitary requirements and plant pest quarantine regulations. In 2004, they conducted more than 5,000 inspections and issued approximately 1,000 federal and State phytosanitary certificates.

Establishments are inspected on a frequency determined by a ranking system. The ranking is based on the relative risks associated with the plant material grown or handled, its place of origin, its associated pest complexes, the growing or holding facility, staffing, history of inspection, and other parameters. The process of certification and licensing at the State level allows plants and plant products to move domestically unless the receiving state requires an additional declaration of pest status resulting from an existing federal or state plant pest quarantine. Under such circumstances, the plant material must be inspected according to a methodology specific to the pest of concern so that its detection or control may be assured if it is present. If the plant material meets the criteria for movement, a

phytosanitary certificate is issued by the state of origin to attest to the health and condition of the commodity. Similar requirements exist for international shipments. The system of licensing and certification of establishments by state agriculture departments is recognized by the National and Regional Plant Boards and is critical to the movement of plants and plant products domestically and abroad.

The introduction and establishment of invasive species within the state is well-documented. Actionable pests are those of regulatory significance that impact the ability of plants and plant products to move freely domestically and abroad in the channels of trade. The discovery of an actionable pest may trigger a quarantine to contain the spread of that pest. A delimitation survey will follow to ascertain the distribution of the pest and to aid in the evaluation of control options. Eradication of an invasive species is the preferred goal but seldom achieved. When the eradication of an actionable pest is not feasible, quarantine regulations that identify the phytosanitary criteria required for the certification and movement of regulated articles are implemented and remain in place indefinitely. The addition of new invasive pests to those under existing regulatory control programs will easily challenge a system of safeguards that does not expand in proportionate fashion.

Cooperative Agricultural Pest Survey (CAPS)

In 2002, a cooperative agreement between USDA/APHIS and DAM established a program of domestic plant pest detection. The Cooperative Agricultural Pest Survey (CAPS) Program targets those pests that have been identified as being at risk for introduction and establishment into the United States. The primary objective of CAPS is the early detection of exotic invasives to be followed by a rapid response. Early detection may allow for eradication or mitigation of a problem by containing its spread and further distribution.

With the formation of the Department of Homeland Security- Customs Border Protection Agency, Plant Protection and Quarantine lost the majority of Agricultural Quarantine Inspection activities at the ports of entry. These inspection activities were a critical part of the first line of defense in pest exclusion. In order to reinforce the mission of Plant Protection and Quarantine, the focus has shifted to protecting the nation's interior. The Hot Zone Trapping Program was developed to provide national focus in early detection and eradication of invasive species through targeting the introduction pathways and potential pest establishment zones. The Hot Zone Trapping Program is a strategic process to identify invasive pest introduction pathways. By using intelligence available to Plant Protection and Quarantine and State regulatory personnel, pathways can be discovered, introductions detected, and pests eradicated in the most effective and efficient means available.

Taxonomic and Diagnostic Support

Because most invasive species are from foreign lands, the expertise necessary to recognize, identify, and confirm their presence is frequently unavailable in this country. Existing taxonomists and laboratory diagnosis and detections are too few to address the workload generated by state CAPS programs. This mismatch in capacity is worsened when volunteers collect more samples. Additional samples remain in storage because no one is available to screen or examine them. This situation undermines our goal of early detection and rapid response.

Pest Databases

The identification of primary, secondary and tertiary risk areas for potential invasive introductions is based upon information generated from various pest databases. These databases include:

Emergency Action Notifications (EAN) and the Violation Database (Forms PPQ 518 Report of Violation, PPQ 591, Notice of Alleged Violation, PPQ 592, Notice of Violation and APHIS 7060 Official Warning.) These documents contain information on violations, pest detection, shipper identification, country of origin, and intended recipient.

Smuggling, Interdiction and Trade Compliance (SITC) Violation Activity Report. SITC's mission is to prevent exotic pests or diseases from entering the country, or from being distributed in commerce once they arrive. SITC personnel routinely conduct market surveys. They work closely with other agencies that have similar goals and objectives, such as the Department of Homeland Security – Customs and Border Pprotection, US Fish and Wildlife Service, US Food and Drug Administration, and USDA Food Safety and Inspection Service.

Automated Targeting System (ATS) – contains industry import information such as how often a particular business imports a certain commodity from a certain country.

Port Interception Network (PIN 309) – contains a listing of all AQI pest interceptions of quarantine significance. The following information is also a part of the PIN database – host material, origin, and destination.

Mail Interception Notice (PPQ 287) – PPQ policy is to clear all mail parcels originating from a foreign country at the first port of arrival into the U.S., as well as to clear offshore domestic mail. A PPQ Form 287 is completed when prohibited agricultural goods or potential agricultural pests are intercepted.

Notice of Official State Quarantine of Shipment of Imported Plants and Plant Materials (PPQ 264). Provides a record of shipment of plants for propagation imported into the U.S.

Application and Permit to Transport Live Plant Pests or Noxious Weeds PPQ 526. This permit is required to move any plant pest and covers both the importation and interstate movement of these organisms.

Global Pest and Disease Database (GPDD). This database was designed as a compendium of information on agricultural pests not known to be established in the U.S.

Offshore Pest Information System (OPIS). This database is a master pest list compiled from pest lists prepared through other sources, including: the USDA's Regulated Plant Pest List; USDA/APHIS/PPQ Cooperative Agricultural Pest Survey (CAPS) target pest list and pest lists prepared by various scientific societies, such as the Entomological Society of America (ESA). OPIS can be used to monitor populations of pests in other parts of the world where they occur, and to predict when they will be at peak levels and are likely to find their way into cargo bound for the U.S.

A wealth of intelligence exists that can be used to direct our domestic invasive pest survey activities and improve efficiency in the workforce. It is recognized that assistance is needed accessing, evaluating and filtering information in order to provide state-survey coordinators and pest-survey specialists with guidance when they propose pest-survey priorities and targets. This is a critical need that can, perhaps, be addressed at the federal level by USDA's Center for Plant Health Science and Technology (CPHST).

Another concern involves the status and integrity of some of the databases previously mentioned. The duties and tasks that generate the information used in some of the databases have been transferred to the Department of Homeland Security (DHS), and it is not known if those databases are being maintained by DHS. Furthermore, even if they are being maintained, it is not known if DHS will permit access to their information.

Coordination

Although the expansion of the workforce created by the addition of Department of Homeland Security provides some immediate relief from handling a bigger workload, the sheer number, diversity, spatial distribution and continuing introduction of invasives requires the coordination of federal, state, county and municipal officials as well as public and private sector assistance. The response to the discovery of an exotic wood boring wasp in Oswego County resulted in a coalition of USDA's APHIS, CPHST, and Forest Service; State Departments of Agriculture and Markets and Environmental Conservation; Cornell University; Cornell Cooperative Extension; and the Village of Fulton's Office of the Mayor.

As a result of the interest generated from this detection event and the number of participants the USDA's APHIS and NYSDAM decided to implement an Incident Command System (ICS). ICS is a management system designed to enable effective and efficient domestic management by integrating a combination of

facilities, equipment, personnel, procedures and communications operating within a common organizational structure. A basic premise of ICS is that it can be used to organize both near-term and long-term field level operations for a broad spectrum of events.

In this example a Unified Command was used. Unified Command is an important element in multi- jurisdictional or multi-agency domestic incident management. It provides guidelines to enable agencies with different legal, geographic, and functional responsibilities to coordinate, plan, and interact effectively. As a team effort, Unified Command overcomes much of the inefficiency and duplication of effort that can occur when agencies from different functional and geographic jurisdictions, or agencies at different levels of government, operate without a common system or organizational framework.

Outreach

State Horticultural Inspectors have been instructed to identify and communicate with individuals within their assigned areas who are interested in or work with invasive plant pests. This group would include DEC regional staff, Cooperative Extension educators, Farm Bureau representatives, New York State Nursery and Landscape Association members, and private organization representatives such as the New York State Invasive Plant Council and The Nature Conservancy. Inspectors have been directed to inform these groups of DAM activities and to invite their participation and input where possible. One outcome of this objective is gaining input with respect to the "local importance" of invasive species of and to allow this information to influence our statewide or regional priorities.

On another plane, DAM is cooperating with the North East Plant Diagnostic Network and the Cooperative State Research Education Extension Service (CSREES) in the enrollment of volunteers to aid in the early detection of invasive plant pests. Although there exist some regulatory hurdles, the resulting coverage of urban, suburban, and rural areas of the State by citizen volunteers will bolster our pest detection goals and objectives.

Plant pests provide some examples.

Golden Nematode

The Golden Nematode is a microscopic worm that lives in soil and came here from Europe in the first half of the twentieth century - either on military equipment returning from World War I, or possibly with imported plant bulbs. It affects potatoes and a variety of other crops and usually causes death in afflicted specimens. It is internationally recognized as a pest of export significance.

The Golden Nematode provides an example of a perpetual quarantine. It was discovered on Long Island in 1941 and a State quarantine was invoked in 1944; a federal quarantine followed four years later. Both restrictions remain in effect

today. For more than 60 years, the federal-state cooperative program to contain and control the spread of the Golden Nematode has been successful. It has limited the infestation to eight areas of the State and has maintained the production of host crops on regulated acreage through the application and use of potato varieties resistant to the Golden Nematode. The program has also secured the movement of agricultural products valued in excess of $500 million annually; these products might otherwise be prohibited from movement outside of the regulated areas.

While eradication of the Golden Nematode is theoretically feasible, attempts have proven to be very difficult and extremely costly. Efforts have involved pesticides, crop rotations, and resistant varieties of crops, but have been confounded by new races of the invasive species. The Golden Nematode remains an example of an invasive species that can be controlled effectively, but only at significant cost and perpetual vigilance.

Swede Midge

The Swede Midge (C*ontarinia nasturtii*) is an insect pest from Eurasia that feeds on mustard family (crucifer) plants such as broccoli and cauliflower. The detection of the Swede Midge in the United States offers a successful example of pest targeting and surveillance; its early detection and rapid response led to the identification of a problem of national magnitude. However, the Swede Midge also illustrates the need for expert identification of suspected invasive species.

When detected in four farm operations in Niagara County in 2004, it was the first report of Swede Midge in the United States. It was found and identified by Cornell Coooperative Extension vegetable crop specialists as part of on-going pheromone trap surveillance in western New York State. In 2001, Canadian researchers discovered that this species was the cause of damage to broccoli crops in Ontario. Farmers had been experiencing losses of up to 85 percent of their broccoli crops since 1994, but they were erroneously attributed to a nutrient deficiency.

The legal ramifications of quarantine pest confirmations demand that pest identifications be performed by federally-recognized experts. The availability of such expertise has been in decline for a number of years. In the case of the Swede Midge specimens from Niagara and Genesee Counties, the federally-recognized expert had to return from retirement to provide the necessary taxonomic identifications. Expertise from outside of the country cannot be utilized as the basis for a regulatory action.

Nevertheless, after taxonomic confirmation of the specimen, the find was reported to the National Agricultural Pest Information System (NAPIS). Shortly thereafter, notification of the detection was distributed to federal and State regulatory officials. The immediate concern expressed by agricultural officials outside of New York was containment of the pest. To mitigate the risk to production areas outside of Niagara and Genesee Counties and to other states, quarantines were placed on the four infested farm locations to prohibit the movement of crucifer

transplants and soiled farm equipment off the farm premises. This action prevented the enactment of exterior quarantines by other states who might otherwise have considered their industries at risk of infestation.

As a follow-up to the quarantine action, federal and state agricultural officials agreed to a survey plan to be implemented in 2005 to limit the infestation. Trapping was conducted within Niagara County and in those counties that surround it: Erie, Genesee, and Ontario. Three additional outlying counties with high acreages in crucifer production was surveyed, as well as transplant production facilities, processing centers, storage areas, and cull piles. The survey required the use of almost 150 traps and generate more than 2,400 samples.

Samples must be screened and will be diagnostically tested with first time county detections requiring taxonomic confirmation. Such confirmations are critical in the context of a regulatory action should such action be challenged in a court of law. The collection and evaluation of data from the 2005 survey and monitoring activities will aid in determining whether the Swede Midge is a candidate for eradication, regulation or management.

DAM relies upon federal support for many of the taxonomic services rendered on samples from the State's Cooperative Agricultural Pest Survey activities. It makes sense to have the expertise at the federal level and available to the states. However, it appears that the present resource is inadequate to service the potential increased workload that would be generated through enhanced invasives surveys.

Late Blight

About 150 years ago, the Irish potato famine resulted in the starvation and death of over one million people and the migration of a million more to the United States. The cause of the great famine was a fungus commonly called Late Blight.

In 1992, a new strain of Late Blight was detected in the United States. The new invasive forms of the disease, thought to have originated from Mexico, were resistant to available fungicides. This has left growers with no way to protect their crops from this virulent disease. The Blight starts as small, yellow lesions but under favorable conditions it can spread through fields in days, turning lush canopies of potato plants into rotting foliage. Blighted potatoes in storage turn purplish and shrunken on the surface, with a corky, reddish rot on the inside. Spores from infected plants can be carried hundreds of miles by the wind to land on healthy potato and tomato plants.

Of the four clonal lineages of Late Blight identified in the United States, US-8, is the predominant type. This strain is extremely virulent. Researchers fear that sexual reproduction will become a normal characteristic of this fungus and may lead to the proliferation of diverse genotypes, and further complicating disease management.

The occurrence of novel forms of Late Blight infestations, the limited ability to manage the disease with pesticides, and the high probability that sexual reproduction will become a normal characteristic of this plant pathogen in the United States, all argue for heightened vigilance.

Plum Pox Virus

Plum Pox Virus was first reported in Bulgaria in 1915. It has since spread to a large part of Europe, the Mediterranean and the Middle East, India and Chile. In 1999 it was discovered in North America in Adams County, Pennsylvania.

Plum Pox is economically detrimental because it can reduce the yield of infected trees and cause fruit to be unmarketable. The severity of the disease depends upon the strain of the virus and the susceptibility of the cultivar. The strain of Plum Pox Virus that was found in Pennsylvania not only infects plums but also most other economically important, cultivated, stone-fruit species including peach, nectarine, and apricot.

In 2000 Plum Pox Virus was reported from Ontario, Canada. Evidence suggests that the virus may have been introduced several years earlier from an unknown source.

Aphids migrating from tree to tree and are likely responsible for short range dispersal of Plum Pox. Human activity accounts for long-range spread. Virus-infested budwood, seedlings, or rootstocks can be transported long distances by passing natural barriers that would limit spread by aphids. In almost all cases, intercontinental spread of this pathogen has been associated with the human transfer of infected host materials.

Because of its proximity to the United States and Canadian infestations, New York State has conducted an annual survey program for Plum Pox Virus since 2000. More than 75,000 samples have been tested and found to be negative for Plum Pox Virus. Surveillance activities will continue until the threat to the State's borders has been eradicated.

Forest Health & Protection

The DEC Division of Lands & Forests recognizes the significant threat that invasive species pose to the forests of New York State and to the people and industries that live in and depend on them. The mission of the Division is to care for and enhance the lands, forests and natural resources in the State of New York for the benefit of all; Lands & Forests is responsible for the care, custody and control of State-owned lands. The Forest Health & Protection Section coordinates and conducts hundreds of forest pest and disease surveys on public and private lands each year. Some of these surveys are targeted for specific invasive species threats to forest health. The majority of the surveys target invasive species of special concern to New York's forests. In addition, forestry field staff in all program areas incorporate invasive species concerns into their planning and

decision-making activities, whether they are providing a forest stewardship plan for a 50-acre private woodlot, or laying out a timber sale in a 1,000-acre State Forest. Lands & Forests staff learn about existing or potential forest health problems from central office notifications, from their clients' concerns, or by observing evidence of problems while performing routine forestry work. Local, Regional and State-wide surveys are regularly conducted to detect changes in specific forest health conditions previously identified. Standard survey protocols are used, or, in their absence, surveys are designed based on sound biological and economic principles. Aircraft are used to detect, delimit, photograph and sketch forest damage. Ground surveys are used to identify causal agents and to collect detailed information that is impractical to collect from the air. Laboratories are used to identify and confirm the identity of invasive pests. All data are collected and recorded according to standards used by northeastern states.

Information on invasive species is delivered to staff and partners through meetings, workshops, presentations reports, the internet and electronic communications. Press releases and other communication with media are used where appropriate. In addition, Lands & Forests staff field hundreds of telephone inquiries per year from the public on various invasive pest-related subjects. Forest Health & Protection staff internally review State Forest Management Plans and provide the plan writers with advice on any pertinent (terrestrial) invasive species issues. The Bureau of Private Land Services works with forest owners through a variety of programs to encourage and foster good stewardship practices, often including the management, control, or avoidance of invasive insects, plants and plant pathogens.

The Division of Lands and Forests maintains a close working relationship with Federal and State partners on all plant pest/disease quarantine issues. Most often this involves direct cooperation with the DAM, and the Cooperative Agricultural Pest Survey (CAPS) program. On matters of regional or national importance, it may involve cooperation with the USDA Forest Service, APHIS-PPQ, and officials from other states in the region.

The Division of Lands and Forests is one of several partners funding the Adirondack Park Invasive Plant Program (APIPP). Lands and Forests is partnering with a University of Vermont study of fungus (*Aschersonia marginata*) that has potential for biocontrol of the invasive Elongate Hemlock Scale. The Division has also provided support for a variety of studies on invasive species by the SUNY College of Environmental Science and Forestry. Lands and Forests, in cooperation with the USDA Forest Service, recently released a ladybeetle predator (*Sasajiscymnus tsugae*) at a number of sites in an attempt to initiate a biological control of the Hemlock Woolly Adelgid.

Asian Long-horned Beetle

The Asian Long-horned Beetle provides a cautionary tale of the need to follow through with eradication efforts when an invasive species has been detected.

Although eradication of this threat to New York's street trees, landscaping, parks and forests is still possible, the time and expenses could have been reduced.

In 1996, the Asian Long-horned Beetle was detected in the Greenpoint section of Brooklyn. It was surveyed immediately thereafter but an effective quarantine was not imposed until after a similar infestation was discovered in Chicago in 1998. When the quarantine was finally imposed, it covered more than 130 square miles of New York City and Long Island.

The Asian Long-horned Beetle was probably introduced in infested solid wood packing material in the 1970s or 1980s. It successfully established itself on a wide variety of native hardwoods such as maples, alders, birches, elms, horse chestnuts, poplars and willows. Because it spends most of its life boring into the wood under the bark, it successfully avoided detection for 15 or more years. Its spread was facilitated by the movement of wood waste to landfills and the sale of firewood within and outside of New York State.

The Asian Long-horned Beetle poses a serious threat to both the urban- and forest-tree resource. It attacks and kills healthy trees and has necessitated the removal of more than 7,000 public and private trees in New York City and on Long Island. It has been particularly devastating in New York City parks and greenways that are frequented by the general public. Approximately 2.7 million trees grow in the City; approximately one-third of these are susceptible. Across the State, an estimated 858 million trees above five inches in diameter are at risk; this involves 62 percent (18.6 million acres) of the State's forested land. In New England, over 1.5 billion forest trees are susceptible. Over the next 10 years, if the beetle is left unchecked, the entire northeastern United States could be affected. If one-third of all susceptible trees are attacked, losses to the timber industry and recreation and tourism are expected to amount to tens of billions of dollars. These estimates are based on attacks of host trees larger than five inches in diameter. These estimates can be expanded twentyfold when the risk to smaller tree stocks (2-3 inches in diameter) are considered. The ecological impacts are incalculable.

Control of Asian Long-horned Beetle requires an integration of activities including: survey and detection; pesticide application; infested tree removal; and a program of regulatory oversight and educational outreach. Factors unique to the urban setting of New York City and Long Island that influence the probability of successful eradication include property access, pesticide usage, clear cutting, restoration and sustained funding.

The issue of property access appears to be unique to New York State. Inspectors must request permission to enter the premises of a private property to examine host trees for signs of infestation. This requires identification of the property owner and then obtaining permission to enter. If permission is denied, an administrative warrant is needed to authorize entry. Prior to seeking a warrant, inspectors repeatedly attempt to gain access through communication with the

property owner. Other states, such as Illinois and New Jersey, have avoided these delays through an effective public outreach effort.

While pesticide applications are not 100 percent effective against the Asian Long-horned Beetle, their application and use can significantly reduce pest populations. In New York State, as in Illinois and New Jersey, the use of a trunk-injected systemic insecticide was chosen because of public health concerns arising from the use of leaf-spray applications. Unlike Illinois and New Jersey, New York treatments are voluntary and require landowner permission and resident notification in accordance with the pesticide notification provisions of State law. As a result, only 57 percent of the targeted properties are treated annually.

In 1997, a program of education and outreach failed to convince the general public of the need to remove all infested and suspect or exposed trees. The reaction was in part attributed to the absence of a defined program of restoration, i.e., replacement of removed trees. Federal and State rules preclude United States Department of Agriculture - Animal and Plant Health Inspection Service (USDA-APHIS) and DAM from providing restoration. As a result, only the worst trees could be removed from the core areas of Asian Long-horned Beetle infestation; suspected or exposed trees were not removed.

Funding, too, was problematic. Long-term control and eradication efforts are often costly and must compete with new, emerging plant-pest issues. Federal and state funding for Asian Long-horned Beetle eradication has averaged $13 million annually with a high of $40 million in 2002. During this period, new emerging pest issues included the discovery of Emerald Ash Borer, Sudden Oak Death and Southern Bacterial Wilt. Although the federal and State agricultural agencies have been successful in obtaining support to drive the beetle eradication effort, fluctuations in funding have had a dramatic impact on the timeline for eradication. Originally targeted for 2009, a reduction in funding associated with a federal-state cost sharing formula authored by the federal government resulted in a decrease in the number of trees chemically treated in 2003 and pushed back the projected date of eradication to 2019.

Sudden Oak Death

The threat of Sudden Oak Death has required a federal quarantine and a national survey to detect this disease of oaks and many other woody species. Tens of thousands of oaks in coastal California have succumbed to Sudden Oak Death since it was first discovered there in 1995. In addition to short-distance dispersal through wind and rain, the Sudden Oak Death pathogen, *Phytophthora ramorum*, can be spread through the movement of nursery stock. In 2003 and 2004, the pathogen was detected in nurseries from California to British Columbia. Because early detection and rapid reporting of potential *Phytophthora ramorum* infections are critical to successful containment of Sudden Oak Death, state and federal regulators needed a standard protocol to respond to new finds of the disease in nurseries outside of the regulated area.

In 2004, the United States Department of Agriculture notified DAM of the movement into New York State of nursery stock possibly infected with *Phytophthora ramorum*. The stock apparently had been shipped in 2003. DAM was asked to visit 15 establishments identified as receiving suspect stock . Only seven of the 15 establishments had carryover stock from the previous year. Sales had not been tracked, which made follow-up of consumer sales impossible. Shortly thereafter, DAM was informed of mail orders of suspect nursery stock to several hundred New York residents. The recipients were sent a letter from the United States Department of Agriculture asking them to contact their State agriculture official if the plants displayed any symptoms of Sudden Oak Death. DAM initiated a survey of 31 establishments and generated over 1000 samples. In addition, routine inspections of nursery grower and plant dealer establishments were expanded to include an examination of Sudden Oak Death host materials. DAM continued to receive notice of new "trace forward" inspection requests from the United States Department of Agriculture; these were based on further testing and identification of nurseries found positive for the disease.

There are a number of issues associated with the 2004 Sudden Oak Death surveys that warrant discussion. The Regulatory and National surveys generated thousands of samples that the federal laboratory in Beltsville, Maryland had difficulty in processing in a timely and efficient manner. They worked with the National Plant Disease and Pest Diagnostic Network. However, at the time, most of the Regional Diagnostic Centers were not authorized to handle a "select agent" from the Threat List created by the Agricultural Bioterrorism Act of 2002. USDA/APHIS has been working with Cooperative State Research Education Extension Service in the accreditation of the Regional Diagnostic Centers that are designed to diffuse the workload associated with Sudden Oak Death and other programs. Diagnostic resources could become taxed if multiple programs run concurrently.

The system could be further taxed - both financially and in workload - with the implementation of a volunteer scouting program by Cooperative State Research Education Extension Service. Cooperative Extension Agents, Master Gardeners, and other citizen volunteers are being trained to be on the lookout for certain targeted invasives. This program, essential to the objective of early pest detection, could result in hundreds of more samples being taken and submitted for analysis. One concern when using volunteer observers is that very few diseases display symptoms unique to a given pathogen. Disease, cultural and mechanical problems may appear to be somewhat similar to the untrained eye. A related concern stems from the requirement for confirmation of a reported detection by a federal or State agricultural official. It is of critical importance for volunteers to maintain basic records on suspect detections and for the diagnostic laboratories to report such findings to the State Plant Health Director and State Plant Regulatory Official as soon as possible.

Even trained experts can be challenged by complicated diagnostic procedures. Because most of these organisms are exotic to the United States, laboratory processes and protocols used to detect and identify invasives may be non-existent.

As a result, interim methodologies may be employed that may later prove to be ineffective. Resources are required to provide diagnosticians with the best available technologies as quickly as possible following the discovery of a new invasive disease.

The Sudden Oak Death experience demonstrated how quickly a problem can be spread across the United States through the movement and distribution of nursery stock. This factor alone identifies the critical need for a close partnership with the nursery and ornamental industry in the control and containment of the spread of invasives. In 2003 and 2004, responses to another disease, *Ralstonia solanacearum*, on geraniums and Sudden Oak Death on nursery stock came at times critical to the economic livelihood of the industry. Continuing dialogue is necessary for the implementation of an effective regulatory program.

An unusual occurrence associated with the Sudden Oak Death survey was the independent sampling by a representative of an industry trade association. This may have stemmed from a belief of unfair regulatory treatment or suspicion involving the adequacy of Sudden Oak Death surveys conducted in eastern states. This individual traveled from the west coast through six eastern states. Although Nassau County is not listed or identified in the federal quarantine order, a nature preserve there was placed under a federal emergency action order and state quarantine when a non-host plant was tested positive by the trade representative. Although repeated tests by others could not replicate the result, foreign countries nevertheless enacted quarantines prohibiting the entry of regulated articles originating from Nassau County. This circumstance may demonstrate the need for a closer working relationship with industry trade organizations and more transparency within the regulatory and phytosanitary processes.

We have learned some useful lessons.

Effective Monitoring

The anticipation or discovery of invasive diseases such as Late Blight or Asian Soybean Rust present a much different challenge to plant pest regulatory officials and growers. These virulent windborne diseases do not lend themselves to control, or even warrant an attempt to slow their spread once detected. In these scenarios, federal and State plant pest regulators work with land-grant university and college researchers, extension educators, integrated pest management specialists, federal and State pesticide officials, and chemical registrants to identify and register materials to use and apply in the protection of agricultural host crops. The spread of such pathogens is monitored, but not for the purpose of implementing a plan of regulatory action.

Emphasis on early detection is advantageous in achieving the elimination or eradication of a pest. However, in the absence of adequate survey data, such efforts can have severe local impacts. For example, when Swede Midge was discovered in Niagara County in 2004, inspection and certification of all

transplanting stock was begun. Detection of Swede Midge in Niagara County would result in a quarantine of all transplants from that area because transplants have been identified as a means of conveyance of the disease. The quarantine would apply to Niagara County even though Swede Midge could be present elsewhere within the State; this restriction could be devastating to Niagara County growers. In this particular scenario, federal and State regulators would benefit from more survey data but it simply is not available.

Rapid Response

Just as effective prevention systems can avoid expensive responses, early detection and rapid response can save enormous amounts of resources. If an invasive species is detected when it first arrives in New York State, it is typically confined to a small area. Eradication efforts need to be intensive and complete but they can be limited in geographic scope. As the invasive spreads to more and more locations, costs rise geometrically. Unfortunately, for many species, public awareness, concern and support for action commonly do not occur until this stage. If meaningful actions are delayed, it may be that the new species is here to stay and only local control or management remain as options.

Any delay in securing the resources necessary to implement a rapid response favors the targeted pest. For example, the Asian Long-horned Beetle is a pest that can be successfully eradicated. However, the discovery of this pest in 1996 did not result in a large-scale rapid response until it was discovered in Chicago in 1998 and federal resources began flowing. Eradication efforts have become much more costly.

Response Options

When an invasive species successfully enters the country and is detected, a rapid response is initiated to determine the extent of its establishment and distribution. This information is important in evaluating response options intended to mitigate its impact on commerce and the environment. Ideally, eradication is both practical and readily achievable. More frequently, invasive species are managed to contain or slow their spread through the regulation of articles that may pose a risk to the accelerated or assisted movement of the pest over great distances. Federal and State parallel quarantines may be enacted and amended as needed with respect to the size and growth of the infestation. Other scenarios may trigger no response because the organism is considered to be generally distributed throughout the State or, as with Asian Soybean Rust, it is determined that nothing can be done to halt or even slow the spread of the organism. Nevertheless, there are cases, such as Late Blight, where the type of pest would not preclude efforts to identify management strategies for growers to combat it.

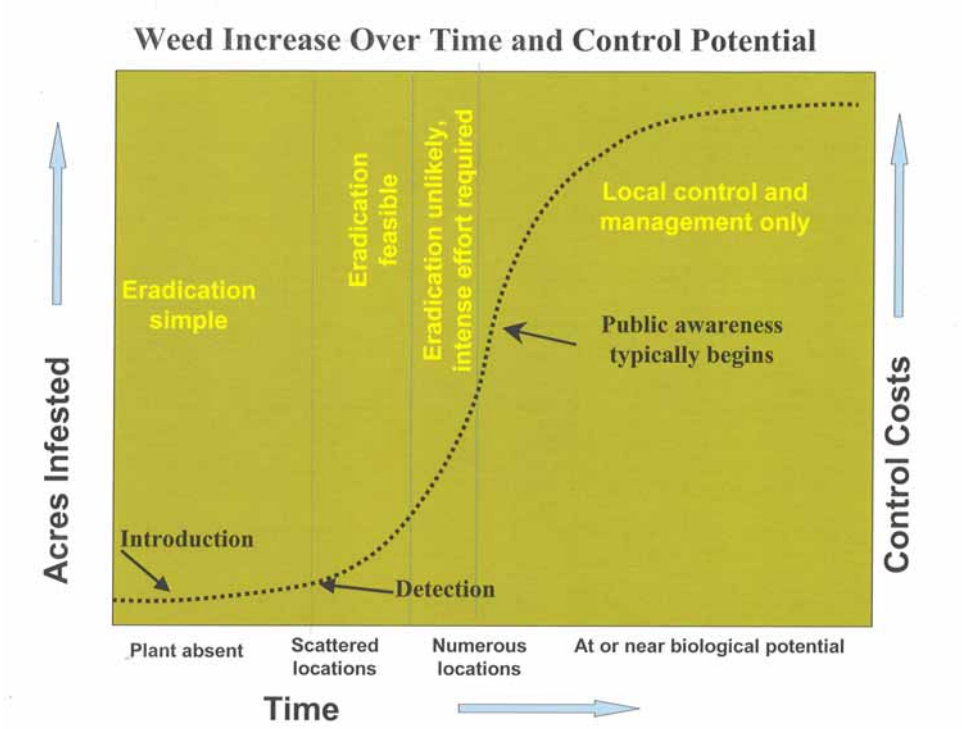

Figure 7 Management options over time. (Adapted by The Nature Conservancy Invasive Species Initiative from Chippendale, J.F. 1991, as used by Hobbs, R. J. and S.E. Humphries. 1995. An Integrated Approach to the Ecology and Management of Plant Invasions. Conservation Biology 9(4):761-770.)

Basic Research

The probability of successful eradication or control of an invasive species is subject to a number of variables. Because invasives are frequently nonindigenous and may not be considered pests in their native habitats, little if any information about their identification, biology and control may be available. Therefore, the mobilization of researchers to identify and address critical data gaps is required. The importance of research in providing a sound basis for regulatory policy cannot be understated. It should also be recognized that such research must frequently be conducted in the country of origin or in federally-approved quarantine facilities because of the regulatory status of the species.

Permanent Quarantine

The Golden Nematode was originally targeted for eradication. It has since evolved into a successful management program spanning more than 60 years. It is unlikely that the Golden Nematode can or will be eradicated. However, because of its importance as a pest of quarantine significance, a federal-State quarantine and control program must be maintained to permit the continued movement of soil-bearing commodities within New York State and within the United States. Foreign trading partners frequently inquire as to the status of this pest and its

control and containment during trade negotiations. The failure to provide assurance that the pest is under control could result in the establishment of restrictions on American agricultural products. Therefore, oversight of the Golden Nematode program, and successful containment of this pest and other invasive species of regulatory importance, are of national as well as State interest.

Public Outreach

A program of public outreach and education is, at least initially, dependent upon a premise for eradication or control. For that reason, the selection of a Science Advisory Panel or New Pest Advisory Group is convened at the federal level with State representation. These groups assess available information on a species and provide federal and State regulatory personnel with a guidance document similar to that of a pest risk assessment. Science Advisory Panels participate in public forums to address questions and concerns raised by the general public.

Continued dialogue and communication are essential to cultivate the cooperation and assistance of local leaders in seeking access to private properties to conduct inspections, treatments and/or removals, and to ensure regulated articles - such as wood waste and debris - are properly handled to prevent the spread of the species. Eradication of an invasive species cannot be declared unless every property within an area under quarantine has been inspected for three consecutive years without a detection. One hundred percent access is required.

Meaningful Restoration

Restoration of invaded areas has become an important component to consider, especially in urban settings. Public forums held in New York City and on Long Island to discuss the eradication of the Asian Long-horned Beetle demonstrated a strong public outcry for the restoration of their treed environment. The federal and State prohibitions on the awarding of damages for the destruction of infected trees, shrubs, plants or other materials was not acceptable to the public or municipalities. Infested tree removal was delayed until the U. S. Forest Service, New York State, and the City of New York appropriated funds for restoration.

Sustained Funding

Eradication efforts must be completed once begun. Eradication of Asian Long-horned Beetle was originally targeted for 2009, but a reduction in federal support in 2003 pushed the projected target date back to 2019.

Sustained program funding is threatened by newly emerging plant pest problems. Most states look to the USDA for assistance in funding and providing the necessary expertise to address a plant pest problem. Unfortunately, the combination of responding to emerging plant pests with the continuation of existing programs places an enormous strain on the system and creates a situation where states compete with each other in an effort to address their own priority issues.

Industry Cooperation

The discovery of Sudden Oak Death being transported in nursery stock shipped from the west coast surprised both federal and state plant-pest officials and the nursery industry. Although efforts were initiated to inspect, test, and certify shipments, the timing was such that spring sales and shipments were already in motion. The cooperation and assistance of the nursery industry was essential if the national survey of receiving nurseries and surrounding environs was to be completed. From the results of the survey, it is apparent that suspect material was shipped and ultimately planted in the environment. While a certification program has been implemented to prevent the further spread of Sudden Oak death, it may be several years before we can ascertain whether or not the pathogen was transferred to the environment.

Best Management Practices

Best Management Practices describe a practice or combination of practices determined to be an effective and practical - including technological, economical, and institutional considerations - means of preventing or reducing the establishment or spread of any invasive species in New York State. They are intended for use by farmers, greenhouse operators and landscape nurserymen.

Swede Midge Best Management Practices provide an example. The Swede Midge program objectives are to: manage or, if at all reasonable, in the case of a small, isolated outbreak, eradicate the invasive species; and avoid negative effects on the environment. Both objectives need to be considered when recommending treatment or re-treatment. Because larvae can only be treated with a systemic pesticide and none has been developed thus far, crop rotation is the control procedure of choice for Swede Midge. Crop rotation combined with field sanitation, discing or deep plowing to eliminate post-harvest debris, pupae or older larvae, is the most effective practices for suppressing and controlling Swede Midge.

Other efforts are independent but effective.

TERRESTRIAL HABITATS

Brooklyn Botanic Garden

Brooklyn Botanic Garden has been studying the plant life of the 25 counties in and around New York City, including the southeasternmost eleven counties of New York State. As part of this study, they have been collecting and observing the present distribution of plants in the region and also gathering historical data from about 1800 to the present. This information has allowed them to start analyzing the change in the flora, as well as finding and describing new species that might potentially become invasive in the future.

American Museum of Natural History

The Center for Biodiversity and Conservation at the American Museum of Natural History has initiated surveys of parts of the New York City Metropolitan Region. Results of this work include developing tools for identification of challenging groups of species such as freshwater mussels. They have also identified a new, introduced centipede in Central Park.

New York Flora Association

A “flora” is a compendium of information that describes the distribution and abundance of all of the plant species in a given geographic area. The New York Flora Association has been working toward a flora for New York State. Their

website has the most up-to-date information about the plants of the State, including distribution maps.

New York State Invasive Plant Council

The New York State Invasive Plant Council has been working to raise the profile of invasive plants, their threats, and appropriate management practices for more than ten years. They maintain a list of the most serious invasive species in New York State and work to better understand their distribution. www.ipcnys.org

New York Natural Heritage Program

The Natural Heritage Program identifies, surveys, and maps rare and endangered species, as well as rare or excellent examples of natural communities. They also record infestations of invasive species, especially as they may jeopardize rare species populations or natural communities.

New York State Parks

A recently completed six-year biodiversity survey of New York State Parks revealed that these parks, ranging from oases in urban settings, such as Clay Pit Ponds State Park Preserve on Staten Island, to the 65,000 acre Allegany State Park in Cattaraugus County, provide an impressive degree of biodiversity. Statewide, these parks are home to 191 significant natural communities, 353 rare plants, and 151 rare animals. Even though the biodiversity survey only evaluated invasive plants and not invasive animals, the threat of invasive plants ranked high on the list of threats to the natural resources of State Parks, ranking third after habitat loss and recreational use issues. Inventory and evaluation of the threat of invasive animals within State Pparks still needs to be done. Once an invasive-animals inventory has been done, it is likely that the threat of both plant and animal invasives could be the number one threat to natural resources in State Parks. Although a similar survey of other municipal and national park lands in New York State has not been performed, it is known that these park lands contribute significantly to the well-being of society by preserving open space and natural areas and providing a respite to humans and wildlife. These areas also contribute to the biodiversity of the state, and harbor rare species and significant natural communities similarly threatened by invasive species.

New York City Parks

A comprehensive approach to control and management is being done by the New York City Parks Department. They received a grant to start this project and had a large crew working for five years to remove invasive plants. Subsequently they have been able to work with smaller crews to manage these sites. The Parks Department also runs a Native Plant Nursery which develops stock of native species for restoration of these impacted sites.

Industry Standards

The nursery and landscape industry, botanical gardens, and arboreta all rely upon many species of non-native plants, some of which can be invasive or harbor invasive predators, parasites or pathogens. In recognition of this potential, these stakeholder groups have developed a Voluntary Codes of Conduct, also known as the “St. Louis Protocols”. The voluntary codes offer professional codes of conduct designed to curb the use and distribution of invasive plant species through self-governance and self-regulation by the groups concerned. This approach has been used successfully to ameliorate other problems but its application to invasive plant threats is novel and innovative. Importantly, the Voluntary Codes of

Conduct were developed recognizing that education must accompany all efforts to address the problem and that some future government regulation may perhaps be needed if such efforts prove insufficient. These codes are now being considered for endorsement by the major professional societies and organizations representing each of the groups covered. If endorsed they will be 'tested' and revised as necessary to improve their utility and effectiveness.

Principles (a.k.a. The St. Louis Six)

Plant introduction should be pursued in a manner that both acknowledges and minimizes unintended harm.

Efforts to address invasive plant species prevention and management should be implemented consistent with national goals or standards, while considering regional differences to the fullest extent possible.

Prevention and early detection are the most cost effective techniques that can be used against invasive plants.

Research, public education and professional training are essential to more fully understanding the invasive plant issue and positively affecting consumer demand, proper plant use, development of non-invasive alternatives, and other solutions.

Individuals from many fields must come together to undertake a broad-based and collaborative effort to address the challenge, including leaders in horticulture, retail and wholesale nurseries, weed science, ecology, conservation groups, botanical gardens, garden clubs, garden writers, educational institutions, landscape architects, foundations and government.

A successful invasive plant species strategy will make use of all available tools including voluntary codes of conduct, best management practices, and appropriate regulation. Codes of conduct for specific communities of interest are an essential first step in that they encourage voluntary initiative, foster information exchange, and minimize the expense of regulation.

Weed Management Areas

Weed Management Areas are geographical regions within which local organizations of landowners and private and public - including city, county, state and federal - land managers who work together in combating invasive plants. The goal of the Weed Management Area program is to promote cooperative efforts to manage invasive plants through an integrated approach that works toward protecting or restoring desired plant communities at the watershed level. Weed Management Areas often function under the authority of a mutually developed Memorandum of Understanding, are governed by a steering committee, and are charged with developing and implementing a Weed Management Area Management Plan. Once a Management Plan is complete, a Weed Management Area is eligible for funding.

Weed Management Areas in the western United States can receive funding through the Center for Invasive Plant Management, which offers a small competitive grants program that has funded 58 programs in 14 western states.

Weed Management Areas are also supported through a state's agriculture or natural resources departments, or through national and regional funding sources such as: the National Fish and Wildlife Foundation; U.S. Fish and Wildlife Service; Bureau of Land Management; USDA Forest Service; USDA Animal and Plant Health Inspection Service; Department of Defense Legacy Resource Management Program; National Park Service; North American Wetlands Conservation Act; and National Biological Control Institute.

Once a predominantly western program, Weed Management Areas are now beginning to develop in the eastern United States. The Forest Service is conducting a series of workshops in Wisconsin, Michigan and Vermont instructing citizens and groups on how to establish Weed Management Areas. In New York State, several Weed Management Areas are already established. These include: the Adirondack Park Invasive Plant Program; Long Island Weed Management Area; and the St. Lawrence-Eastern Lake Ontario Weed Management Area.

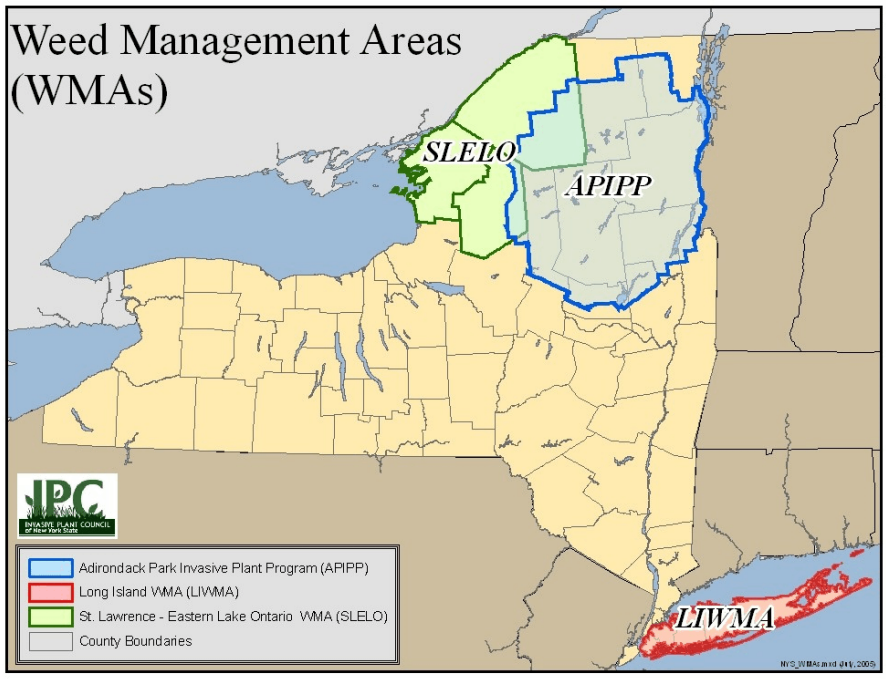

Figure 8 Current Weed Management Areas in New York State.

Linking Girls to the Land

The Thousand Islands Girl Scout Council has begun a program to train 150 Scouts to help in the management of Black Swallowwort. They will use Global Positioning System equipment to find and map the occurrence of this aggressive

weed in Jefferson and St. Lawrence Counties. By providing the information to DEC and to landowners where it is found, they hope to prevent the spread of Black Swallowwort to neighboring Lewis County.

AQUATIC HABITATS

There are many successful invasive species efforts throughout New York State. One key to solving aquatic invasive species problems is identifying excellent model programs. Following are some successful programs that deal with aquatic invasive species.

Monitoring and Surveillance Networks

Monitoring and surveillance networks are crucial to effective management of invasive species. They enable the building of a reliable inventory of the distribution of invasive species and the identification of patterns and trends in the movement of these species. These networks provide the early detection that leads to rapid response and eradication. They also serve as a platform for public outreach and education to increase awareness of invasive species.

Invasive species monitoring is commonly encompassed within some existing monitoring networks, but is usually ancillary to the broader objectives of most agency monitoring programs. These "add-on" monitoring modules are frequently ineffective in identifying new infestations in larger areas otherwise evaluated for different environmental indicators. That being said, the need for invasive species inventories should continue to be communicated to monitoring staff and incorporated into existing programs when practical. An example of this is the plant monitoring components of the New York Citizens Statewide Lake Assessment Program. This is a lake monitoring program conducted jointly by the DEC and the New York Federation of Lake Associations. Lay volunteers monitor more than 200 lakes throughout the State. Similarly, the DEC ambient lake monitoring program has used early detection and rapid response strategies to identify and eradicate the first known Water Chestnut invasion on Long Island.

Perhaps the most effective means for monitoring invasive species is to establish broad monitoring networks. These would include volunteers trained to identify invasive species - networked with experts capable of confirming the identification of these invaders - , non-governmental organizations dedicated to providing support for invasive species management, and government agencies capable of linking networks, identifying effective management tools, and targeting resources.

The Adirondack Park Invasive Plant Program, described in the following section, is an outstanding example of a successful monitoring and surveillance program. It works as an effective model for establishing and maintaining surveillance networks, enhancing collaboration among and within the public and private sectors, and developing early detection-rapid response strategies for controlling

early infestations. This Program should be maintained and expanded to other regions of New York State.

A less elaborate, but still effective, program is the Drop-a-Brick Program from the Lake George Association (LGA). The nature of this proactive program is to act as an early detection network for Zebra Mussels. While Zebra Mussels have been found in a few places in Lake George, it appears that water chemistry or substrate may impact their ability to get established in other areas. Extensive hand control operations have been established to remove mussels in these locations, validating the need for an early detection network. In the Drop-a-Brick program, each volunteer participant suspends a brick from his or her their dock. Favoring hard surfaces, Zebra Mussels attach themselves to the brick. At the end of the summer season, the participants check the brick and report whether they have found evidence of Zebra Mussels. In the program's first year, more than 80 people participated, covering every municipality in the Lake George Basin. With the help of the Coast Guard Auxiliary, the Lake George Association was also able to monitor many of the islands that dot Lake George. This model has applicability to other regions of the State, particularly for detecting invaders that are transient or not easily monitored.

These monitoring and surveillance efforts collect key information that can populate data clearinghouses, which serve as essential tools for resource managers and the public when developing prevention and management strategies. These include inventories maintained by the Invasive Plant Council, the Darrin Freshwater Institute, and the National Sea Grant Aquatic Nuisance Species Clearinghouse.

Adirondack Park Invasive Plant Program

Arguably, New York's best chance at preventing invasive plants from spreading before it is too late is in the Adirondack Park. The Adirondack Park Invasive Plant Program (APIPP) is a two-time, national award-winning program protecting the Adirondacks from the real and lasting negative economic and environmental impacts of invasive species. Started in 1998, the initiative is a partnership of State agencies, not-for-profits, and resident groups. The APIPP partners are The Nature Conservancy - Adirondack Chapter, NYS Adirondack Park Agency, NYS Department of Environmental Conservation, NYS Department of Transportation, and Invasive Plant Council of New York State; they operate under a Memorandum of Understanding.

The APIPP partners developed an integrated management plan to expand partnerships with communities across the region, and to inventory, map, monitor, and manage infestations to prevent the spread of targeted invasive species in the Adirondacks. APIPP coordinates two projects: the Terrestrial Invasive Plant Project and the Aquatic Invasive Plant Project. Program successes include developing an invasive plant training program for citizens and staff. APIPP has established a regional volunteer monitoring program to detect invasive plants. This has involved recruiting 125 staff and citizen volunteers to survey 128 lakes and ponds and engaging 70 volunteers to inventory and map terrestrial invasive plant occurrences. The partnership has also developed best management practices for the control of terrestrial invasive plants; these practices have been used to control approximately 70 percent of documented terrestrial plant infestations each year. APIPP educational materials have increased public awareness and their website, www.adkinvasives.com, has been widely visited. In addition, in one year alone, APIPP partners have given presentations to over 6,000 individuals. These achievements demonstrate the effectiveness of partnerships, collaboration, and coordination, and the Program is increasingly recognized as a successful model that promotes prevention, early detection, rapid response, and education to protect valuable New York State resources threatened by invasives.

Prior to APIPP, there was no coordinated monitoring program specifically for aquatic invasive plants, and resource managers had no clear picture of the extent of the aquatic nuisance plant problem in the Adirondacks. Partnership-building, information-sharing, and APIPP's volunteer program crystallized the understanding of the distribution of aquatic invasive plant species: As of 2004, 47 lakes had documented infestations of aquatic invasive species. Local groups controlling aquatic invasive species in the Lake George and Lake Champlain basins and the New York State Federation of Lakes are other successful local and regional partnerships with APIPP.

Biological Control of Purple Loosestrife

Biological control - or simply biocontrol - refers to the use of natural pests to control invasive species. The general principle recognizes that many invasive species can invade successfully because they enjoy an absence of the predators,

pests, parasites and diseases to which they were subject in their native landscapes. Biocontrol research is focused on finding organisms - control agents - that will control invasive species without causing undue harm to native species.

The recognition of Purple Loosestrife as a major invasive wetland species, and the inability to control this species with mechanical or chemical means, resulted in the development of a biological control program in the mid-1980s. Funding from the United States Congress in a special appropriation enabled the initial research in Europe to identify and study potential insects as control agents. After initial results proved successful, a coalition of federal and state natural resource agencies from across temperate North America, together with biocontrol scientists, formed a Purple Loosestrife working group, which was coordinated by Cornell University. Through actions of this group, funding from many different sources enabled the program to continue. By 1992, host-specific insects were introduced into seven states - including New York - and into Canada. Over the past decade, host-specific insects have been mass-produced at Cornell and have now been introduced into 35 states. At many of the early release sites, Purple Loosestrife populations have decreased dramatically. Since coordination of the program was through Cornell, insects were released in New York, initially at DEC's Tonawanda Wildlife Management Area. These insects have now been released, with some funding by DEC, at hundreds of sites across the state, and their feeding is reducing Loosestrife infestations in many wetlands. The net result of reductions in Purple Loosestrife abundance is a return of invertebrates, amphibians, birds, and mammals. However, New York currently does not have a statewide ecological and economic assessment of the recovery effort.

Great Lakes Fishery Commission

The Great Lakes Fishery Commission provides an example of effective regional cooperation for invasive species management. It was created in 1954 with two major responsibilities: 1) to develop and coordinate Great Lakes research programs focused on maximizing sustained productivity of native lake trout; and 2) to formulate and implement a program to eradicate or minimize Sea Lamprey populations in the Great Lakes, including New York's Lake Ontario and the eastern basin of Lake Erie. The Commission does an excellent job coordinating between two countries and neighboring states and provinces. The research component allows the Commission to tap top-notch scientists, keep abreast of the latest scientific and technological advances, and apply adaptive management to the control of Sea Lamprey. These are all excellent attributes of a successful invasive aquatic species program. In Lake Ontario, the Commission 's Sea Lamprey Control program has been successful, with "wound rates" on native lake trout (the indicator species) being maintained within the target levels. Costs and concern over continued use of chemicals have driven alternative approaches with a focus on long-term control of Lamprey. Among the more promising scientific advances, the Commission is currently investing in the application of pheromone-based control research as well as the use of low barrier dams and sterile males to control Lamprey.

Grass Roots

Advocacy and stakeholder groups have grass roots support to promote aquatic invasive species management in New York State. The Coalition of Lakes Against Milfoil - known as COLAM -, for example, now has members in all parts of the State, with the goal to eradicate or minimize the impact of Eurasian Watermilfoil in New York's waters. COLAM advocates for: the implementation of a statewide invasive species management plan; a consistent and streamlined permitting process throughout New York which includes early detection and rapid response utilizing all effective control methods including herbicides; and a partnership between New York State and the lake associations that would include funding and technical assistance. A similar group, the counties belonging to the Finger Lakes-Lake Ontario Watershed Protection Alliance - or FLLOWPA - organized in 1984 to deal with Eurasian Watermilfoil.

National Aquatic Nuisance Species Clearinghouse

Establishment of zebra mussels in the Great Lakes prompted the need for basic information on aquatic invasives, including their biology, ability to spread, impacts, ecology, and potential for management. To meet this need, the Empire State Electrical Energy Research Corporation provided initial funding to support the New York Sea Grant Clearinghouse, now the National Aquatic Nuisance Species Clearinghouse. The Clearinghouse, established in 1990, currently receives funding from the National Sea Grant Program and the National Oceanic and Atmospheric Administration and publishes quarterly information on research, meetings, legislation, and sightings of important aquatic invasive species. This information is used to encourage and facilitate communication among researchers and stakeholders through the Clearinghouse's *Aquatic Invaders* publication. The main thrust of the Clearinghouse is to be a repository of published information on aquatic and in some cases terrestrial invasive species encompassing both peer reviewed and "gray" publications. The Clearinghouse serves a critical function to its stakeholders in New York State and other states, but will require dedicated funding to support and maintain its high profile visibility and utility. Visit the Clearinghouse at its website: www.aquaticinvaders.org

New York Sea Grant has been funding and implementing aquatic nuisance species research and extension outreach programs since the early-1980s, when it began responding to information and education needs pertaining to Eurasian Watermilfoil and nuisance algae blooms on Lake Ontario and the Finger Lakes. Since the introduction of the Zebra Mussel into the Great Lakes Basin in 1988, New York Sea Grant has been a national leader in aquatic invasive species research and outreach.

In addition to being the home of the National Aquatic Nuisance Species Clearinghouse, New York Sea Grant is a member of the Northeast and Mid-Atlantic Regional Panels on Aquatic Nuisance Species (established by the National Aquatic Nuisance Species Task Force), and helps to provide those bodies with outreach education assistance and research linkages. A Senior Extension

Associate serves on the Communications, Education and Outreach Committee of the National Aquatic Nuisance Species Task Force and is a member of the National Invasive Species Advisory Committee, which provides information and advice to the National Invasive Species Council on matters pertaining to the federal government's involvement in invasive species issues.

New York Sea Grant offers aquatic nuisance and invasive species training for educators and develops educational materials for those audiences. Since 2001, New York Sea Grant has invested more than $1.5 million in aquatic invasive species - both freshwater and marine - research throughout colleges and universities statewide. The only nationwide Zebra Mussel economic impact study to date was undertaken in 1995 by New York Sea Grant and is currently being revisited with a research team from Cornell University.

New York Sea Grant is also involved in aquatic invasive species outreach activities throughout the State's Great Lakes, Finger Lakes, St. Lawrence River, Hudson and Peconic estuaries, and in the Long Island Sound and Atlantic coastal regions. Since 1995, New York Sea Grant has spent approximately $ 1 million on aquatic invasive species outreach activities, including the Clearinghouse.

Invasive Plant Database

The Invasive Plant Council of New York State has begun the creation of an Invasive Plant Database. The purpose of this effort is to provide reliable information about the distribution and management of invasive plants throughout New York and its bordering states and provinces. It is intended to serve as a clearinghouse for information on invasive plants species. The database's current and reliable information is integral to managing invasive species; its data is necessary for prevention, early detection, and assessment.

When fully developed, this centralized database will house location information for invasive plants throughout New York State. The information will be displayed in a geographic information system (GIS) format to allow for easy visualization of the data. Similar information from neighboring states and provinces will also be depicted. The geographic information system will be able to analyze the data spatially and temporally so that rates of spread can be predicted.

A useful example of the capability of the Invasive Plant Database can be seen with the distribution of Giant Hogweed. This invasive plant can cause severe skin injuries - photodermatitis - when its sap contacts unprotected skin. By overlaying known Giant Hogweed locations with the locations of schools, eradication efforts can be directed where the risk is highest.

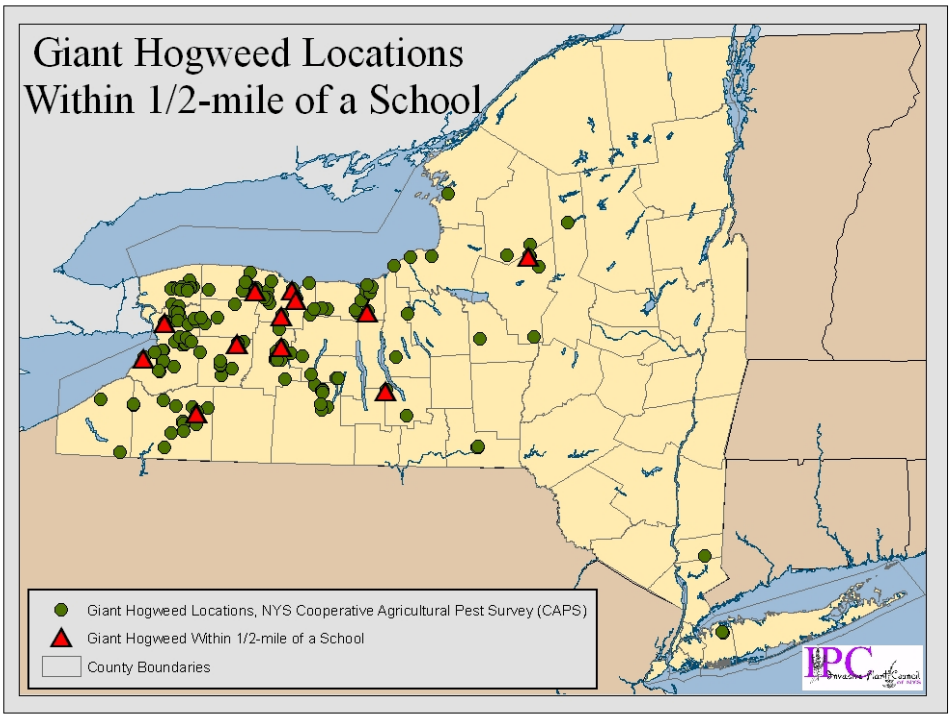

Figure 9 Relationship of a harmful invasive to high-risk locations.

Informal Coordination

Chronic Wasting Disease has shown how government agencies and other necessary organizations can coordinate their efforts when needed. As Chronic Wasting Disease in white-tailed deer was reported in more and more states in recent years, New York State organized to both monitor its deer herds and also be prepared to contend with the disease's potential occurrence. DEC has responsibility for both wild and captive deer; DAM has responsibility for captive herds only. With the captive herds, DEC is primarily concerned with the importation and possession of deer; DAM is primarily concerned with the health of the deer. In addition, the United States Department of Agriculture provides technical support for the identification of the disease and can also get involved in controlling infestations. All three agencies rely upon Cornell University's School of Veterinary Medicine to provide expertise in identifying Chronic Wasting Disease.

DEC, DAM, USDA and Cornell began to coordinate their efforts in 2002 when Chronic Wasting Disease was reported east of the Mississippi River. After reviewing existing regulatory and monitoring practices, the organizations developed a comprehensive approach to minimizing the risk of importation and spread of this disease. They also initiated an enhanced monitoring effort to

improve New York's early detection capability. DEC stepped up its monitoring of wild deer herds while DAM increased its monitoring of captive herds. Because Chronic Wasting Disease can only be verified by analyzing selected tissues from dead deer, samples were collected from deer that were killed by hunters, by landowners suffering deer damage, by collisions with vehicles - with the cooperation of the New York State Department of Transportation - and by deer farmers. Cornell and the USDA tested the samples. Most important, this team also prepared a contingency plan to guide them if the disease were found within our borders.

Chronic Wasting Disease was found in New York State early in 2005. Although this circumstance demanded exceptional efforts from each of the partners, the coordination that had led to the planning and preparation paid off handsomely. Each organization knew its role and could rely on the others to perform theirs.

Regional Coordination

On a national scale, the United States Fish and Wildlife Service employs an invasive species coordinator in each of seven regions, one of which represents the Northeast Region and is located at the Lower Great Lakes Fishery Resources Office in Amherst. This regional coordinator networks with local, regional, and national programs, coordinates early detection and monitoring efforts, and contributes to education/outreach initiatives. DEC is represented on the Northeast Regional Panel of the Aquatic Species Nuisance Task Force. This is an excellent avenue to get federal attention on both New York State and Northeast regional issues.

New York State Aquatic Nuisance Species Plan

New York State's first-in-the-nation Aquatic Nuisance Species Management Plan was approved by the Federal Aquatic Nuisance Species Task Force in 1994. A revised Plan has been prepared but has not been submitted for approval pending the outcome of this Report. The revisions in the new Plan are based primarily information from: federal guidance for State Aquatic Nuisance Species management plans; input from public meetings; experiences of DEC staff; and the Lake Champlain Basin Aquatic Nuisance Species Management Plan.

The revised plan is directed primarily at addressing the impacts of unintentional, unsanctioned introductions of aquatic invasive species. It describes specific problems the state has experienced, goals and objectives; lists of both known and potential invaders; and the roles and responsibilities of federal, state, and local agencies and organizations. A key feature of the revised Plan is the detailed implementation tables. These tables restate the goals and objectives and identify the tasks that must be accomplished to achieve them. For each task, the estimated cost, source of funding, priority (in terms of when it is scheduled for completion within a three-year period), and a list of collaborating agencies is provided.

The goals of the revised Aquatic Nuisance Species Management Plan are to: provide effective and efficient program management; prevent the introduction of new invasive species into the waters of New York State and enforce relevant laws and regulations; control the spread of invasive species to new water bodies within the State, and mitigate adverse ecological, societal, and economic impacts resulting from their introduction; involve and motivate the general public to take steps to help prevent new introductions and control the spread of onvasives through education; encourage, promote, and support research in New York State.

Habitattitude™

The fish, plants and other aquatic life used by aquarium hobbyists and water gardeners include some potentially invasive species. Habitattitude™ is a non-regulatory, volunteer effort intended to prevent invasions. It is a public-private partnership whose partners are: the U.S. Fish and Wildlife Service; the Pet Industry Joint Advisory Council (PIJAC); the National Sea Grant College Research Network; and 4) state fish and wildlife agencies.

The U.S. Fish and Wildlife Service works to conserve, protect and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people. The Pet Industry Joint Advisory Council is the world's largest pet industry trade association. It represents all segments of the pet trade and works to ensure the availability of companion animals and to sustain the entire pet industry. It focuses on education, information, and governmental issues involving pet stores, companion animal supply, and restrictions or obstacles to pet ownership. The Sea Grant network is a network of colleges and research institutions that are headquartered at many of the nation's universities in coastal and Great Lake states. It conducts research, outreach, and education activities to address challenges associated with our marine and coastal resources.

Pet owners and water gardeners sometimes use species, such as Snakehead Fish or South American Water Hyacinth, that could be invasive if they escaped or were released to natural environments. The Habitattitude™ partners have created a strategic alliance that focuses around the development, implementation, and evaluation of a national public awareness campaign to promote the responsible enjoyment of aquarium and water garden hobbies and the protection of our natural aquatic environments. The intended outcome of the Habitattitude campaign is to educate the target audience about the growing threats created by aquatic invasive species and the need for them to enjoy their hobbies responsibly. By laying this foundation, the campaign can empower its audience to use appropriate disposal alternatives when faced with unwanted aquarium and water garden species. The secondary intent is to unify the public and private sector organizations associated with this sector around this issue and provide them a communications vehicle that simplifies the issue of aquatic invasive species, educates consumers about the potential impacts of unwanted aquarium and water garden species, and encourages them to adopt proactive prevention procedures to protect and conserve our environment.

By focusing the campaign around a central brand and theme that translates the complex issue into a recognizable signature and understandable terminology, the design seeks to unify all governmental agencies, businesses affiliated with the pet, aquarium and water garden sectors, and research universities around an effective prevention message and leverage their ability to communicate by providing them with customizable campaign resources while simultaneously giving them ownership for this effort.

The primary resource will be a national campaign website that will contain information about the issue, the species, the legal framework surrounding pet ownership and how aquarium hobbyist and water gardeners can prevent the spread of unwanted species. The cooperative marketing materials will also be available in downloadable formats.

Mute Swan

New York State has joined other states and Canadian provinces in trying to reduce the harm caused by Mute Swans. They no longer permit releases of captive-reared swans but do permit nuisance Mute Swans to be destroyed or relocated into captivity. Some public and private land managers conduct ongoing efforts to actively remove or prevent establishment of this invasive.

These efforts to manage Mute Swans were suspended until recently by virtue of a federal court decision that interpreted this invasive species to be protected under the Migratory Bird Treaty Act. This circumstance was remedied when the United States Fish and Wildlife Service made clear, through a listing process, that invasive species are not protected under the Treaty.

Currently, DEC is conducting research on New York's Mute Swan population. Ground, boat and aerial surveys are being used to monitor population numbers and productivity, seasonal distribution and movement patterns, and habitat use.

"Aquatic Hitchhikers"

A variety of literature has been created to raise public awareness and understanding of invasive species. The Mississippi River Basin Panel has developed the "Stop Aquatic Hitchhikers!" campaign with a leaflet and a bumper sticker. The leaflet provides information about a several invasive species. It also explains how to prevent their spread by way of boating and other water-related recreational activities, like fishing, scuba diving, and waterfowl hunting. Stickers have also been developed to encourage responsible disposal of bait. The "Don't Dump Bait" program was developed by the State of Indiana.

Success is incomplete.

Corrective actions to deal with aquatic invasive species problems require both short-term and long-term remedies and solutions. In the case of the Great Lakes Sea Lamprey program, for example, primary impediments include the need for the Great Lakes Fishery Commission to secure continuing funding. It has a short-term need to continue the lampricide program as well as a long-term need for research into alternatives to costly lampricide chemicals.

Eurasian Watermilfoil

Eurasian Watermilfoil is the most widespread nuisance aquatic species, both in New York State and across North America. Its management illustrates a need to both enhance support for research and also to improve regulatory processes.

Research should focus on control methods, especially biocontrol. Numerous mechanical and chemical control methods have been employed for many years and can prevent the spread Eurasian Watermilfoil. These methods do not provide

a lasting solution. However, on-going research at Cornell University has shown that biocontrol is very promising. The techniques need to be developed in order to implement a program that could provide a meaningful solution to this widespread problem. The effort is languishing because of insufficient funding.

In addition to effective control, biological or otherwise, current efforts need to focus on preventing the spread of Eurasian Watermilfoil. In Lake George, Eurasian watermilfoil was first detected as three populations in 1985. In ensuing years, the Watermilfoil populations have increased while the Lake George Association, DEC, and Adirondack Park Agency have been unable to reach consensus over the need, or best approach, to control the species in the lake.

The Coalition of Lakes Against Milfoil, the Lake George Association, and the Eagle Lake Property Owners Inc. have urged the control of, and a streamlined permitting process for, Eurasian Watermilfoil. They are especially concerned about a more efficient and streamlined early response option. They recommend a permitting process that clearly identifies requirements and regulations and improves coordination among government agencies. In particular, they seek regulations that allow for an immediate response - localized treatment - after the first detection of an invasive species.

It should be noted here that, beginning in 2004, DEC has begun to solve at least part of these problems by comprehensively reorganizing the way it responds to requests to control aquatic invasive plant species. It has enhanced the consistency of the aquatic herbicide permitting process across the State. It has also reached out to stakeholder groups, including pesticide applicators, to provide information and to identify and meet their needs while continuing to protect the States waters and other aquatic resources.

Finally, stakeholders identified a need for dedicated funding for both short term (herbicide control, hand pulling etc.) and long-term (biocontrol in combination with other management techniques) remedies to manage invasive plants.

Adirondack Park Invasive Plant Program

Although already discussed above as a success story, the Adirondack Park Invasive Plant Program's (APIPP) approach to tackle invasive plant species before they become widespread and difficult to control has encountered obstacles to complete success. The goal of this program is to protect Adirondack waters through prevention, early detection, rapid response, and long-term control. The APIPP program has excellent goals and approaches to dealing with the invasive plant species problem but implementation has been limited by shortfalls in personnel, dedicated funding, and statutory authority. These obstacles include:

> APIPP partners and volunteers effectively document aquatic new invasive plant infestations. However, when an invasive is detected, they do not have the capacity for the appropriate rapid response to eradicate small, manageable infestations: eradication.

APIPP is unable to adequately monitor infestations and control practices.

For emergent plants such as Purple Loosestrife, Common Reed and Japanese Knotweed (sometimes considered aquatic), APIPP strives to control populations yet is unable to engage in restoration practices.

APIPP educates lake users about aquatic nuisance species, yet public use areas and fishing, hunting and boating licensing programs do not include threat, impact, and spread prevention information.

APIPP aims to develop and promote voluntary codes of conduct among specific stakeholder groups, yet there is limited to no organizational or legislative support across the state.

Other impeding factors include: the occasional lack of consensus among stakeholders about appropriate prevention/management techniques (often centered around the use of herbicides); and the lack of organizational or legislative mandates for staff and the public to comply with invasive species introduction and spread prevention.

The Ship Vector and Ballast Control

The major ports across New York State are vulnerable to invasions by ship-borne invasive species. Ports that accommodate ocean-going and Great Lakes system vessels include New York City, Albany, Ogdensburg, Oswego, Rochester, Buffalo and Dunkirk.

The Coast Guard has taken the issue of aquatic invasive species very seriously and recently instituted mandatory rules for ballast water reporting. Now, any vessel with ballast tanks that operates outside of its local area must submit a ballast water report. Ballast Water Management practices are also mandatory. Vessels originating outside of United States waters must exchange ballast mid-ocean, retain ballast while in United States waters, or treat ballast water. Discharge in the Hudson River or Great Lakes is prohibited unless there are safety, stability or security concerns. For uptake and discharge in United States waters, the regulations require that vessels: avoid operations near marine sanctuaries; minimize uptake where harmful organisms or pathogens are located or in poorly flushed areas, in darkness when organisms may rise in the water column, and in shallow water; clean ballast tanks regularly; minimize discharge in coastal and internal waters; rinse anchors and chains; remove fouling organisms from hulls; maintain a ballast water plan; and train in ballast-water management. Ballast water reporting is also required.

It should be noted that there is no offshore ballast water exchange or treatment required for vessel operation solely in United States waters and that, even with ballast water exchange, all organisms are not removed. Also, crude oil tankers and military vessels are exempted. Ballast water regulations have also been developed by the International Maritime Organization of the United Nations, but

have not yet been adopted. The U. S. Coast Guard believes that ballast water treatment and management technology is not yet sufficient to completely control the potential for spreading invasive species.

In the Great Lakes, transoceanic shipping has been identified as the primary mechanism responsible for the introduction of aquatic invasive species over the last four decades. Currently, transoceanic ships are subject to a ballast water law that took effect in 1993 whereby oceangoing vessels with declarable ballast on board conduct open-ocean ballast exchange if the water is to be subsequently discharged within the Great Lakes system; after the exchange, ballast water must possess a salinity of no less than 30 parts per thousand. The premise behind ballast water exchange is that most freshwater organisms resident in the ballast tanks are purged during the exchange, and the remaining organisms are killed by osmotic stress. Despite this policy, the discovery rate of invasive species has increased, suggesting that the ballast water exchange as currently practiced is insufficient to prevent ship-vectored invasions to New York's Great Lakes.

Ship-vectored invasions like Zebra and Quagga Mussels and future high risk invaders are best prevented by identifying and addressing shortcomings in the current program. In particular, technology and policy should be developed to address the risk posed by the ship vector as a whole, rather than continuing to assume that ballast water exchange is sufficient. Implementation and evaluation of ballast water controls, including vessels declaring "no ballast on board" (NOBOB), are necessary to make significant progress toward prevention. Whatever the solutions may be for vessels with ballast or no ballast on board, enforcement must ensure 100 percent compliance with no exceptions.

The Coast Guard has also developed the Shipboard Technology Evaluation Program (STEP) to facilitate shipboard testing of new, experimental ballast water treatment systems in order to help the marine industry develop more options for ballast water management. They are also developing a ballast water discharge standard. The intent is to develop technology that meets a sound standard, not to sacrifice the standard to meet current technology. Finally, from the U.S. Coast Guard's realm of involvement in aquatic invasive species, the goal is to develop standards and technology that protect the biological security and diversity of our waters in a way that is actionable by industry as soon as possible. This goal requires enhanced communication and cooperation among the Coast Guard, other federal agencies, regional bodies, New York State and local jurisdictions, industry representatives, research institutions, and citizen groups. Continued infestation of New York's waters with aquatic invasive species from the ship vector is a serious issue and New York State needs to be firm with its federal partners to stop aquatic invasive species by this vector.

The National Aquatic Invasive Species Act and the International Maritime Organization Convention propose different approaches to the management of ballast water as well as other ship-borne vectors. The challenge of regulators is to balance effective prevention with costs when critical scientific information is unavailable. And while these efforts address only the potential for new invasions,

the Great Lakes Commission is developing a model approach that would include early detection, monitoring, and rapid response.

Two recent legal cases bear on this issue as well. In 2004, the New York State Department of Law joined six other Great Lakes states to force EPA to regulate ballast water discharges. In 2005, a federal court in California that ballast water discharges cannot be exempted from the requirements of the Clean Water Act. This has implications especially for ballast-water exchange in United States waters.

The State of Michigan has recently passed legislation to implement its own ballast water control program. If enacted, it would institute a permit process in 2007 that would require ships to demonstrate that they do not discharge aquatic species or that they treat their ballast water. The costs and specialized training needed for the implementation of such an effort would be considerable.

Common Reed (*Phragmites*)

The invasion of Common Reed - or *Phragmites* - into New York's tidal marshes illustrates a need for regulatory streamlining. Although many organizations recognize the problems caused by *Phragmites* and have aligned to resolve them, comprehensive restoration efforts have been delayed, and even foiled by, regulatory processes.

In the marine areas of New York, extensive *Phragmites* invasions are found in saltmarshes throughout all of our major estuaries: New York Harbor, Long Island Sound, the South Shore Bays and the Peconics. The percentage of areas affected by *Phragmites* is not well-documented, nor is the rate of expansion, - airphoto analysis and field verification are needed to fully characterize the extent of the problem - but there is general agreement that there has been a large increase in *Phragmites*-dominated areas over the past 30 to 50 years. The national and State estuary programs for these marine systems all recognize *Phragmites* as one of the preeminent threats to saltmarsh habitat.

Phragmites control has been the focus of many habitat restoration efforts. Saltmarsh restoration typically relies upon physical manipulations of marsh topography and drainage to restore tidal flows; herbicides are not needed. The Long Island Wetland Restoration Initiative has identified wetland restoration opportunities in cooperative meetings of State and Federal agencies and non-governmental organizations. The work focuses on formerly-connected wetlands and wetlands with restricted tidal flow as areas in which restorations, including *Phragmites* control, would generate high benefits.

Suffolk County is preparing an environmental impact statement for its vector control program. The impact statement will address both the use of pesticides and the County's water control practices such as ditching, ditch maintenance, and open marsh water management. As part of the impact statement, an extensive literature search and review is being conducted. The literature review will be

useful in evaluating historic *Phragmites* areas as well as various wetlands restoration and *Phragmites* control methods.

A recent example of wetlands restoration involving a partnership of State, Federal and local agencies, non-governmental organization and academic institutions, is a project at Beaverdam Creek, located on the South Shore of Long Island. The project, led by Ducks Unlimited, involved the restoration of tidal flow, removal of dredge spoil, *Phragmites* removal, regrading and the planting of native wetlands vegetation on an eight-acre site. The project is intended to restore the natural wetlands ecology by creating tidal channels, ponds, and new marsh areas that will improve habitat for fish and wildlife.

State Tidal Wetlands Regulations (6NYCRR Part 661) address activities occurring in or adjacent to tidal wetlands. As is common with such habitat protection statutes and their supporting regulations, the focus is to prevent actions which could harm the wetlands and the resources associated with them. The regulatory process does not anticipate actions intended to improve degraded wetlands. There are currently no guidelines in the regulations specifically for salt marsh restorations or invasive species control. Nevertheless, the regulations are a critical component that must be considered in any wetland restoration project and, despite the lack of guidelines, provide opportunities for managing invasives like *Phragmites*. The regulations can direct seasonal construction windows, project designs, and monitoring requirements. In practice, plantings for mitigation and restoration are generally required to be native vegetation. In 2000, DEC and DOS prepared "New York State Saltmarsh Restoration and Monitoring Guidelines" which do address wetland restorations and *Phragmites* control.

New York State owns a considerable amount of tidal wetlands, many of which are invaded by *Phragmites;* DEC manages over 3000 acres on 41 separate units. *Phragmites* control or other restoration work has been precluded by a lack of Unit Management Plans for most of these lands.

With all of the concern, effort and resources aligned in favor of restoring *Phragmites*-infested tidal wetlands, it remains for the regulatory process needs to be aligned with program goals.

Finally, it should be noted that *Phragmites* is a problem - over many mores acres, in fact - in freshwater wetlands, too. Cornell University has begun research on bio-control techniques that could provide meaningful landscape-scale means for control or restoration. In the meantime, conventional efforts on Long Island have been successful. This is especially critical in rare infested communities like Coastal Plain Ponds.

Sea Grant and MIT Sea Grant Surveys

Except for tidal wetlands restoration, much of which involves the control of *Phragmites*, there has been little effort dedicated to the detection, monitoring or control of invasive species in marine waters. It is important that we establish

baseline levels for all non-native species and continue to monitor to detect new arrivals and to determine trends for both known problems, like *Phragmites*, and potential problems, like the Asian Shore Crab.

In 2003, MIT Sea Grant conducted a short-term and limited survey of invasive species in Long Island Sound, the Peconic estuary, and New York Harbor. They spent only one to two days studying floating docks at three sites within each estuary and yet found dozens of non-native species in each estuary. In 2005, Connecticut Sea Grant generated an invasive species list for Long Island Sound. It found about 60 non-native species as well as about 40 others - both marine and freshwater species - whose origin was uncertain.

Fish and Wildlife Laws and Regulations

Although there is no comprehensive statute or regulation that addresses invasive fish and wildlife, there are numerous provisions in federal and State law that control trafficking in such species.

Most wildlife cannot be possessed or sold in New York State. There are exceptions for certain game birds and game animals and for scientific or educational purposes. Chronic Wasting Disease has spurred regulatory attention by both DEC and DAM in recent years. Controls on importation, possession and feeding of deer had been revised to reflect the increasing threat. Now that the disease has been found in wild deer, further restrictions are being implemented.

Fish, too, are regulated. Existing laws regulate stocking of fish into New York's waters. Some especially threatening invasives, like Piranha, Grass Carp, Asian Carp, and Snakehead Fish have received special regulatory attention. The sale of bait is licensed and some species, such as all Carp, Goldfish, and Sea Lampreys must be destroyed if captured with other bait species.

Currently, it is illegal to stock fish in any New York State water without a permit. The law does not apply to emptying bait buckets and live wells; it does, however, list organisms that can and cannot be used as bait. The prohibited species include Eurasian Carp, Goldfish, and larvae of Sea Lamprey. The law restricts the use of bait in particular waters and also addresses the possession and movement of particular Invasive Species, such as Zebra Mussel, Round Goby, and Water Chestnut. Environmental Conservation Law can include other species if it can be shown that "such species of wildlife or fish would pose a danger to the health or welfare of the people of the state, an individual resident or indigenous fish and wildlife populations". Other actions could include: prohibiting the emptying of bait buckets into public waters; establishing a list of permissible bait species, as Vermont does; licensing importers, exporters, and dealers of bait; and educating the public on baitfish and other invasive species issues. Educational tools such as the "Don't Dump Bait" sticker developed by Illinois-Indiana Sea Grant could be effective.

The state regulations for Marine Hatcheries, On-Bottom and Off-Bottom Culture of Marine Plant and Animal Life (6NYCRR Part 48) control the species that are permitted to be used for aquaculture; they also limit the areas from which plants and animals can be imported. The restrictions apply whether the aquaculture operation occurs in water or on land and even to operations that do not have a connection to tidal water. Non-native species are not permitted to be imported into the state for aquaculture. The geographic areas from which plants and animals may originate is limited through the importation permit in order to control the potential introduction of diseases such as MSX and Dermo or toxic algae into the state. While there are no known introductions of non-native species in New York, DEC's capacity to ensure that intentional or unintentional introductions do not occur is limited.

The regulations of 6NYCRR Part 44, Lobsters and Crabs, prohibit the possession, importation, transport or commerce in Chinese Mitten Crabs, including the liberation of Mitten Crabs into the waters of the state. However, New York's ability to monitor international commerce is limited. Mitten Crabs have been found in New York seafood markets. There is a similar national law.

There are currently no New York State laws or regulations that address other avenues of non-native species introductions into marine waters. A bill proposing ballast water regulation was introduced in 2003, but has not been adopted; it closely mirrored Federal regulation by the United States Coast Guard.

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Chapter IV.

SURVEY OF TASK FORCE ORGANIZATIONS

Between July and September of 2004, the Task Force surveyed its seventeen member organizations to assess who is doing what to combat invasive species. The goal was to capture information on a significant majority, but not all, of the State, Federal, local and private Invasive Species program activities in the State. The questionnaire also started the process of identifying other interested organizations and collecting possible recommendations.

The Survey

Fifty-five questions were prepared by the Task Force Steering Committee, relying heavily on the survey conducted by the National Invasive Species Council in 2000. Members of the Steering Committee met with one or more representatives of each Task Force member to discuss responses to the questionnaire before it was returned.

The Kitchens Group was retained by The Nature Conservancy to assist with the survey process and to review, organize and summarize the answers.

The Survey had seven sections:

Leadership and Coordination - An overview of each agency or organization and current Invasive Species initiatives, authority, responsibilities, leadership and coordination.

Impacts - Evaluating the nature, scope and magnitude of the environmental, ecological, economic, recreational and social impacts caused by invasive species in New York.

Management Programs - Identifying the actions and initiatives taken to prevent or respond to the introduction and spread of invasive species, especially with regard to prevention, early detection, rapid response, control, management and restoration.

Education and Outreach - Identifying existing public education programs and future needs.

Research and Information Management - Documenting existing research, data collection, plus the sharing and use of updated databases.

Funding - Details on funding.

Conclusion/Other - Identifying suggested conclusions and other issues related to invasive species.

Summary of Responses

Leadership & Coordination

The Survey data suggest that there is a great need for more cooperation among the groups trying to address Invasive Species problems. The Survey data also suggest that there is an opportunity for the State to play a facilitating role with regard to leadership and the setting of regional and state invasive species policy and strategy.

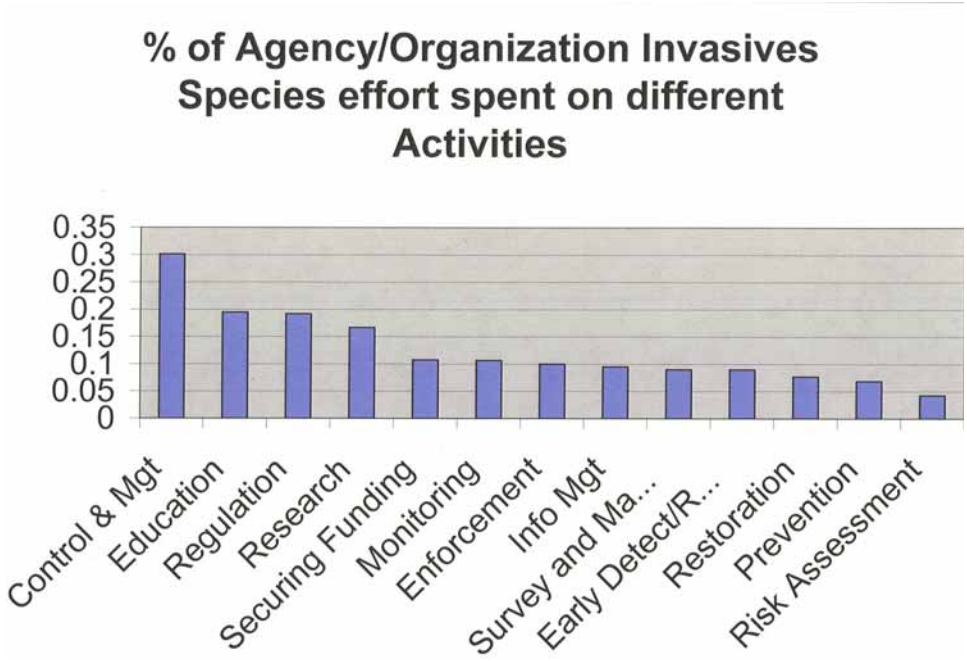

Figure 10 Table courtesy of the Kitchens Group and TNC.

Impacts

The Survey data suggest that the negative impacts of Invasive Species are well documented. The environmental and ecological impacts of the problem are especially well understood. The economic and social impacts are best understood only as they relate to a small group of established invasives. Additional research is needed.

Management Programs

The Agencies and organizations on the Task Force appear to be more oriented toward control and management, for several large established invasive species problems, rather than prevention, early detection, rapid response, restoration and overall program coordination.

Education and Outreach

Seventy-one percent of the respondents say their agency or organization has no press or public relations operation that supports Invasive Species outreach. Only 12 percent have done public opinion research on the subject. Task Force members say public awareness is a serious problem and must be addressed. Fifty-three percent of respondents say they try to inform the public on the issue. And while 71 percent say their agency or organization has no press operation for invasives, 53 percent say they have materials to provide for the press.

Research and Information Management

Just over half the respondents, 53 percent, say they have electronic database information on invasive species. The Invasive Species Plant Council, a member of the Task Force, is developing a tool – an integrated data base for tracking of invasive species across the state. There are opportunities to improve and better integrate the management of invasive species information collected and used by multiple agencies and organizations. New York is home to multiple nationally recognized institutions with expertise and experience with regard to invasive species research, education and outreach, including Cornell, Hudsonia and Sea Grant.

Dedicated Funding

Overall, lack of dedicated funding to deal with Invasive Species is perceived as the number one problem. More staff dedicated to Invasive Species is the next most important need. Seventy-six percent of respondents feel their strategic ability to deal with the problem of Invasive Species is limited by the lack of funding. Dedicated funding is a common characteristic of successful programs in other states.

Conclusions

Based on the survey responses, the problems and threats of invasives are well understood by the experts. There are a number of dedicated state staff and excellent programs that exist to address various specific invasive problems, but there is no dedicated capacity charged with providing overall strategic coordination.

The members of the New York State Invasive Species Task Force appear to be more reactionary than proactive with regard to the invasive species problem, with

a growing but still inadequate degree of inter-agency and public-private coordination and cooperation. There is a clear need for a stronger federal role in preventing invasive species problems, and providing states such as New York with Federal funds to assist in this effort.

The survey identified some of the greatest successes regarding invasive species in New York today at the local level, and indicated that these successes are the result of local or regional coordination and cooperation among a combination of local, state, federal and private parties. Such strategic coordination at the statewide level, and additional funding and support for regional coordination, is key to a successful New York State invasive species program.

There exists an opportunity and support for establishing dedicated invasive species funding. A public-private partnership should invest proportionately more resources in overall strategic planning, coordination and communication. As available funds increase, future invasive species problems and costs can be more effectively contained and minimized by looking more at prevention, early detection and rapid response as a priority for those funds.

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Chapter V.

RECOMMENDATIONS

The statute requires that this report include "specific recommendations regarding:

existing state laws,
regulations,
programs,
policies,
practices and
resources available to:

prevent the introduction of invasive species;

the detection and rapid response to and control of populations of such species in a cost-effective and environmentally sound manner;

the monitoring of invasive species populations accurately and reliably;

the restoration of native species and habitat conditions in ecosystems that have been invaded;

research on invasive species and development of technologies to prevent introduction and provide for environmentally sound control of invasive species;

the promotion of public education on invasive species; and

the means to foster greater coordination between state agencies and the public."

1. Establish a permanent leadership structure to coordinate invasive species efforts.

Background

Although each recommendation is significant, there is one upon which the success of the others rests: coordination. Coordination among federal, state, and local programs is essential to address the gaps in regulatory and administrative

authorities; avoid duplication of efforts; develop integrated and consensus-based program priorities; and identify funding and research needs.

While there is a clear role for the federal government in coordination, such as sponsoring research, or monitoring international or interstate commerce to prevent entry of undesirable species, much of the work to track, prevent, eradicate, and control invasions of undesirable species falls to the individual states.

States are increasingly faced with invasive species challenges and the need for strategic planning to effectively and efficiently address them. Due to overlapping and, at times, conflicting policies, establishing mechanisms to coordinate the efforts of multiple agencies and sectors becomes essential. States have accomplished this by establishing two coordination tools: councils and plans.

No group can "go it alone" because of the immense scope of the invasive species challenge. As of 2002, approximately 36 states had some type of interagency invasive species council, either voluntarily or legislatively established. Most councils began in much the same way as the New York State Invasive Species Task Force – by a charge to report interagency recommendations to a legislature. One of those recommendations has been to create a permanent Invasive Species Council. Some councils, such as those created in Wisconsin, Oregon and Washington, are represented by top officials within relevant agencies, as well as key stakeholders within private sector and public interest groups. Others, such the Florida Invasive Species Working Group, have only state agency staff with non-governmental organizations serving an advisory role.

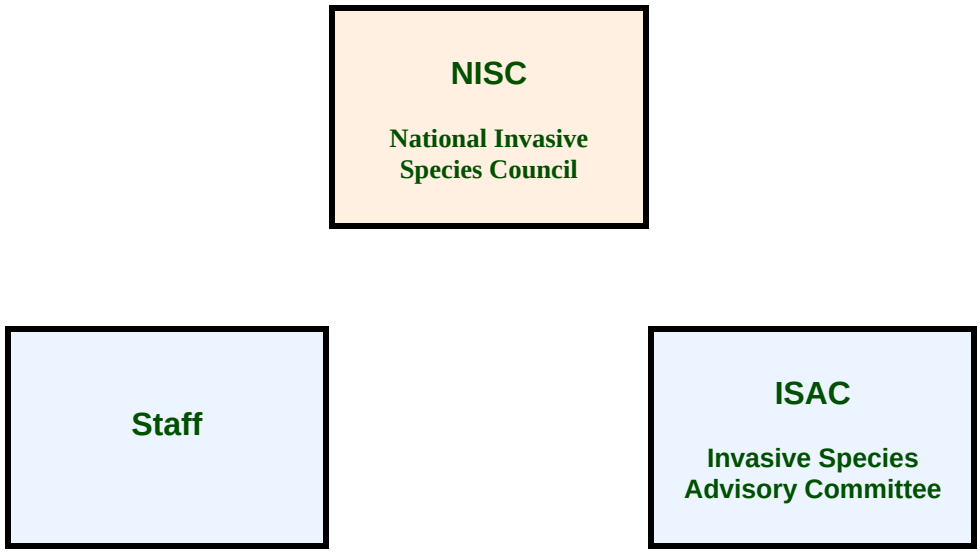
When evaluating a framework for coordination, states can also look to the Environmental Law Institute for guidance. The Environmental Law Institute prepared a comprehensive report assessing the tools and strategies needed for a comprehensive and effective invasive species management program. The report presented a model state program, the "Gold Standard". For a state to reach the "Gold Standard," it must establish a comprehensive council and develop a comprehensive plan addressing all categories of invasive species threatening that state. The council and plan should benefit from formal state recognition and earmarked funding to ensure political backing and financial support. A "Gold Standard" state recognizes that the effective management of invasive species requires the coordination of state agencies to combat the problem of invasive species as a whole. A council will facilitate coordinated state actions and a plan will direct that council's actions.

New Jersey is recommending that their state comply with the "Gold Standard". More recently, states are not only establishing councils, but also hiring specific council staff to oversee their coordination. Representatives in both New Jersey and Idaho proposed to their legislatures the addition of associated council staff. Depending on the state's organizational framework, council staff may be housed in the Office of the Governor, in a single agency but with interagency jurisdiction, or in a public benefit corporation.

State councils ensure that agency activities are coordinated, complementary, cost-efficient and effective. New York will be better able to implement and enforce existing authorities and tools aimed at the prevention, control, and management of invasive species if it, too, coordinates their use.

The Federal government uses a three-part approach. The first part is the National Invasive Species Council (NISC), which includes executives from each of 28 federal agencies; the executives' participation has been mandated by Executive Order. They are served by a staff whose members were assembled from several of these agencies. This is the second part of the Federal model. Organizationally, the staff are housed in the United States Fish and Wildlife Service. The Council is advised by the third part, the Invasive Species Advisory Committee (ISAC). The Advisory Committee is composed of approximately 30 stakeholders from state organizations, industry, conservation groups, scientists, academia and other interests.

Federal Model



Another model would be a two-part system, reflecting the way the New York State Invasive Species Task Force has operated. Under this approach, the "council" would include both State government agencies and non-governmental organizations. They would be served by staff, either from State agencies alone or in combination with member non-governmental organizations.

ISTF Model

Recommendation

An Executive Council should be established to address and pursue the preliminary recommendations of the ISTF. The Executive Council would be comprised of select state agencies and authorities engaged in the prevention, control and eradication of invasive species. The group should include State agencies and authorities whose missions relate to invasive species: the Departments of Agriculture and Markets; Education; Environmental Conservation; Health; Parks, Recreation and Historic Preservation; and Transportation. The Adirondack Park Agency, the Thruway Authority and Canal Corporation should also be considered.

The Executive Council should identify resource needs and allocate staff and other resources to facilitate the advancement of goals and objectives.

The Executive Council should possess the ability to establish ad hoc teams comprised of public and private sector representatives to assist in the pursuit of stated goals and objectives.

The New York State Invasive Species Task Force should continue as a permanent body and serve as the overarching advisory group paralleling the Federal model. The full breadth of stakeholders should be represented. Industry, especially, should be given an opportunity to participate. Arborists, the turfgrass trade, contractors, pesticide manufacturers, utilities, tourism and recreation industries should have voices, perhaps through trade associations.

Because a permanent Executive Council would have the ability to speak with one voice for the entire invasive species management community in New York State, it would also act as liaison for regional and national cooperation and coordination.

The Executive Council would oversee: 1) preparation of a comprehensive invasive species management plan; 2) the allocation of staff and other resources; 3) integration of data and other information; and 4) a comprehensive program of public education and outreach.

2. Prepare and implement a comprehensive invasive species management plan.

Background

New York State currently has no comprehensive plan for the coordinated management of invasive species. In many cases, individual agencies or organizations address invasive species in their internal strategic or work planning documents, but do not have ways to address the issue comprehensively. In the best cases, agencies and organizations have joined forces - either formally or informally - to solve particular invasive species problems. Weed Management Areas offer useful examples of this more comprehensive approach.

The development of a management plan for invasive species may begin with a comprehensive review of existing efforts and programs. The ISTF conducted a preliminary survey of State agencies, authorities and private sector organizations. A more thorough analysis of the information obtained from that survey is needed. Where the survey focused on public and private sector agencies and organizations at the State level, an area of significant importance and impact remains to be explored: federal agencies and their oversight of programs of pest exclusion and interception. USDA's Animal and Plant Health Inspection Service, the Department of Homeland Security's Customs and Border Protection, the U.S. Forest Service and the U.S. Fish and Wildlife Service represent federal authorities with programs that could significantly influence the development and evolution of a New York State management plan for invasives.

At present, many of the agricultural invasive species associated with the Cooperative Agricultural Pest Survey (CAPS) program are identified through pest risk assessments conducted by USDA personnel. Federal expertise and assistance is needed to aid in the identification of potential pest organisms of foreign origin, and the pathways they may exploit in entering the country or State. USDA and DHS maintain a variety of databases that identify importers, pest interceptions at ports of entry, smuggling, interdiction and trade compliance violations, and "hot zone" data that can be used to direct and guide state cooperators with respect to invasive species surveillance and detection. Coordination and the cooperation of adjacent states can assist in determining pest risks and important pest targets. Programs of domestic surveillance may identify weaknesses in foreign agricultural certification programs and provide feedback to federal agencies charged with pest exclusion responsibilities. A comprehensive understanding of the federal process is critical to the development of a statewide strategy for invasive pest management.

Another key step in an effective invasive species program is the selection and prioritizing of: 1) invasive species of concern for prevention and/or control; and 2) habitat and regions of New York State that must be preserved and protected from invasion. Risk assessment helps to set priorities by identifying those species that might arrive here (the risk of introduction) and the damage they would likely

cause if they were introduced (the risk of significant damage). Species that have a high risk of appearing in New York and a high risk of causing widespread, significant damage if they do, require a higher priority for prevention or control (if already here) than those with lower risks.

Several risk assessment systems are used nationwide. The U.S. Department of Agriculture and many states regulate plant and pest species that threaten agriculture or other economic interests. In 2003, the California Exotic Pest Plant Council standardized criteria for states to use to categorize invasive non-native plants that threaten wildlands. Another system, the Alien Plants Ranking System 5.1, assesses species at a site scale in grasslands and prairie parks. More recently, a ranking system to evaluate species that threaten biodiversity over a large scale, such as states, regions, or nations, was developed by NatureServe in partnership with The Nature Conservancy and National Park Service. The system was designed to assess, categorize, and list invasive species based on four major aspects of their total impact: ecological impact, current distribution and abundance, trend in distribution and abundance, and management difficulty.

Once prioritization occurs, risk assessment can then be used to develop a list of invasive species that are considered a threat to the State's economy, public health, agriculture or environment. States use a range of listing programs that vary among wildlife, terrestrial plants, aquatic plants, plant pests, and diseases. The listing of species can best be described by two approaches, the development of a "dirty" list or of a "clean" list. A dirty list identifies prohibited, restricted, or regulated invasive species, and a "clean" list identifies species which may be freely imported and proliferated. All other species are considered unlisted and must be pre-screened and approved before introduction or proliferation.

The Environmental Law Institute's 2004 report, "Making a List: Prevention Strategies for Invasive Plants in the Great Lakes States", reveals that each of the Great Lakes states has at least one program that uses a listing approach to regulate undesirable plants. Illinois, Minnesota, and Wisconsin have additional listing programs that specifically target non-native invasive species in order to protect the natural resources of their states. Minnesota uses a four-tier classification system for non-native wildlife and plant species: Prohibited species (unlawful to possess, import, purchase, transport, or introduce except under a permit for disposal, control, research, or education), Regulated (legal to possess, sell, buy, and transport but they may not be introduced into a free-living state), Unregulated (non-native species that are not subject to regulation), Unlisted species (non-native species that are not on the Prohibited, Regulated, or Unregulated lists but must be approved by the state agency before releasing into a free-living state).

Other states have only a two-tier listing system. In Vermont, the Department of Agriculture and Markets adopted a two-class plant quarantine rule: Class A includes species not yet know to occur in Vermont and all species on the federal noxious weed lists; the movement, importation, sale, possession, cultivation, and/or distribution are prohibited; Class B includes species that occur in Vermont

and pose a serious threat to the state; their movement, sale, and/or distribution are prohibited.

Lists are used to classify not only groups of plants and wildlife but also for noxious weed seed or individual invasive species. Such lists can be an effective, relatively easy, and cost efficient front line tool that is often a part of a state's prevention strategy. Lists can also provide information to assist natural resource managers in setting priorities for managing invasive species already established at a site, and for making decisions about plant materials to be used in various projects and the potential consequences of using certain species. Whether or not lists are regulatory, they serve an important role in educating the public, natural resource managers, state agencies and other sectors about species that pose significant threats.

New York State could establish and maintain at least two kinds of lists, neither of which would be regulatory in nature. The purpose of both lists would be to inform management decisions. Clearly, they would be used in developing invasive species programs. Ideally, such lists would also be used by other natural resource conservation efforts. For example, a watershed management plan could rely on these lists to identify needs for invasive species actions within its boundaries. In either instance, they would not serve any regulatory purpose. On the other hand, regulation should be viewed as one of many types of management and should be used wherever it would serve the purposes of invasive species management.

Watch Lists can identify invasives that are not known from New York State - or from a particular watershed or other geographic area within the State - but have the potential to come here and cause harm.

Priority Lists can identify invasives that are known from New York State and are known to cause significant problems. For this list, further distinctions could be made based on such characteristics as the nature and extent of harm, the period of time since invasion, manageability and the like. Both lists should reflect the diverse geography of New York State because the risks and opportunities for any particular species frequently vary within the State. The major watersheds of New York State could provide a useful framework to reflect such differences.

Early detection of an invasive species should trigger a rapid response to eradicate it. Under existing conditions in New York State, this frequently occurs at the expense of other program activities. When more than one species invades at the same time, the necessary concurrent responses quickly eliminate any elasticity within the workforce. One viable approach would be to establish a pool of personnel from a variety of agencies and organizations. The federal government uses this approach to respond to invasions in National Parks. The Park Service is assisted by the Department of Agriculture's Forest Service and Interior's Fish and Wildlife Service. Designated personnel are trained and equipped to act when called upon. The State of Pennsylvania has developed a similar capacity.

A rapid response capacity in New York State would involve several State and federal agencies and potentially some non-government organizations as well. Because of the number agencies and their governing statutes, the federal Incident Command System (ICS) provides a model infrastructure for the coordination and order of participants in an invasive species event. The advantages of using Unified Command are: a single set of objectives is developed for the entire incident; a collective approach is used to develop strategies to achieve incident objectives; information flow and coordination are improved among all jurisdictions and agencies involved in the incident; all agencies with responsibility for the incident have an understanding of joint priorities and restrictions; no agency's legal authorities will be compromised or regulated; and the combined efforts of all agencies are optimized as they perform their respective assignments under a single Incident Action Plan. This system was used to very good effect during the recent invasion of Chronic Wasting Disease.

Recommendation

New York State should have a "Comprehensive Plan for Invasive Species Management". Such a plan should address all taxa of invasive species. The Comprehensive Plan should, at a minimum: establish interagency responsibilities; describe coordination among different agencies and organizations; recommend approaches to funding invasive species work; address prevention, early detection and rapid response; identify opportunities for control and restoration, including research needs; and describe effective outreach and education. Responsibilities for different agencies need to be clearly defined and contradictory or conflicting procedures need to be resolved. The Comprehensive Plan should identify needs for additional staff positions at State Agencies. It should also identify needed New York State or federal legislation.

A particular emphasis should be placed on both prevention and early detection and rapid response to prevent future damage. The ability to respond quickly and effectively, especially when leading to eradication (either locally or regionally) of new pest species should be paramount.

The Comprehensive Plan should evaluate and incorporate, as appropriate: the approved New York State Aquatic Nuisance Species Management Plan; the Lake Champlain Basin Aquatic Nuisance Species Management Plan; and the Adirondack Park Aquatic Nuisance Species Management Plan, which is in development.

3. Allocate appropriate resources for invasive species efforts.

Background

Invasive species cause problems across many sectors of society; they are also caused by many societal activities. Commerce, transportation and travel, of course, have direct relationships with the movement of invasive species into and

within New York State. It is appropriate then, that these same activities contribute toward the management of invasive species. Insufficient funding, and especially the lack of "dedicated" funding streams, has been identified by most states as one of the foremost obstacles to effective management.

States continue to be challenged for sufficient funding for invasive species management. Frequently, they use existing resources to manage the problems associated with invasives. Nevertheless, there are many sources of dedicated funding. There is more dedicated funding available for plant problems than for animal problems. Whereas 15 states have dedicated funding for invasive Plant Species and 26 states have dedicated funding for invasive Plant Pests and Disease Management, only four states have dedicated funding for invasive Wildlife Species. In addition, eight states have dedicated funding for invasive Aquatic Species and four states have dedicated funding for invasive Insects.

Assessing the economics of invasive species management can be challenging as the task is linked to a number of variables of which limited information pertaining to the target may be known or available. The ability to respond to a notification of an invasive event requires some degree of infrastructure and support staff. The Executive Council must evaluate the State's collective ability to respond to new emerging invasive species threats while maintaining existing programs of invasive species management. The ISTF conducted a survey of state agencies, authorities and private sector organizations requesting in part information addressing each respondent's authority and funding mechanisms with respect to invasive species management. A more thorough review of the responses received is warranted.

At present agencies, authorities and the private sector appear to employ a variety of techniques to support invasive specie activities. The federal-state cooperative program for the eradication of the Asian Longhorn Beetle has an operational budget of $30 million of which $23 million in federal support originates from USDA's Animal and Plant Health Inspection Service, with $2 million contributed from New York State through the Department of Agriculture and Markets and $5 million from the City of New York's Department of Parks and Recreation. Additional funding from the United States Forest Service and the New York State Department of Environmental Conservation addresses tree replanting and public education.

The 2005 Cooperative Agricultural Pest Survey Program (CAPS) funded through USDA-APHIS to the New York State Department of Agriculture and Markets is $432,000. These funds are allocated for infrastructure development and the early detection of targeted invasive species. The New York State Department of Agriculture and Markets provides a percentage of the time of its 19 Horticultural Inspectors located across the state in pursuit of the CAPS program objectives. The estimated cost of this contribution is $350,000.

The ability to respond beyond the discovery phase (detection) of an emerging pest event may be hindered by the absence of a non-specific or non-dedicated source of funding. The recent discovery of the *Sirex noctilio* in Oswego County has

resulted in a rapid response engaging the resources of federal and state agencies and the land grant college. Initial survey and response activities have cost approximately $100,000. If the situation escalates, continued survey and regulatory response could exceed $500,000. The development of an integrated pest management strategy to address this concern could exceed $1 million. The source of these possible funding scenarios is not known.

A short time ago a federal-state cost sharing formula was published in the *Federal Register* for comment. The Office of Management and the Budget suggested that the states should contribute to the cost of federal-state cooperative programs of pest management and put forth a formula for cost sharing. Many states agreed with the proposal conceptually but stated they did not have the funding necessary to support expensive long term projects at the state level.

At present if a pest emergency is declared by the Secretary of Agriculture, USDA-APHIS may access the Commodity Credit Corporation (CCC) for financial support. Generally CCC funding is available the first two years of a program with the recommendation that APHIS seek to incorporate the expenditure into their annual operating budget with an increase in the state obligation. If APHIS is unsuccessful in this effort a shortfall can result. Any reduction in sustained funding for a longer term program can substantially impact the target date for completion of an eradication effort. For example, a decline in Asian Long-horned Beetle funding in 2003 which resulted in a reduced survey and treatment coverage moved the target date for successful eradication from 2009 to 2019.

It is known that the ability to draw upon available resources may not be sufficient to address the scope and magnitude of a pest problem of unknown proportions. The detection of the ALB in the Greenpoint section of Brooklyn in 1996 resulted in the immediate deployment of state and federal personnel to delimit the infestation. This limited workforce assumed the infestation had been contained within an area of regulation approximately 50 square miles in size. This assumption was in error as the present area under regulation is 132 square miles. Had greater resources been available to federal and state government agencies a more accurate assessment of the area of infestation may have prevented the further spread and distribution of this pest as we presently know it.

The Fiscal Year 05-06 New York State budget included $1 million for invasive species eradication efforts. It is intended as a statewide grant program to match projects by local governments and not-for-profit organizations.

Funding decisions for invasive species management programs must consider the long-term outlook. Frequent injections of small quantities of funds targeted toward controlling a species can result in short-term gains but more expense in the long-term. On the other hand, permanent management efforts such as biocontrol could require a single, albeit larger, initial investment in program costs but yield sustained benefits. For example, developing Purple Loosestrife biocontrol has cost about $1 million. Once up and running, though, the benefits are perpetual. Compare this one-time investment with numerous less costly programs that

require continuous maintenance funding; the latter is much more expensive. For example, the control of Water Chestnut on Lake Champlain in 2000 cost $500,000 for the state of Vermont alone; this is an annual cost with no hope of permanent control of the species. While not every species may be controlled with biocontrol, funding should support the development and teaching of all options. The integration of different management techniques will offer a larger "toolbox" for managers to deal with invasive species problems.

Some potential sources of revenue that have been suggested for New York State include the following: fees on importing and exporting at New York State ports of entry; recreational fees for use of boats and boat launches, trailheads, parking lots, and the like; the Environmental Protection Fund; fees on horticultural and aquarium sales, or recreational equipment; and State general funds. The State of Maine requires annual "Lake and River Protection" stickers for all motorboats and personal watercraft at a fee of $10 for residents and $20 for nonresidents. Revenues are used for management of aquatic invasive species.

No one entity can provide the funding or staff resources to meet the invasive species program needs. Strategies that explore opportunities for public-private partnerships are most likely to succeed. Implementation of the recommendations in this Report does not require an expansion in State government programs *per se*. Rather, many of the recommendations could be implemented through leveraging the efforts of stakeholders, with the assistance of contracts and/or grants. Invasive species programs could be implemented through non-governmental organizations, academia, and industry. The primary role of New York State government could be to ensure coordination of efforts and to allocate resources where they will be most effectively used.

The appropriate resources are critical to all allocation recommendations in this Report, but are particularly important for Recommendation 1, creating a permanent coordinating body, and Recommendation 2, preparing a comprehensive plan. Some components of a comprehensive invasive species management system, such as the preparation of a comprehensive plan and an information management system, could be best accomplished through the contract process. Other components, such as education and outreach, research and management activities, are probably best served by a competitive grants program. As a long-term goal for such efforts, $10 million per year has been suggested as a reasonable level of support from New York State. This total could reflect new funding - including from Federal sources - or the redirection of existing resources.

Staff are needed to implement many of the Recommendations. Estimates range from five to eight permanent staff, with numerous opportunities to use interns as well. Annual costs for personal service and related expenses such as travel, supplies and equipment are estimated between $450,000 and $800,000.

Recommendation

Adequate funding should be allocated to invasive species management activities, including: coordination; prevention; eradication; control and management, including research; and public education. In the near-term, sufficient staff should be allocated to invasive species management. The development of a comprehensive plan should begin as soon as possible but should not delay on-going efforts that are of obvious value.

4. Establish a comprehensive education and outreach effort.

Background

The public must begin to understand the nature of the invasive species problem, the significance of the impacts, and how human activities contribute to proliferation of the problem. It is difficult to rally support beyond those who are close to the issue when the core of the public is unaware of the issue. Consequently, a public education and awareness campaign is a critical component in a strategy for dealing with invasive species.

Many existing invasive species management programs have educational components. Such efforts include informational materials like brochures, identification cards, and stickers, and also websites like Sea Grant's Aquatic Nuisance Species Clearinghouse. They also include technical training for volunteers, especially in identification of invasives.

Education and outreach can be accomplished through a variety of approaches. Public schools, websites, list serves, the conventional communications media, workshops, educational materials, and in-person presentations can all sensitize the public and elected representatives to the invasive species issue. Furthermore, New York State has ample opportunity to inform the traveling public via the Thruway Authority and the Canal Corporation. The Thruway Authority, for example, has 27 service areas across New York State that are visited by many thousands of travelers daily. The Canal Corporation has 57 locks used by boaters throughout the canal season. Large public events like the New York State Fair, boat shows, sport shows, agricultural field days, aquaria, and the like, can reach out to large audiences.

Volunteers can have tremendous impact on the outcome of a local invasive species problem and must be considered in any success strategy. It is important to recognize that a volunteer workforce will function in proportion to the amount of training and support provided by lead agencies. Organization and guidance are of critical importance. The identification of priority species and instructional information about survey, detection and record keeping can exponentially enhance federal and State efforts to detect and record the presence of invasives at a minimal cost.

An "Adopt a Species" program, similar to "Adopt a Highway" could be especially useful in initiating inventory and management efforts. Invasive species education

and policies should be integrated into all existing and relevant New York State programs. For example, modules about invasive species could be added to training for licensed pesticide applicators. Similar opportunities exist to educate recreational boaters when registering boats, or when participating in boating safety training.

Clearly, our future generations and future stewards of New York State's natural resources could be taught about invasive species. Our public schools could become involved through funds to support materials, workshops, in-service teacher training and other opportunities.

Part of public awareness and outreach may involve the holding of a conference or symposium to draw in expertise from the northeast to share knowledge and concerns about invasive species.

Recommendation

New York State should develop a comprehensive outreach and education program for invasive species. It should do so by coordinating existing efforts but also exploiting opportunities to incorporate invasive species messages into the full variety of educational opportunities.

5. Integrate databases and information clearinghouses.

Background

Management of any problem, of course, relies upon accurate and reliable information. A principal reason to organize information into databases is to enable users to ask questions - and then to have the questions answered in a complete and thorough way. With respect to invasive species, the geographic location of occurrences is often the most critical. There are numerous existing databases, including federal databases, that contain information about invasive species in New York State, but there is no single database that contains all of this information. There is other information, especially about species biology and management, that is better managed through clearinghouses. Invasive species managers for all taxa need ready access to all of this information. It would be especially useful if it were available from a single source. And, because the information base about invasive species is growing continually, it should be current.

The Invasive Plant Council of New York State has begun the creation of an Invasive Plant Database. The goal of this effort is to provide reliable information about the distribution and management of invasive plants throughout New York and its bordering states and provinces. It is intended to serve as a clearinghouse for information on invasive plants species. Current and reliable information is integral to managing invasive species. Good data are necessary for prevention, early detection, and assessment.

The centralized database would house location information for invasive plants in New York State. It will be displayed in a geographic information system (GIS) format to allow for easy visualization of the data. Similar information from neighboring states and provinces will also be depicted. The geographic information system would be able to analyze the data spatially and temporally so that rates of spread can be predicted.

In its role as clearinghouse, the Invasive Plant Database would include contact information for professionals who work with invasive plants in New York as well as links to technical information about management strategies. Resource managers will be able to contact each other directly and thus share information first-hand. Of the many uses of this database, it will certainly provide a basis for developing lists or otherwise ranking threats or management options.

Sea Grant's National Aquatic Nuisance Species Clearinghouse is an international library of research, public policy, and outreach education publications pertaining to invasive marine and fresh-water aquatic nuisance species in North America. It is the home of North America's most extensive library of publications related to the spread, biology, impacts and control of zebra mussels. The Clearinghouse is operated by New York Sea Grant, a bipartite research, education and technology transfer program of Cornell University and the State. The Clearinghouse is funded by the National Oceanic and Atmospheric Administration and is located on the campus of State University of New York at Brockport.

Recommendation

New York State should establish a state-wide database clearinghouse for all taxa of invasive species that incorporates existing data from agencies and organizations in the state, as well as from nearby states, provinces, Canada, and our own federal government. Such a database would provide the aggregate data on-line in a GIS so the information can be easily accessed and visualized and it would also allow users to interactively create their own maps and do their own queries of the database. Location information for invasive plants in neighboring states and provinces and contact information for land managers would be included, as would automated links from the different data sources across the State, to ensure that the most accurate and up-to-date information is in the central database. Ideally, the database would incorporate data from different agencies and organizations seamlessly from whatever database is being used at the local level.

6. Convene a regular invasive species conference.

Background

The invasive species issue, although a serious environmental problem for a long time, is only now beginning to receive widespread public attention and support. Over the last ten or so years, the federal government and most states have begun to marshal efforts and resources to address the invasive species. As with any such

issue, the likelihood of a meaningful response is related to the amount of public attention it receives. If relegated to the "back burner", invasive species management efforts will continue without the needed coordination and resources.

Recommendation

The permanent coordinating body should organize and convene a regular (annual or biennial) invasive species "summit" to focus and maintain attention on New York's comprehensive invasive species program. The conference should attract and include representatives from all stakeholder groups and should cover a broad array of topics. At its inception, it should be integrated with the development of the comprehensive invasive species management plan.

7. Formalize New York State policy and practices on invasive species.

Background

New York State government as it exists today has numerous opportunities to manage invasive species. For example, New York holds title to millions of acres of the State. The Department of Environmental Conservation holds the most land, with about 900,000 acres in State Forest Lands, Wildlife Management Areas, Recreation Areas and public access sites such as parking areas and boat launch sites; the Adirondack and Catskill Forest Preserves comprise almost 3 million more acres. The Office of Parks, Recreation and Historic Preservation has 300,000 acres in over 200 different parks and historic sites. The Thruway Authority and Canal Corporation control lands along 641 miles of superhighway and 524 miles of canals. The Department of Transportation owns the right-of-ways and other facilities along its more than 15,000 miles of roads (and railways, ports and airports). The Office of General Services is responsible for over 850 sites around New York. These agencies conduct management and development activities on much of this land.

In addition to ownership, New York State also exerts some influence over the use of lands held by others. DEC can lead by example at its State Tree Nursery, which produces hundreds of thousands seedlings of tree and shrub seedlings each year. Most of these are offered to private landowners for conservation purposes. Historically, the Nursery has grown species that have proven to be invasive. Also, the Department of Environmental Conservation regulates land use actions on thousands of parcels of private lands each year; a large portion of these actions involve manipulation of the landscape. Examples include permitting activities pursuant to the Freshwater and the Tidal Wetlands Acts and Protection of Waters. Pesticide Applicators are also licensed.

Opportunities exist throughout these agencies to: 1) avoid the use of invasive species in landscaping, habitat restoration, or species management; 2) actively eradicate or control invasive species where practical; and 3) expand the use of native (or at least non-invasive) species of plants and animals.

Recommendation

All State agencies and authorities should take a leadership role in: 1) phasing out uses of invasive species; 2) expanding use of natives; 3) promoting private and local government use of natives as alternatives to invasives; and 4) wherever practical and where consistent with watershed and Weed Management Area Plans, prohibiting and actively eliminating invasives at project sites funded or regulated by New York State. This could be accomplished through such mechanisms as a Governor's Executive Order

8. Establish a center for invasive species research.

Background

Effective control of many invasive species requires research. Because most invasives come from foreign lands, scientific knowledge may be limited or nonexistent. Only original research on biology and control can provide the needed information for many species. While traditional principles of quarantine and control can be implemented to contain or reduce the probability of spread, only applied research can lead to eradication or control. Eradication programs like the Asian Longhorn Beetle suffer from the scarcity of technologies to aid in detection and control.

Nevertheless, much important scientific investigation of invasive species is conducted within New York State. Its many colleges and university study questions about these species that are critical to their management. Cornell University, for example, has developed meaningful biological control for Purple Loosestrife. They have identified Eurasian insect pests that can dramatically reduce the magnitude and effects of Loosestrife invasions. In developing the use of these control agents, they have performed all of the testing necessary to satisfy federal rules on their introduction and they have also developed the techniques to raise sufficient quantities. Cornell's success with such coordinated efforts has been well-demonstrated by the Sea Lamprey control program as well.

While current efforts and expertise are scattered and uncoordinated, the State has enormous resources that could be brought to bear in developing responses and coordinated efforts to new (and old) nuisance species. A model on how to develop a New York State Center for Invasive Species Research can be found in the national Centers for Disease Control and Prevention (CDC). At CDC, human diseases are detected through connections to a monitoring program and a rapid response team is formed to deal with an emerging problem. CDC itself has a network of experts that it can call upon since every case will be unique requiring specialized knowledge. Similarly, a New York State Center for Invasive Species Research could be independent of a State agency and include a consortium of universities and colleges from across New York State which have an interest and expertise in invasive species. Ideally, a Center for Invasive Species Research would be connected to a major research university as a home institution, such as Cornell University with its Land Grant mission and link to New York State's Sea Grant College, its long-term research and outreach interest in invasive species, and its long history of working in outreach and extension through Cornell Cooperative Extension. Many faculty are already involved in research on invasive species at Cornell (and many more at SUNY and private institutions), but because there is no leadership and three-year funding cycles do not foster long-term collaboration, research does not necessarily address the immediate needs for New York State and its stakeholders.

Similarly, the New York State Integrated Pest Management (IPM) Program could serve as a significant resource to federal, state and local representatives in evaluating integrated invasive pest management strategies that could be applied in their control. The NYS IPM program has traditionally funded research,

demonstration, and information transfer of environmentally sound pest management strategies. It may also serve as a primary source of recommendations for federal and state regulatory actions. The IPM program has the ability to reach out to the broad array of expertise on the campus, experiment stations and extension community.

Recommendation

New York State should establish a regional Center for Invasive Species Research to serve the region and the State, stretching from the Great Lakes to the Mid-Atlantic to New England and southeastern Canada. It should be independent and not be under the umbrella or direction of State government; it should be a research arm that closely collaborates with the Invasive Species Task Force and State agencies as well as with other federal and regional entities involved in invasive species management.

9. Coordinate and streamline regulatory processes.

Background

Many environmental regulatory programs have been designed to protect against activities that are presumed to be inherently harmful. These programs were intended to protect against activities that physically disturb the landscape or that kill living things with pesticides or other chemicals. The regulations generally do not reflect the many benefits that can result from such activities when used for different purposes, such as for the restoration of habitats or even ecosystems. And so, as unintended consequences, well-founded efforts to prevent, eradicate, control or otherwise manage invasive species are sometimes stymied by environmental regulatory programs or processes.

One example involves the training required for the licensing of Pesticide Applicators. Currently, land managers wanting to use certain herbicides to control invasive plants on natural areas must undergo the same training as conventional applicators. A module could be developed expressly for "conservation" or "restoration" audiences to more efficiently enable - while still ensuring human and environmental safety - the management or eradication of invasives.

Another example involves the restoration of both tidal and freshwater wetlands invaded by *Phragmites* or other invasive plants. Restoration may involve physical manipulations, changes to water regimes, or applications of herbicides. The regulatory processes could be applied in such a way that these activities - and especially the restoration of wetland benefits - are facilitated and not hindered.

DEC began such streamlining in 2004 for aquatic nuisance vegetation. It did so by taking a comprehensive look at associated issues and ensuring consistent processes across the State. It provided useful information to stakeholders, including technical information for consultants. Similarly, it provided information

to DEC staff to ensure that reviews of permit applications are conducted with a common set of information and assumptions.

Recommendation

New York State should review and, as needed, reform relevant regulatory processes to remove unnecessary impediments to the restoration of invaded ecosystems. Processes should facilitate the efficient application of best management practices.

10. Encourage nonregulatory approaches to prevention.

Background

Voluntary codes offer professional codes of conduct designed to curb the use and distribution of invasive species through self-governance and self-regulation by the groups concerned. The nursery and landscape industry, along with botanical gardens and arboreta, have developed a set of Voluntary Codes of Conduct, also known as the "St. Louis Protocols". This approach has been used successfully to ameliorate other problems but its application to invasive plant threats is novel and innovative. Importantly, the Voluntary Codes of Conduct were developed recognizing that education must accompany all efforts to address the problem and that some future government regulation may perhaps be needed if such efforts prove insufficient. These codes are now being considered for endorsement by the major professional societies and organizations representing each of the groups covered. If endorsed they will be 'tested' and revised as necessary to improve their utility and effectiveness.

Principles (a.k.a. The St. Louis Six)

> Plant introduction should be pursued in a manner that both acknowledges and minimizes unintended harm.
>
> Efforts to address invasive plant species prevention and management should be implemented consistent with national goals or standards, while considering regional differences to the fullest extent possible.
>
> Prevention and early detection are the most cost effective techniques that can be used against invasive plants.
>
> Research, public education and professional training are essential to more fully understanding the invasive plant issue and positively affecting consumer demand, proper plant use, development of non-invasive alternatives, and other solutions.
>
> Individuals from many fields must come together to undertake a broad-based and collaborative effort to address the challenge, including leaders

in horticulture, retail and wholesale nurseries, weed science, ecology, conservation groups, botanical gardens, garden clubs, garden writers, educational institutions, landscape architects, foundations and government.

A successful invasive plant species strategy will make use of all available tools including voluntary codes of conduct, best management practices, and appropriate regulation. Codes of conduct for specific communities of interest are an essential first step in that they encourage voluntary initiative, foster information exchange, and minimize the expense of regulation.

Recommendation

New York State should encourage the broad array of stakeholder industries to develop and or adopt voluntary codes of conduct like the "St. Louis Protocols." The State should explore ways to award some form of official recognition of such efforts.

11. Influence Federal actions to support invasive species prevention, eradication and control.

Background

The federal government plays a major role in many aspects of invasive species management. Especially through funding, research, and regulation, they provide crucial support to states. Their National Invasive Species Council coordinates federal efforts. Federal lead on any concerns that cross political or geographic boundaries, such as ballast water, national or international regulation and guideline will be more effective than local efforts.

For example, it is unlikely that the allocation of additional resources into port inspections will be of any significant benefit. Examination of even two percent of the cargo and passengers entering the United States is a daunting task. It would appear that working in conjunction with our foreign trading partners to perform more intensive phytosanitary inspections at the point of origin may be of greater value and benefit. Using some of the databases available we may be able to target invasive pests with a high probability of transport and establishment. In doing so we might be able to work with agricultural officials from the country of origin in the prevention of hitchhiking pests traveling on a host or commodity. USDA-APHIS-PPQ should be directed to develop an exclusionary strategy based upon existing databases. They should also cooperate with Customs and Border Protection to profile high risk cargo emphasizing pest interceptions and the implementation of stricter phytosanitary requirements for commodities and countries that demonstrate a history of pest detections/interceptions.

The eradication and control of invasive pests constitutes an enormous financial burden. The cost of the Asian Long-horned Beetle Eradication Program in New York State has averaged $13 million annually. Because of a reduction in the federal appropriation in 2003 the timeline for successful eradication was pushed back 9 years at an estimated cost of $117 million. Florida's Citrus Canker Eradication Program has cost more than $600 million in its 10 years of existence. The Emerald Ash Borer eradication program underway in Michigan and Ohio since 2002 has spent about $ 74 million.

The survey, detection and eradication or control of invasive non-indigenous plant pests and diseases will continue to challenge the abilities of USDA-APHIS and state cooperators to secure the necessary funding for the mandated safeguarding of American plant resources. Present funding at the federal level is inadequate to support existing eradication and control initiatives. The major control initiatives directed at Asian Longhorned Beetle, Emerald Ash Borer, Citrus Canker, and Sudden Oak Death are ongoing. All of these are funded with the Emerging Plant Pests budget line item. The funding needed to address these pests and others totals $175 million. In order for eradication efforts to be successful, it is imperative that full, reliable and continuous funding be made available to the partner agencies involved in this process.

Recent increases in federal support for enhanced domestic surveillance through Homeland Security allocation and the Pest Detection Initiative have focused on infrastructure development. Expanding world trade and the threat of bio-terrorism have increased the risk of destructive insects, diseases, nematodes and weeds being introduced into the United States. Improving pest detection and response capabilities to meet the increasing challenges of new pest introductions requires adequate funding. The funding needed to accomplish this totals $100 million.

As mentioned above, taxonomic and diagnostic support - to identify suspected invasive species - is a critical component of early detection. Existing experts and laboratory diagnoses and detections are too few to address the workload generated by the State CAPS programs.

Recommendation

New York State should work with its Congressional Delegation, National Governors Association, Environmental Council of the States, federal agencies, and other bodies to influence federal actions with respect invasives species..

12. Recognize and fund demonstration projects.

Background

Management of invasive species is not a losing battle; there are many opportunities for success. There are numerous programs that exist or are "ready to go" but require only support, especially financial resources. The Weed Management Areas, the Invasive Plant Database, and Cornell's on-going research into bio-control techniques for such widespread species as *Phragmites*, Eurasian Watermilfoil, and Garlic Mustard could provide dramatic advances in invasive species management if supported by New York State.

Recommendation

New York State should begin funding efforts that would clearly demonstrate the possibilities for successful invasive species management. Such demonstration projects should include the full range of activities: prevention; monitoring and detection; information management; eradication and control; applied research; and education and outreach. Funding, whether through competitive grants or other mechanisms, should be aimed at multi-year projects with durations sufficient to generate meaningful results.

* * *

Appendix A - Statutory Language

Chapter 324 of the Laws of New York, 2003

AN ACT creating the New York state invasive species task force Became a law August 5, 2003, with the approval of the Governor. Passed by a majority vote, three-fifths being present. The People of the State of New York, represented in Senate and Assembly, do enact as follows:

§ 1. Legislative intent. The Legislature finds that invasive plant and animal species pose an unacceptable risk to New York State's environment and economy and that this risk is increasing through time as more invasive species become established within the state. The Legislature additionally finds that invasive species are having a detrimental effect upon the state's fresh and tidal wetlands, water bodies and waterways, forests, meadows and grasslands, and other natural communities and systems by out-competing native species, diminishing biological diversity, altering community structure and, in some cases, changing ecosystem processes. Moreover, the Legislature recognizes that the ecological integrity of an increasing number of publicly and privately-owned parks and preserves is being adversely affected by invasive plants and animals, challenging the ability of land management agencies to effectively manage these sites. The Legislature further recognizes that nearly half (forty-six percent; fifty-seven percent of the plants, thirty-nine percent of the animals) of the species on the federal list of endangered species are declining, at least in part, due to invasive species. The Legislature additionally finds that invasive species have an adverse impact on the New York State economy. Particularly affected by these species are the water supply, agricultural, and recreational sectors of the state economy. The economic impact to the national economy has been estimated to be as high as one hundred thirty-seven billion dollars annually.

§ 2. The New York state invasive species task force is hereby established. The role of the task force includes, but is not limited to:

(a) assess the nature, scope and magnitude of the environmental, ecological, agricultural, economic, recreational, and social impacts caused by invasive species in the state;

(b) identify actions taken by members of the task force, state and local governments and the public to: prevent the introduction of invasive species; detect and respond rapidly to and control populations of invasive species in a cost-effective and environmentally sound manner; monitor invasive species populations accurately and reliably; provide for restoration of native species and habitat conditions in ecosystems that have been invaded; conduct research on invasive species and develop technologies to prevent introduction; provide for environmentally sound control of invasive species; promote public education on invasive species; and the means to address invasive species;

(c) prepare a report to the governor and the legislature that provides specific recommendations regarding: existing state laws, regulations, programs, policies, practices, and resources available to prevent the introduction of invasive species; the detection and rapid response to and control of populations of such species in a cost-effective and environmentally sound manner; the monitoring of invasive species populations accurately and reliably; the restoration of native species and

habitat conditions in ecosystems that have been invaded; research on invasive species and development of technologies to prevent introduction and provide for environmentally sound control of invasive species; the promotion of public education on invasive species; and the means to foster greater coordination between state agencies, and the public.

§ 3. The task force shall issue its findings, in the form of a report, no later than November 30, 2005.

§ 4. The task force shall consist of a total of 17 members and shall include the commissioners of environmental conservation, agriculture and markets, transportation, the office of parks, recreation and historic preservation, secretary of state, the chairperson of the New York state thruway authority, the director of the New York state canal corporation, the chairperson of the Adirondack Park agency, and the program manager of the New York natural heritage program, or a designee of such agencies, public authorities or programs. The commissioners of environmental conservation and agriculture and markets shall select the task force's 8 at-large members from each of the following: New York biodiversity research institute, New York state's land grant university, New York sea grant, a statewide organization formed to address invasive species, a statewide land conservation organization, a statewide agricultural organization, a nursery business and a boating organization.

§ 5. The commissioner of agriculture and markets and the commissioner of environmental conservation or their designees shall serve as joint chairs of the task force.

§ 6. The task force may consult with any organization, educational institution, governmental agency, or person including, but not limited to, the United States Department of Agriculture, the United States Coast Guard, the Port Authority of New York and New Jersey, and the National Invasive Species Council.

§ 7. The commissioners of environmental conservation and agriculture and markets may reconvene the task force, with the same or different members, after issuance of the report, to address any invasive species issues.

§ 8. The members of the task force shall serve without compensation, except that at-large members shall be allowed their necessary and actual expenses incurred in the performance of their duties under this act.

§ 9. This act shall take effect immediately.

The Legislature of the STATE OF NEW YORK

Pursuant to the authority vested in us by section 70-b of the Public Officers Law, we hereby jointly certify that this slip copy of this session law was printed under our direction and, in accordance with such section, is entitled to be read into evidence.

JOSEPH L. BRUNO, Temporary President of the Senate
SHELDON SILVER, Speaker of the Assembly

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Appendix B - Contributors

Kim Adams	SUNY-ESF/State Forest Health Extension
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Thomas Marks	Great Lakes Sport Fishing Council
John McLaughlin	Ecological Services Group, NYC Department of Environmental Protection
John Mickelson	Center for International Earth Science Information (CIESIN), Columbia University
Fred Mushacke	Bureau of Marine Resources, NYSDEC
Brad Njaa	Veterinary Medicine, Cornell University
Elizabeth Novak	NYS Thruway Authority/Canal Corporation
Chuck O'Neill	New York Sea Grant, SUNY College Brockport
Nancy Ostman	Cornell University Plantations
Pam Otis	NYS OPRHP
Alpa Pandya	The Nature Conservancy
Bivan Patnaik	U.S. Coast Guard Headquarters
Tim Preddice	Bureau of Habitat, NYSDEC
Steve Radzyminski	Environmental Analysis Bureau, NYSDOT
Lubomira Rydl	APHIS, USDA
Paul Salon	Plant Materials Specialist, USDA-NRCS
Amy Samuels	Water Quality, Cornell Cooperative Extension of Onondaga County
Ed Sander	Great Lakes Fishery Commission
Mike Scheibel	Mashomack Preserve, The Nature Conservancy
Cornelia Schlenk	New York Sea Grant
James Skaley	Ithaca, NY
Karen Snover-Cliff	Plant Pathology, Cornell University
Doug Stang	Bureau of Fisheries, NYSDEC
Jonathan Staples	APHIS, USDA

Rolf Tiedemann	Eagle Lake Property Owners Association
Stephanie Weiss	Save the River
Tim Wenskus	Forester, NYC Parks and Recreation - Natural Resources Group
Lori Williams	National Invasive Species Council
Karlee Yurek	NYC Soil & Water Conservation District

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Appendix C - Federal Executive Order 13112

By the authority vested in me as President by the Constitution and the laws of the United States of America, including the National Environmental Policy Act of 1969, as amended (42 U.S.C. 4321 *et seq*.), Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990, as amended (16 U.S.C. 4701 *et seq*.), Lacey Act, as amended (18 U.S.C. 42), Federal Plant Pest Act (7 U.S.C. 150aa *et seq*.), Federal Noxious Weed Act of 1974, as amended (7 U.S.C. 2801 *et seq*.), Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq*.), and other pertinent statutes, to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause, it is ordered as follows:

Section 1. Definitions.

(a) "Alien species" means, with respect to a particular ecosystem, any species, including its seeds, eggs, spores, or other biological material capable of propagating that species, that is not native to that ecosystem.
(b) "Control" means, as appropriate, eradicating, suppressing, reducing, or managing invasive species populations, preventing spread of invasive species from areas where they are present, and taking steps such as restoration of native species and habitats to reduce the effects of invasive species and to prevent further invasions.
(c) "Ecosystem" means the complex of a community of organisms and its environment.
(d) "Federal agency" means an executive department or agency, but does not include independent establishments as defined by 5 U.S.C. 104.
(e) "Introduction" means the intentional or unintentional escape, release, dissemination, or placement of a species into an ecosystem as a result of human activity.
(f) "Invasive species" means an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health.
(g) "Native species" means, with respect to a particular ecosystem, a species that, other than as a result of an introduction, historically occurred or currently occurs in that ecosystem.
(h) "Species" means a group of organisms all of which have a high degree of physical and genetic similarity, generally interbreed only among themselves, and show persistent differences from members of allied groups of organisms.
(i) "Stakeholders" means, but is not limited to, State, tribal, and local government agencies, academic institutions, the scientific community, nongovernmental entities including environmental, agricultural, and conservation organizations, trade groups, commercial interests, and private landowners.

(j) "United States" means the 50 States, the District of Columbia, Puerto Rico, Guam, and all possessions, territories, and the territorial sea of the United States.

Section 2. Federal Agency Duties.

(a) Each Federal agency whose actions may affect the status of invasive species

shall, to the extent practicable and permitted by law,
(1) identify such actions;
(2) subject to the availability of appropriations, and within Administration budgetary limits, use relevant programs and authorities to: (i) prevent the introduction of invasive species; (ii) detect and respond rapidly to and control populations of such species in a cost-effective and environmentally sound manner; (iii) monitor invasive species populations accurately and reliably; (iv) provide for restoration of native species and habitat conditions in ecosystems that have been invaded; (v) conduct research on invasive species and develop technologies to prevent introduction and provide for environmentally sound control of invasive species; and (vi) promote public education on invasive species and the means to address them; and
(3) not authorize, fund, or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species in the United States or elsewhere unless, pursuant to guidelines that it has prescribed, the agency has determined and made public its determination that the benefits of such actions clearly outweigh the potential harm caused by invasive species; and that all feasible and prudent measures to minimize risk of harm will be taken in conjunction with the actions.
(b) Federal agencies shall pursue the duties set forth in this section in consultation with the Invasive Species Council, consistent with the Invasive Species Management Plan and in cooperation with stakeholders, as appropriate, and, as approved by the Department of State, when Federal agencies are working with international organizations and foreign nations.

Section 3. Invasive Species Council.

(a) An Invasive Species Council (Council) is hereby established whose members shall include the Secretary of State, the Secretary of the Treasury, the Secretary of Defense, the Secretary of the Interior, the Secretary of Agriculture, the Secretary of Commerce, the Secretary of Transportation, and the Administrator of the Environmental Protection Agency. The Council shall be Co-Chaired by the Secretary of the Interior, the Secretary of Agriculture, and the Secretary of Commerce. The Council may invite additional Federal agency representatives to be members, including representatives from subcabinet bureaus or offices with significant responsibilities concerning invasive species, and may prescribe special procedures for their participation. The Secretary of the Interior shall, with concurrence of the Co-Chairs, appoint an Executive Director of the Council and shall provide the staff and administrative support for the Council. (b) The Secretary of the Interior shall establish an advisory committee under the Federal Advisory Committee Act, 5 U.S.C. App., to provide information and advice for consideration by the Council, and shall, after consultation with other members of the Council, appoint members of the advisory committee representing stakeholders. Among other things, the advisory committee shall recommend plans and actions at local, tribal, State, regional, and ecosystem-based levels to achieve the goals and objectives of the Management Plan in section 5 of this order. The advisory committee shall act in cooperation with stakeholders and existing organizations addressing invasive species. The Department of the Interior shall

provide the administrative and financial support for the advisory committee.

Section 4. Duties of the Invasive Species Council.

The Invasive Species Council shall provide national leadership regarding invasive species, and shall:
(a) oversee the implementation of this order and see that the Federal agency activities concerning invasive species are coordinated, complementary, cost-efficient, and effective, relying to the extent feasible and appropriate on existing organizations addressing invasive species, such as the Aquatic Nuisance Species Task Force, the Federal Interagency Committee for the Management of Noxious and Exotic Weeds, and the Committee on Environment and Natural Resources;
(b) encourage planning and action at local, tribal, State, regional, and ecosystem-based levels to achieve the goals and objectives of the Management Plan in section 5 of this order, in cooperation with stakeholders and existing organizations addressing invasive species;
(c) develop recommendations for international cooperation in addressing invasive species;
(d) develop, in consultation with the Council on Environmental Quality, guidance to Federal agencies pursuant to the National Environmental Policy Act on prevention and control of invasive species, including the procurement, use, and maintenance of native species as they affect invasive species;
(e) facilitate development of a coordinated network among Federal agencies to document, evaluate, and monitor impacts from invasive species on the economy, the environment, and human health;
(f) facilitate establishment of a coordinated, up-to-date information-sharing system that utilizes, to the greatest extent practicable, the Internet; this system shall facilitate access to and exchange of information concerning invasive species, including, but not limited to, information on distribution and abundance of invasive species; life histories of such species and invasive characteristics; economic, environmental, and human health impacts; management techniques, and laws and programs for management, research, and public education; and
(g) prepare and issue a national Invasive Species Management Plan as set forth in section 5 of this order.

Section 5. Invasive Species Management Plan.

(a) Within 18 months after issuance of this order, the Council shall prepare and issue the first edition of a National Invasive Species Management Plan (Management Plan), which shall detail and recommend performance-oriented goals and objectives and specific measures of success for Federal agency efforts concerning invasive species. The Management Plan shall recommend specific objectives and measures for carrying out each of the Federal agency duties established in section 2(a) of this order and shall set forth steps to be taken by the Council to carry out the duties assigned to it under section 4 of this order. The Management Plan shall be developed through a public process and in consultation with Federal agencies and stakeholders.
(b) The first edition of the Management Plan shall include a review of existing and

prospective approaches and authorities for preventing the introduction and spread of invasive species, including those for identifying pathways by which invasive species are introduced and for minimizing the risk of introductions via those pathways, and shall identify research needs and recommend measures to minimize the risk that introductions will occur. Such recommended measures shall provide for a science-based process to evaluate risks associated with introduction and spread of invasive species and a coordinated and systematic risk-based process to identify, monitor, and interdict pathways that may be involved in the introduction of invasive species. If recommended measures are not authorized by current law, the Council shall develop and recommend to the President through its CoChairs legislative proposals for necessary changes in authority.

(c) The Council shall update the Management Plan biennially and shall concurrently evaluate and report on success in achieving the goals and objectives set forth in the Management Plan. The Management Plan shall identify the personnel, other resources, and additional levels of coordination needed to achieve the Management Plan's identified goals and objectives, and the Council shall provide each edition of the Management Plan and each report on it to the Office of Management and Budget. Within 18 months after measures have been recommended by the Council in any edition of the Management Plan, each Federal agency whose action is required to implement such measures shall either take the action recommended or shall provide the Council with an explanation of why the action is not feasible. The Council shall assess the effectiveness of this order no less than once each 5 years after the order is issued and shall report to the Office of Management and Budget on whether the order should be revised.

Section 6. Judicial Review and Administration.

(a) This order is intended only to improve the internal management of the executive branch and is not intended to create any right, benefit, or trust responsibility, substantive or procedural, enforceable at law or equity by a party against the United States, its agencies, its officers, or any other person.

(b) Executive Order 11987 of May 24, 1977, is hereby revoked.

(c) The requirements of this order do not affect the obligations of Federal agencies under 16 U.S.C. 4713 with respect to ballast water programs.

(d) The requirements of section 2(a)(3) of this order shall not apply to any action of the Department of State or Department of Defense if the Secretary of State or the Secretary of Defense finds that exemption from such requirements is necessary for foreign policy or national security reasons.

WILLIAM J. CLINTON
THE WHITE HOUSE,
February 3, 1999.

Appendix D - Summary of Public Information Meetings

Prepared by Steering Committee

Six public information meetings were held around the State on the evening of August 2, 2005. At each meeting, a formal presentation was followed by an open discussion. The goal was to answer questions from the public regarding the draft final report. Formal comments were not taken during these sessions, rather, attendees were encouraged to make formal comment in writing or via email to DEC by September 14.

Eighty nine members of the public participated including Senator Marcellino. Affiliations included OPRHP, Scenic Hudson, the Mohonk Preserve, Hudson River Sloop Clearwater, The Nature Conservancy, DEC, Lake Champlain Sea Grant, the press, IPCNYS, Onondaga County, Oswego County, lakeshore owner associations such as Schroon Lake, Rainbow Lake, Mt. Arab /Eagle Crag Lake, and the Lake George Association, and several unaffiliated private citizens.

Below are general topic headings with the specific comments.

Developing Lists or Species Included in the Report

Why were genetically-modified organisms (GMO's) not included in the report?

Some indicated they would like a list or top ten.

Education

Are any curricula being developed in NYS?

What is being done to educate industry?

Education and outreach to the general public were favored over conferences and seminars for professionals.

Publications should be written for the common person - simple is good.

NYS needs a newsletter to inform the public about all of the species of concern that are presented in the ISTF powerpoint and report, (eg. Giant hogweed).

It is important to note that taxonomists are becoming a rare breed (eg. Swede midge) and essential to the early detection of new invaders need funding to support this profession.

There should also be training given to Verizon and Niagara Mohawk staff who

take boats to service camps. Staff should have to certify that their boats have not previously been in infected lakes.

Important to have staff dedicated to the invasive species issue to make things happen.

Research

What research has been done to identify how much managing invasive species would save?

Natural Systems

Perhaps invasive species were simply a part of evolution....if we have a catastrophe, there is potential for evolution of invasive species to serve us under these new conditions.

At least one person was skeptical of the whole process as being too large and far gone to have much impact now.

Funding

Additional funding for existing efforts was identified as the greatest need.

Did the ISTF consider funding from sources similar to Maine's boat sticker program? Even kayaks and canoes should pay user fees. NY is so far behind.

What is the cost figure for New York's proposed invasive species program?

Report sounds good, however are resources currently available to implement?

Will private landowners get assistance with controlling invasives (not just advice)?

Private Sector Inclusion

Attendees expressed an interest in the utilization or integration of the private sector into invasive species management. Some attendees indicated they have membership or access to large tracts of land that would be useful to invasive species management.

Regulation

There was very strong support for new restrictions on transport and trafficking of invasive species and suggested that the report have specific language in a recommendation relating to this.

Is there a law preventing the transport of water chestnut and other invaders? There should be a law prohibiting the intentional transport of aquatic plant invaders.

Laws do exist within the DEC but are often intentionally overlooked by Regional staff.

Minnesota has laws and enforces them by establishing road block check points.

VT made it a felony to transport invasive species but it was not enforced, however when they made the transport of invasives a misdemeanor, it was much more enforceable.

The report does have some language that states that laws are needed.

Even though it costs money to put laws in place and to enforce them, it will cost more if we do nothing and must manage infestations in the long run.

The ISTF can look to leadership in VT, eg. rather than blacklisting bait fish, VT green-listed bait appropriate to have, everything else is considered banned until proven acceptable.

Regulations against transport etc. of species are a must; new tighter regulations are needed.

One can still buy aquatic invasives in NYS this should be a “no brainer” that these species should not be permitted to be sold.

Private citizen on Seneca River dealing with water chestnut voiced frustration on who and where to go to for help. Lots of "passing the buck" when seeking help.

Existing Efforts

Lake George has ANS rules and regulations developed by the Lake George Park Commission.

Instead of certifying that boats have not been in infected lakes, they should instead go to wash stations because they may not know if lakes are infested or not.

Did the ISTF look at other states programs as models?

Did the ISTF look at the NYS ANS plan?

MN, VT, and NH are a doing better job than NYS.

Some state agencies can facilitate outreach efforts instead of hindering them eg. DMV has not been cooperative with spread prevention, but Governor could require that they do so.

DOH would not necessarily be a plus on the committee - it was thought they were too much of a bureaucracy.

How strongly will both NYS and federal agencies support initiatives on invasive species control?

Need database and website for all aspects of the invasive species issue including control, general information, etc.

Why not just build on Great Lakes Collaborative that is currently being organized?

Definite Timeline

We applaud what has been done, but it will be essential to put a date and timeline on the recommendations for their implementation, especially for the first 2 recommendations (Task Force continuation/staff, and Statewide Management Plan).

Other Agency Involvement

How were various federal agencies involved with the Task Force and how can we get more of their input and support? This question came from an individual who was a former federal employee and recognized that there were no federal folks at the review session.

Federal input is needed to be able to accomplish objectives on invasive species program.

All federal agencies should be brought up to speed on New York's invasive species issue.

Miscellany

Department of Homeland Security will not have invasive species as a priority.

Inspections of horticulture should establish a paper trail.

General Impressions

Attendees were universally upset that there wasn't a better PR campaign to announce these meetings.

The discussion centered on networking with our federal partners, importance of education and outreach, frustrations from both the public and private sectors, and the need for coordination including development of websites.

In general the commentors supported the need for action and some or all of the *Recommendations*. A couple of the attendees - representing a private nursery - thought this is just more bureacracy and will place more tax burden on citizens.

In sum, all the voices at the session were positive toward the Task Force and recognized that this was an opportunity (an opportunity that has taken a long time to get to the current stage!) that should not be wasted.

Much discussion centered on good communication and involvement with federal partners (including political representatives), the need for education and outreach,

the need to involve the private sector in management and control, and keep the process simple.

Most of the attendees were lake people interested in milfoil, but I was struck by the sense that they were willing to put their parochial views aside and look at the big picture. Very heartening.

* * *

Appendix E - Summary of Public Comments

prepared by the ISTF Steering Committee

In addition to the oral comments received at the six public meetings convened around the State on August 2, we received 73 written comments during the formal comment period that closed on 14 September. The purpose of this document is to summarize those comments and to give a sense of the prevalence with which each one was expressed.

There were many comments commending the effort of the Task Force and thanking the State for recognizing the serious issue of invasive species. Comments were received thanking the Task Force for trying to pull together a more coordinated, effective, state-wide effort, and trying to identify more State support to respond more effectively to invasive species problems in New York. The ISTF was congratulated for meeting the time deadlines and preparing a workable document.

Many commentors felt that these actions are important to protect our public health, agriculture, economic, environmental and recreational resources. One commentor advised that the ISTF should not interpret the lack of attendance at the public meetings as a lack of interest. This commentor asserted that more people would have attended if they had been better advertised and with more notice.

The many comments and suggestions have been paraphrased and placed under standard headings. The first twelve headings are those used in Chapter V, Recommendations, of the Report. Additional headings have been created for ideas that did not readily align with existing recommendation topics.

1. Leadership Structure

a. Need dedicated staff and an organized/coordinated statewide invasive species program. Establishment of necessary infrastructure and operation for prevention, early detection, rapid response, permitting for public/private management actions and control, education and enforcement is critical and requires a commitment of five to seven dedicated staff and dedicated funding.

b. Need a State Leadership/Oversight Council. Other states have found ways to involve a range of public agencies and the public in effective program development and implementation, and maintain public support. Some comments supported recommendation for a permanent leadership structure. Some suggested that this would best be accomplished with specific legislation authorizing such a bureau in DEC. Others urged that the ad hoc teams continue to have a role. And others supported the proposed two tier system.

c. The Adirondack Park Agency should be part of any "Executive Council."

d. ISTF needs to oversee preparation *and implementation* of a plan.

e. Volunteer Participation is important. A number of states have trained volunteer corps which vastly expand invasive species control and management statewide. Any structure should provide for volunteers.

f. Ensure regional collaboration. Regional collaboration is critical to prevention and control of invasive species problems.

g. Include a deadline i.e. "Establish a permanent leadership structure to coordinate invasive species efforts by Nov. of 2006".

h. Clarify reporting structure; Executive Council should replace the ISTF and should have staff to support it.

i. Interstate and international commerce should be represented through Port Authority, Niagara Frontier Transportation Authority, Thousand Islands Bridge Authority.

j. Include utility, extractive and land-disturbing industries.

k. Support the need for strong, coordinated leadership that can develop and aggressively implement #2 (Comprehensive Plan).

l. There must also be a multi-state cooperative effort to detect and control invasive species.

m. Partnerships with public, private, and non-profit organizations for control efforts.

n. The recommendations provided in this report must be implemented, especially those focused on a comprehensive, coordinated, and funded invasive species program.

o. A regional collaborative effort should be addressed in Recommendation 1, which calls for the "establishment of a permanent leadership structure to coordinate invasive species efforts." This will occur through the creation of an Executive Council, composed of selected state agencies and

authorities. This recommendation does state that the Executive Council would act as a liaison for regional cooperation; however, it does not identify or call for such a cooperative effort to be undertaken. In order to address this need, we request the inclusion of a statement calling for New York's involvement in a northeast regional Invasive Species Council. This Council will help New York properly plan for the management of invasive species, and better prepare the state for potential future introductions.

2. Comprehensive Plan

a. Need a comprehensive plan to control and eradicate, plan for protection/prevention, and regional and multi-state cooperation. Plan should include an annual budget as well as short-term and long-term action plans. Plan should be created within one year and updated every 3-5 years. Plan should mandate annual or bi-annual report to access success of programs.

b. Strongly support the recommendation to establish a "Comprehensive Plan for Invasive Species Management" (pg 80) as described. The Task Force should also evaluate if the establishment of coordinated regional plans could be accomplished more quickly.

c. All public agencies should be coordinated in the structure and response so that they spend their invasive species resources toward common invasive species goals.

d. Should include coordination with other countries with more experience with particular invasive species such as the UK for Japanese knotweed.

e. Need to include budgets and long-term funding suggestions.

f. Need a more specific timeline. Some urge adoption of a more precise timeline for implementation of ISTF recommendations.

g. This recommendation should include a deadline for the completion of the plan. i.e. "Prepare and implement a comprehensive invasive species management plan by Nov. of 2007".

h. Needs timelines with clearly-defined goals. Incorporate and implement the draft ANS Plan. List areas most important to protect.

i. Need to identify responsibilities of various agencies.

j. There is an opportunity for NY to be a "gatekeeper" to protect much of the United States.

k. Need to incorporate the Adirondack Park Aquatic Nuisance Species Management Plan. This plan should be recognized and supported by the

ISTF final report.

l. Incorporate local plans into Statewide CP.

m. Description of plan should put greater emphasis on early detection and rapid response.

n. Need to prioritize places to protect. Sensitive habitat not inundated with invasives needs protection first. Some commented that the Adirondack Park must be listed as a priority area for invasive species prevention, mitigation and public education. The Forest Preserve needs special attention and a plan for constant monitoring. Need a focus on prevention in the Adirondacks, and other areas of sensitive habitat. Many of the waters in the Adirondack Park are the last place in New York not overrun by Eurasian Watermilfoil (EWM). Examples: Adirondack Park; Constitution Marsh in the Hudson River Estuary.

o. Planning should recognize state's regional differences. A statewide plan should recognize/include regional plans that recognize differences around the state.

p. High resource value areas in NYS should include Iroquois NWR, Montezuma NWR, and Long Island NWR. USFWS wants to collaborate with private and public partners on IS management.

q. All the Important Bird Areas in New York that are impacted by invasive species should be included on Priority Lists for restoration activities.

r. Need to propose lists of specific species. Although Ag & Mkts Commissioner has the authority, no formal noxious weed list has been established, and one should be. Although DEC Commissioner can under current law declare a weed a pest, that is for purposes of outlining pesticide use. While the plan describes different types of lists, it fails to recommend or endorse any particular approach. Such a recommendation is needed. Some suggest a 2-tier "Clean/Dirty Watch List" be developed.

s. A list is needed and should be updated regularly (annually); need explicit, measurable goals and objectives; use adaptive resource management.

t. Include a list of invasive aquatics.

u. Need to address lists – e.g. Oriental Bittersweet, Water Chestnut.

v. Develop lists for priority in prevention and control. List areas to be protected.; use habitat type rather than watersheds. Consider NatureServe ranking system and TNC Ecoregional Plans.

w. Wants mute swan on a list of priority invasives.

x. With the development of priority and watch lists, specific attention should be paid to the Minnesota program discussed in the background of Recommendation 2, which developed a four-tiered classification system. This system included strong regulatory language relating to the possession, importation, purchase, transportation, and introduction of non-native plant and wildlife species. New York should implement a similar program for listed species impacting the state, especially as the sale of many non-native invasive species occurs throughout the state today.

y. Need to ensure the availability of good quality native plants for use in landscaping.

z. Should include discussion of counter-effective control practices for E. water milfoil such as mechanical harvesting.

aa. Should include more emphasis on biocontrols such as larval moth *Acentria ephemerella*.

bb. Magnitude of risk associated with invasive species is grossly understated (Federal Reg 1999).

cc. Plan should call for risk assessment in establishing priorities. Rather than using Incident Command System, should use "environmental management system".

dd. Arrival Rate is underestimated and should reference APHIS AQIM monitoring protocol.

ee. Prepare and implement a comprehensive invasive species management plan.

ff. Concerned with ISTF "species-by-species" approach. Fine for agriculture and terrestrial invaders, but not endorsed approach for prevention of aquatic invaders.

gg. Establish a preventive "vector" approach and avoid not only the identified high-risk invasive species, but also prevent unknown species.

hh. Focus realistic control efforts to specified outcomes.

3. Staffing & Funding

a. Need dedicated, sustained (long term) funding. Need to quantify in the report the amount of dedicated funding needed to run a comprehensive program and implement the recommendation of the ISTF report. Many recommend at least $10 million annually (for core staffing needs, coordination and grant programs). It was commented that the report makes only general suggestions about possible sources of funding. Some suggested that specific funding sources not just be discussed, but

recommended, including:

i. Boat Registration fee dedicated to invasives (Maine example).
ii. Dedicated funds from the EPF – but not for Agency staff.

b. Funding should support the development and teaching of all (management) options. Some commented the plan needed to include this statement.

c. $250,000 annually should be provided for the State's existing and proposed Weed Management Areas (WMAs). Comments suggested this funding for Long Island WMA, Adirondack Park Invasive Plant Program, and Eastern Lake Ontario WMA, plus new WMAs in the Fingerlakes, Lower Hudson Valley and Catskill regions.

d. Follow-through of the recommendations is extremely important. "The economic and environmental cost of doing nothing would be astronomical."

e. Need more explicit detail on funding objectives, goals and priorities and dedication of annual funding for prevention and EDRR (Early Detection and Rapid Response)..

f. Fees will increase awareness and should be collected and fully restricted to invasive species issues and control.

g. The commitment to a dedicated funding source of $10 million could help ensure the implementation of the Task Force recommendations.

h. Dedicated, ongoing funding has to be acquired immediately. Invasives wait for no man! Fees for every boat used in the Forest Preserve would be a start and if dedicated to aquatic problems, I suspect not many owners would object. Perhaps a voluntary fee for various uses would get people more aware of the problems, including for non-motorized boats such as mine.

i. Fund a co-ordinated program for just the forest preserve (in the Catskills too if leadership can be found). APIPP should be encouraged and supported in every way possible, especially until a statewide program is funded at an adequate level.

j. A recommendation for dedicated and permanent funding and staff must be added. The state should designate an invasive species coordinator whose mission is restricted to invasive species issues. Provide details on increased and/or redirected state agency staffing. $10 million in dedicated annual funding.

k. Land-disturbing industries should contribute, esp. for prevention.

l. Support the National Plant Diagnostic N etwork Regional Centers to ensure the accurate diagnoses needed for effective prevention.

m. Specify funding for demonstration projects. This is the number one problem; $ 10 million/year should allocated. It should support dedicated staff and grants programs like WMAs.

n. Need $10 million/year in Adirondack Park alone. Consider: Boat Registration fees, fishing license fees; Park entrance or parking fees; Public Campsite fees.

o. Dedicated funding and staffing warrant separate heading.

p. At least $10 million of dedicated, continuous funding is needed to initiate an effective program. Consider adding a fee to boat licenses.

q. Specifically articulate support for Federal efforts to prevent aquatic invaders.

r. Adequate funding provided by Federal/State ISC to fund all levels of research, detection, control/eradication efforts, even the private landowner.

s. Successful control requires predictable, long-term funding in implement all phases of the management plan.

t. This report provides a detailed discussion of the critical need for funding invasive species programs, however, the specific recommendation set forth in Recommendation 3 does not quantify how much funding is needed for implementation, or detail the source of the funding. This information must be included in this recommendation to properly guide the Legislature and Governor in creating a dedicated and sustained funding program. As the report states, "fluctuations in funding have had a dramatic impact on the timeline for eradication." Without specific recommendations to the level of funding, we can only expect that problems will continue to grow. Specifically, we suggest an initial commitment of at least $10 million annually, for core staffing needs and necessary program funding, to begin implementing a successful invasive species program. Many of the potential sources of funding described in this recommendation will help to provide the necessary funds. Fee increases, such as the Maine "Lake and River Protection" sticker example, should be explored in more detail in the specific recommendation.

u. Having a specific category in the Environmental Protection Fund (EPF) will help to ensure a dedicated funding stream for invasive species control efforts. This approach is acceptable as long as it does not come at the expense of other traditional EPF programs.

4. Education & Outreach

a. Public Education/Outreach. Support for recommendation that a comprehensive education program be developed and implemented. All

NYS waterways should have educational signage.

b. Provide greater detail of how this will be done. There could be more specific suggestions regarding education, including aquatic signage.

c. Promote the use of native plants.

d. Develop classroom curricula. Public schools need invasive information.

e. Work with colleges and universities in the State to ensure that Landscape Architect Curricula includes material on invasive plants Some institutions include invasive plants such as Barberry and Burning Bush in their teachings.

f. Promote recruitment of students for taxonomy programs. There is a shortage of taxonomists.

g. Lake Champlain Sea Grant should be included in addition to NY Sea Grant.

h. Do mailings to registered boaters.

i. Include lake and river organizations in outreach efforts.

j. Report should place greater emphasis on costs associated with invasive species.

k. Should distinguish between E. Water milfoil and native, beneficial milfoils and other native macrophytes.

l. Efforts need to reach actual workers involved in earth moving activities and focus on practical solutions such as burning Japanese knotweed stems in metal barrels.

m. Succinctly worded mailings will encourage private property owners to participate.

n. This recommendation is “imperative”.

o. I note that NY doesn't yet have a comprehensive list of invasive plants. I think that is a first step.

p. I believe that in order to be successful in combating invasives, private landowners need to be included and assisted in any way possible.

q. Such an education program should expand its target audience to include the nursery trade, highway departments, park managers, and all other professionals involved in the establishment or maintenance of vegetation.

r. A "comprehensive outreach and educational effort" should include an

integrated approach to develop standardized educational materials targeted for use throughout the NYS educational system.

s. Course material should be developed in standardized formats and made available to primary through advanced educational curriculums in NYS. Existing program materials from NYSDEC, NYS Ag and Markets and other NYS agency sources of invasive species should be used as reference models for reproduction and use in all grade level instructional settings.

t. Educational materials should be developed for each grade level with interactive elements such as modules for invasive plant identification, scouting, reporting alternative species, impacts on native flora and faunal communities.

u. Educational materials and products should be reproduced and disseminated by appropriate non government organizations (NGO), school systems or private sector stakeholders after NYS ISTF and respective agency review.

v. Educational curriculums and class lessons should include hands on instructional exhibits and demonstrations by environmental professionals.

w. Environmental Stewardship opportunities should be developed through public education, environmental organizations, community organizations, NGOs involved in urban environmental quality programs. Stewardship involving 'adopting species', parks, roadways, streams corridors etc. to remove undesirable species where possible.

x. Urban habitats and stream riparian corridors should be priority targets for educational awareness and stewardship program.

y. Urban communities and especially minority youth groups should be targeted for involvement in invasive species awareness and stewardship programs. Invasive plant species (other invasives as appropriate) in urban parks, open space and transportation corridors should be surveyed, mapped and impacts prioritized for development of stewardship programs.

z. Educational research and demonstration projects should be encouraged and monitored to develop invasive species management strategies and methodologies that involve community stewardship.

aa. Use Cooperative Extension in a key role for coordinating information and education efforts.

bb. Use public campgrounds with boat wash stations, inspections, signage and education. Specify dollar amount. Focus message on most threatening (Top 5).

cc. Consider distributing information with boat licenses.

dd. Alert nurseries and retail outlets of invasive plants in NYS Cooperative about training of volunteers and invasive information among all organized groups/clubs and associations appreciation for habitat restoration and use of native species.

ee. Involve all garden centers in consumer educational literature/seminars on invasive species.

ff. Include elementary school science or social studies curricula.

gg. Create invasive species games (DEC Forester George Profous will help on this one.)

hh. Focus on good website connects on the internet.

ii. Develop classroom curricula for the public schools that addresses these issues, starting at the elementary level.

jj. The report is very through in its coverage of the Invasive Species in New York. If the information in the report were incorporated into materials and presentations for the public the Coast Guard Auxiliary stands ready to assist in its distribution.

5. Databases & Information

a. Need integrated databases and a clearinghouse for invasive data and information, and there also needs to be a regional approach as part of this, plus integration with other regional/multi-state and national databases.

b. Need a state-wide inventory of infested and non-infested areas, especially for publicly accessible water bodies.

c. Single entity needed to manage this. The report should identify a recommended single entity that will be the focus point, public point of contact, for this information. It might be the designated research entity (see recommendation #8).

d. Recommend coordination/integration with the National Biological Information Infrastructure (NBII). This is the current best standard.

e. Should include information for all taxa of invasive species from NYS and nearby states and provinces with reference to IPC being only plants.

f. Concern with update of Agricultural databases with shift to Office of Homeland Security.

g. Concerns about quality of data collected by volunteers.

h. New York City watershed grassroots initiatives and their strengths have

not been fully considered or incorporated into the proposed framework. The recommended statewide invasive species database clearinghouse should be fully integrated with other national and regional databases.

i. Databases and information management are very important but require careful design.

j. USFWS is willing to contribute GIS info from NWRs to NYS database.

k. Need for research-based list of invasive species that can be prioritized and monitored.

l. Potential infestation of *Syringa amurensis japonica* in West Lebanon, NY.

m. Utilize the preliminary protocols created by US Fish and Wildlife Service and the National Park Service for database information.

n. It is essential that information exchange use integrated databases for NYS.

6. Conference

a. Some supported this suggestion, some gave it a low priority. The comment giving it a low priority said it would not work well to reach all stakeholders, would really only help researchers, managers and regulators, and would not be the best use of limited funding.

b. Use of a conference does not appear to be realistic.

c. A conference should include a forum for public and local government.

7. Policy & Practices

a. Executive Order. Comments were received in support of an Executive Order, as recommended, to implement recommendations of the ISTF.

b. Executive Order should immediately eliminate some current state practices. Some made the comment that the state should not phase out but should eliminate immediately certain practices with an executive order, such as state sale of invasives.

c. The Federal Executive Order (#13112) might be a good model for NYS.

d. State agencies still seeding and planting non-native plants and known invasive species when native alternatives are available.

e. Phase out the use invasive species and to expand the use of natives as alternatives.

f. It is irrelevant whether or not legislation damages a relationship (p. 22)! DOT should not be allowing road salt to get into wetlands (encouraging *Phragmites*).

g. DEC should do the right thing with non-migratory Canada geese—eliminate them.

h. This recommendation is relatively weak in proposing how policy and practices would indeed become formalized. Recommend an Executive Order requiring all state agencies to cooperate with regional and local invasive species agencies and organizations.

i. DOT and DEC practices encourage invasives; eg planting Norway Maple in Malone along Rt 11; DOT mowing also spreads invasive seeds. DEC stocks mostly non-native fishes; DEC prohibits use of native willows for stream restoration but encourages use of non-native willows.

j. Incorporate information from DOT Environmental Procedures Manual into NYS-regulated activities.

k. Cite DOT successes in raising worker awareness viz. invasive species.

l. Develop a New York State bill regulating ballast discharges (Follow Michigan's lead).

m. Farm Bureau (Albany) will support an executive order entitled "Harmful Species" if it includes "regardless of origin," that "can cause economic or human health harm." They want to replace "invasive species" with harmful species." Farm Bureau (Albany) opposes origin based "invasive species" listings and regulation of game species such as brown trout, rainbow trout, and pheasants.

n. We applaud the Task force for Recommendation 7, requiring agencies to use native plants on all government owned and managed properties. Through this example, other local governments, industries, and citizens will be prompted to adopt the same principles. In this regard, in 2001 Westchester County enacted a Native Planting Executive Order (Appendix B), requiring that only native plants be used on all county owned property. Other counties should be encouraged to follow the example set by Westchester County.

8. Research Center

a. Comments supported this recommendation and urged that more information be gathered about existing research capacity in formal centers as the federal and state level.

b. Cornell was identified by some as an excellent choice for this.

c. Other comments applauded Cornell, but suggested looking first at existing regional and federal centers to use, to save money.

d. Regional Diagnostic Centers need to be accredited to handle "select agent" samples.

9. Regulatory Process

a. Comments supported this recommendation, while some also noted that special laws and regulatory agencies in the Adirondack Park be recommended, especially with regard to policies that would support prevention, early detection, rapid response, management, restoration and management.

b. Comments made that DEC and other agencies approval process (such as for chemical management) should facilitate, not hinder, the efficient application of best management practices.

c. Need clarity/timely permitting processes for use. Concern about negative environmental consequences of some control methods (e.g. SONAR) in the Adirondacks. Some suggested only using pesticides as a last resort.

d. It is worth emphasizing that the necessity to develop a broad consensus of appropriate tidal and freshwater wetland restoration activities among regulatory agencies, conservation professionals and landowners is crucial to reducing the proliferation of invasives as well as improving water quality and ecosystem health.

e. Use Adirondacks as a model for regulatory reform, efficient use of resources, and effective Park-wide control.

f. NYS should provide service re invasive aquatics (EWM), especially technical assistance.

g. Current regulatory process is the "greatest hurdle to rapid response efforts".

h. The invasive species process must involve all regulatory agencies. For example, efforts to remove barberry and loosestrife from natural areas while local garden centers are allowed to sell them or gardeners swap them.

i. Emphasize aquatic herbicides as a necessary management tool.

j. Pesticides should be used as a last resort. While the streamlining of the regulatory process is needed, it cannot come at the expense of the environment as a whole. All management options and practices must be taken into consideration when developing management programs to combat invasive species. However, we strongly encourage the inclusion

of a statement in Recommendation 9 to the effect that "before resorting to chemical treatment methods, all other non-chemical options will be explored."

10. Nonregulatory Approaches

a. Comments supported this, along with support for the St. Louis Protocols.

b. Too much reliance on voluntary controls. As an example, Purple Loosestrife can still be purchased through nursery catalogs.

c. Nurseries could help themselves by promoting species as "non-invasive".

d. Minimally, strong consideration should be given to the recommendation for local and regional Planning and Conservation Boards to prohibit, or at least discourage, the establishment of invasive species from site plans, subdivisions and mitigation plantings.

e. Nursery sales of species like hemlocks need to be trackable. Vermont proved this with the wooly adelgid recently. More legislation... Not just a "close partnership" but laws and penalties.

f. Voluntary codes are well and good, but I see purple loosestrife still being sold as "sterile".

g. Get the word out to trade-associations especially landscape/nursery plants of invasiveness woody trees, shrubs, and vines.

h. Recommendation 10 discusses voluntary approaches that can be taken by the nursery and landscape industry to prevent introduction of invasive plants. These non-regulatory approaches can be very beneficial, and should be promoted, as called for in this recommendation.

11. Federal Actions

a. Comments were received in support of this recommendation.

b. Should stress prevention including elimination of foreign vessel traffic in the St. Lawrence River through establishment of transfer port near Montreal.

c. Need vastly improved federal inspection to intercept introductions that emphasize proactive not reactive approaches.

d. Coast Guard can and should enforce its own existing regulations.

e. Farm Bureau (Albany) opposes further Congressional Action on noxious weeds or invasive species until certain points are addressed:

Full risk assessment conducted by land grant research institutions;

Secretary of Agriculture have discretionary authority determination to list a "new" noxious weed;

Landowners must give explicit written permission to researchers and governmental personnel to enter their property;

Control programs must be properly funded and landowners compensated for their efforts; and

Federal government should have the authority to impose regional quarantines.

12. Demonstration Projects

a. Comments supported this recommendation, but urged that projects funded should have a strong likelihood for success and build on ongoing programs across New York.

b. Comments supported this as a very high priority, and not listed at the end of the list of recommendations, but perhaps switched with comment #6.

c. The Adirondack Park Invasive Plant Program should be a top priority for this funding.

d. The SONAR demonstration project on Lake George should be funded.

e. Managing Porcelainberry and Bittersweet along state parkways such as the Saw Mill parkway would be a highly visible project to help raise public awareness. Include signs about the work.

f. Demonstration projects should be included as part of research and/or education and outreach.

g. Constitution Marsh Audubon Center on the lower Hudson River, which is impacted by Phragmites and Water Chestnut, is undertaking a restoration project to combat the spread of Phragmites. This five-year demonstration project is studying the effectiveness of different management techniques for controlling the spread of this invasive reed. However, additional funding is needed in order to complete the effort. In this case, many education opportunities exist to promote awareness of invasive species problems and methods to address them. Constitution Marsh should be included as a priority site for restoration and funding.

The following comments contained ideas that did not readily "fit" within the existing 12 Recommendations.

13. Legislation & Enforcement

a. Comments were made that the ISTF report should be clearer on recommending that enforcement of regulations, policies and laws will be critical to success.

b. Some recommended that the ISTF propose that the state regulate the sale of potentially invasive species.

c. Need regulatory approaches to ensure changes in behavior.

d. Needed stronger regulatory/enforcement recommendations.

e. Need *stronger* regulation; not just stream-lined. There should be more specific and more strict penalties for importation, distribution and release of invasive species.

f. Establish new laws to prevent the spread of invasive species.

g. Strengthen current laws.

h. Prohibit sale of Eurasian Watermilfoil.

i. Require registration of canoes and kayaks.

j. Ban *planting* of Burning bush, Norway maple, Bittersweet, Buckthorn, etc. in new housing developments.

k. Add regulations for Canada Goose.

l. Some non-native invasive plants should not be sold in retail stores/nurseries.

m. Revise Baitfish regulations. Use Vermont's as a model. Have a "green" list (OK species) and a "black" list.

n. Feral cat colonies are also a problem. Mandate cat licensing.

o. Need comprehensive legislation because NY Invasive Laws are not unified. Various laws exist with regards to different invasive/pest issues, but there is no comprehensive legislation. Legislation is needed to: unify existing laws; implement some of the ISTF recommendations; acknowledge invasive problem; and address lists (see comments on lists).

p. Need specific legislation to protect I-87 Adirondack Northway corridor from invasives carried by vehicles transporting lumber.

q. Need legislation that will require "Testing Protocol for any Ocean Going Vessel Entering U. S. Waters". This would require testing for presence of chlorine concentration at port or estuary of entry of ballast prior to discharge with penalties for non-compliance.

r. Some institutions are at fault, and this document is too politic to be firm in what needs to happen. Nurseries need to be *prohibited* from selling plants that are invasive in their area or may harbor pathogens or destructive insects.

s. I have seen the impact of several horticultural "mainstays", including Norway Maple, burning bush and Japanese barberry, on our natural woodlands, and feel it is necessary to follow Massachussetts' lead in halting the use of these plants, among others, in the horticulture trade.

t. I also believe that nurserymen will not willingly stop growing and promoting such invasive plants as Norway maple and burning bush, when the public demand is so strong. Legislation is probably the only way.

u. "Expertise from outside the country cannot be utilized as the basis for a regulatory action." Doesn't new legislation have to remedy this roadblock?

v. We need legislation to permit access to private property to look for dangerous organisms (such as beetles—maybe not for plants, which do not fly to their next victim).

w. Emptying bait buckets and live wells in public waters need to be banned.

x. Legislation needs to address the spreading of invasives, not just trafficking in them.

y. The ISTF report should be clearer on recommending that enforcement of regulations, policies and laws will be critical to success.

z. The State should regulate the sale of potentially invasive species.

aa. More than 180 invasive species in the Great Lakes; the Coast Guard's NOBOB ("No ballast on board") does not resolve the problem. Invasive species anywhere in Great Lakes are a problem for New York.

bb. Need regulations preventing the sale and planting of non-natives; existing regulations should be enforced. Nurseries need a list of "disallowed" species.

cc. Regulate other industries that use plants or spread soil on equipment: oil and gas (at well sites); logging, farming, development. Could also use BMPs, voluntary incentives.

dd. Non-regulatory approaches are insufficient; use Federal Noxious Weed Act as a model.

ee. Consider Massachusetts approach to prohibiting the importation and sale of invasive plants.

ff. NYS should consider regulating transportation of ballast water through its waters. NYS should consider requiring proof of adequate insurance by vessels.

gg. Consider laws in Maine, Vermont, New Hampshire, Florida, Texas, Washington.

hh. Review "Invasive Plants in New York State: Options and Recommendations for Legislation and Policy", by Blossey and Evanhoe, 2003.

ii. Regulate the sale of potentially invasive species. Many species of non-native plants and animals are sold today in the State. In several instances, many of the most noxious invasive species were once, or are still, sold in the State, such as purple loosestrife and the snakehead fish.

14. Prevention

a. The report focuses on management of existing invasive problems but should also detail measures needed to prevent introduction of new invasives, especially to areas not yet infested.

b. Prevent Water Chestnut from expanding into Oneida Lake.

c. A more proactive approach in 2000 could have prevented in the Great Lakes and with Chronic Wasting Disease if adequate staffing and monetary resources were allocated (by DEC).

d. Should add reference to $1.9 million, 3 year, six agency NOBOB (No Ballast on board) report which determined that greater than 75% of vessels claiming no ballast actually have residue that is discharged throughout great lakes as shipments are off-loaded and loaded.

e. Too much emphasis on prevention as opposed to continuing spread.

f. Include a Rapid Response Strike Force.

g. The Draft Report's emphasis on early detection and rapid response, although strong and consistent throughout, could use even stronger emphasis. More discussion and emphasis required on the role of the "polluter" and their responsibilities in detection, compensation and restoration.

15. Natural Systems

a. This topic deserves more attention and should be explained and treated as a separate category.

b. Report slanted towards agriculture and forestry as opposed to ecology.

c. Need more attention on coastal systems and anthropomorphic interruption of natural processes such as disruption of currents and natural sediment transfer by jetties.

d. The native species and habitat restoration aspect was not dealt with in sufficient detail and none of the 12 recommended actions deals with

restoration. Discussion of restoration should be expanded and restoration should be included in the list of recommended actions. We are concerned that the special circumstances of invasions into natural (and semi-natural) systems need to be explained and treated as a somewhat separate category.

16. Definition

a. The use of the federal definition was understood, but it was suggested that this could be improved on. Terms used need to be carefully defined to avoid confusing the definition.

b. CWD is a prion, not a species, so should not be considered an invasive species.

c. Suggest a more scientifically-based definition, to acknowledge that sub-specific categories can be critical in understanding and characterizing invasive taxa. "Invasive species are non-native species that can cause harm to the environment or to human health."

17. Miscellany

a. Build a group of volunteers to help; it could be similar to “Vine Cutters” in Westchester. Involve Americorps.

b. The more specific and ambitious the recommendations are now, the more effective future management efforts might be.

c. Confusing, choppy, use of examples is overdone.

d. “Linking Girls to the Land”, a feminist focus is very out of place in the context of the rest of the section and the report as a whole.

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