

**DRAFT — 7/10/00**

**United States Invasive Species  
Draft Management Plan:  
Preparing for the Future**

**National Invasive Species Council  
Washington, DC**

## Foreword

Organisms are moved around for a variety of purposes—to supply food and industrial materials, for example. Almost all of the crops and livestock in the United States originated in other countries, and many of our exotic pets, garden plants, and other living products come from afar.

An increasing number of organisms are arriving unintentionally as hitchhikers with people and products to escape into the environment. Some of these organisms and those that are brought on purpose come with costs as well as benefits. Invasive species are those non-native organisms that harm, or have the potential to harm, the environment, economy, or human health.<sup>1</sup>

In 1993, the Office of Technology Assessment concluded that the number of invasive species and their cumulative impacts are creating a growing burden for the United States. The agency also found that federal policies and programs to protect us from the most harmful invasive species were not adequate. Four years later, more than 500 scientists and natural resource managers from across the country wrote the Administration to express their deep concern about the damage done by invasive species every year. They called for a coordinated federal strategy to prevent the introduction and spread of invasive species.

The President responded with the Invasive Species Executive Order (13112) on February 3, 1999 (Appendix 1). The order established a federal Invasive Species Council and directed the Council to assemble a nonfederal Invasive Species Advisory Committee. The order also required the Council to prepare an invasive species management plan to address coordination and invasive species issues. The Council and Advisory Committee established expert working groups to assist in this task.

This document is the draft of the first national invasive species management plan. It provides the conceptual framework and preliminary recommendations for federal actions to prevent and control the spread of invasive species within the United States and among other countries.

In reading this plan, we hope that you will gain an understanding of current and future challenges posed by invasive species and how federal coordination, statutes, regulations, and programs can be improved to meet those challenges. You will read about strategies for more rapid federal responses and greater accountability when problems do arise. And we hope that you will also identify opportunities for your own involvement in carrying out this plan and improving it over the long term.

We invite you to join us in this important endeavor. Everyone has a stake in its success.

(Council co-chairs)

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<sup>1</sup> The Invasive Species Council and Invasive Species Advisory Committee are currently developing standard terminology and definitions for "invasive species" and related concepts to be incorporated into the final management plan.

## Using this Plan

This draft was developed through an extensive public process that attempted to reach common ground concerning the direction that the federal government should take over the long run. It is a document in the making, and additional public comment will provide insights for the final plan. Public involvement, partnerships, and biennial progress reports will continue to shape future versions of the management plan.

This is not a detailed implementation plan. Rather it provides the framework and concepts for each relevant agency to incorporate into its budget and program planning processes. The second phase of the planning process is to devise an implementation strategy, which will provide details of how federal agencies can best respond to the plan.

This management plan provides an understanding of the broad issues related to invasive species while calling for action to address problems caused primarily by invasive species that will "arrive, survive, and thrive"—that is, those invasive species that will do the most harm. The goal is to reduce the impacts of invasive species and minimize associated economic losses, environmental degradation, and harm to human health.

Previous reports have analyzed the invasive species problem and made numerous recommendations. This plan must do more than just recommend, however. It must move the federal agencies forward to "do the doable." It must build on existing partnerships and pave the way for future collaboration. At the same time, it must be realistic. It must set goals and objectives and outline tasks that will address the most pressing and immediate problems related to invasive species while laying the groundwork for longer term programs.

This draft contains some gaps. For example, the section on federal budgets is not yet complete. The section on federal authorities awaits further analysis by a group of experts in invasive species law. In addition, there will be a summary of major recommendations and detailed actions around pilot projects. These and other gaps are being addressed as the planning process proceeds.

## Organization of the Plan

The management plan is divided into four sections. The first section briefly describes problems associated with invasive species and future trends that will have an impact on the introduction of invasive species.

The second section describes the federal response to date to the challenges presented by invasive species, providing a brief summary of authorities and management approaches and a discussion of gaps in those authorities and approaches.

The Action Plan section presents a vision and the guiding principles that underlie this plan and a series of recommendations for federal agencies that focus on the next few years as well as measures that can be achieved over the longer term. This section includes strategies to reduce the risk of invasive species introductions and identifies research priorities.

The Council Progress and Action section describes the work of the Council to date and actions that the Council will take over the next few years prior to revision of the management plan. It also provides accountability measures that hold the Council responsible for seeing that the plan is carried out.

The recommendations are directed at the federal government's role in invasive species policy, as required by Executive Order 13112. This includes development of working partnerships with state, tribal, local, and international governments; regional compacts; nongovernmental organizations; and the private sector. None of the recommendations should be construed as interfering with state, tribal, and

local governmental authorities and responsibilities.

Many federal and nonfederal experts assisted in developing this draft plan. The Council received able guidance from the Invasive Species Advisory Committee and members of the Council's six nonfederal/federal expert working groups, organized to focus on the following issues related to invasive species: international efforts; communication/education/ outreach; policy/regulation; risk analysis/prevention; management (control and restoration); and research/information/documentation/monitoring.

At public meetings and through written comments, the Council heard from numerous entities such as the National Governors' Association and federal task forces as well as from members of the public. The Council expects that comments at five hearings across the country in July 2000 and during the comment period following announcement of the draft management plan in the *Federal Register* will provide additional insights.

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## **Summary of Recommendations and Pilot Projects**

**PLACEHOLDER**

## I. Invasive Species: The Problem

"There are a lot of bioinvasive hitchhikers from around the globe, and now is the time to take action. The costs to habitats and the economy are racing out of control."

Bruce Babbitt

Secretary of the U.S. Department of the Interior and  
Co-chair of the National Invasive Species Council

Every state and ecosystem in the United States has been adversely affected by invasive species. The resulting economic and environmental costs are high, and some invasive species have negative effects on human health.

Numerous studies have attempted to quantify the costs of damage caused by invasive species. A recent Cornell University study estimated that invasive species—including plants, mammals, birds, amphibians and reptiles, fish, arthropods, and mollusks—cost Americans about \$137 billion every year.

A recent report by the Ecological Society of America notes that invasive species can cause extinctions of native species and completely alter fire regimes, nutrient cycling, hydrology, and energy budgets in native ecosystems. Technical reviews estimate that invasive species are at least partly responsible for the demise of between 35 percent and 46 percent of all species currently listed as endangered and threatened in this country. They have yet to put a price tag on the losses to be incurred by future generations if worldwide genetic diversity is reduced by invasive species.

Conservation experts, who track invasive plant infestations, estimate that invasive plants cover 100 million acres in the United States and are spreading every year across three million additional acres—an area twice the size of Delaware. Up to 4,600 acres of public natural areas are lost daily to invasive plant species.

As invasive plants spread, they displace vegetation that provides valuable forage for livestock and wildlife, eliminate critical habitats, and affect other natural resources (including water) that are important for threatened and endangered wildlife as well as agricultural production.

### **Examples of environmental damage and economic losses caused by invasive species**

- The zebra mussel can clog the water intake pipes in electrical utilities and other industrial plant operations. One paper mill in Escanaba, Michigan, alone reported removing 400 cubic yards of zebra mussels from its intake system at a cost of \$1.4 million.
- A Montana rancher has been fighting leafy spurge on his grazing lands since his father bought the ranch in 1938. As leafy spurge increased its foothold, the value of the rancher's grazing lands decreased. It costs him, thousands of other ranchers and farmers, and—ultimately—consumers of American food products millions of dollars every year to control leafy spurge and other noxious weeds.
- In Brooklyn, New York, neighbors gathered to watch as municipal workers cut down more than 2,000 trees infested with the Asian long-horned beetle. That effort cost \$5 million. Chicago, Illinois, now faces the same threat.
- In California and Florida, hydrilla has overtaken thousands of miles of free-flowing rivers and irrigation canals, making it impossible to paddle a canoe or operate a motor boat on many popular recreation waterways and causing major problems for farmers. State governments spend at least \$100 million every year to control aquatic weeds such as hydrilla and water hyacinth.
- Sea lampreys collapsed lake trout and other Great Lakes fisheries. It costs the United States and Canada \$13 million every year to control this species.
- Brown tree snakes have bitten at least 200 people, caused 1200 electrical outages, and driven most

native birds to extinction on Guam.

**Suggested graphic**— Two-page map of the U.S. that highlights the location of several invasive species. Highlights should be geographically distributed and representative of invasive plant and animal species, both terrestrial and aquatic.

Invasive species can serve as hosts for serious diseases that affect humans. The recent outbreak of West Nile viral encephalitis in New York demonstrates how animals can carry a disease that may be transmitted to humans by insects. The Chinese mitten crab, a newcomer to the San Francisco Bay, is an intermediate host of the oriental lung fluke that affects humans and other mammals, although to date, there is no evidence that the mitten crab invaders are carrying the parasite. A South American strain of cholera was found in ballast water in Alabama in November 1991.

As the use of pesticides and herbicides to control invasive species grows, so does the potential for indirect effects on human health. The Heinz Foundation reported in 1999 that pesticide and herbicide use rose 800 percent during the previous 40 years. Health hazards associated with past applications of DDT are well known, and public concern over the use of pesticides remains high judging from recent malathion campaigns against the medfly in California.

## **Current Situation**

Whether or not most of us realize it, invasive species have a profound effect on our lives. From the introduction of human, animal, and plant pathogens to the negative impacts resulting from the establishment and spread of predatory non-native species and the weeds in our fields, we are all touched by invasive species.

The earliest records of governmental intervention regarding invasive species are from the 14<sup>th</sup> and 15<sup>th</sup> centuries. In 1403, for example, Venice, Italy enacted a ship detention system as a barrier to disease. The word “quarantine” means “forty,” and that was the number of days that a ship’s crew and passengers were compelled to remain on board to ensure that epidemic diseases such as bubonic plague, yellow fever, and cholera were not introduced to the Venetian population.

Protection of domesticated plant and animal resources from invasive species has also been a government concern for some time. In 1875, Europe acted to protect its crops from the North American Colorado potato beetle and the American grape gall-louse. The United States was one of the last major nations to pass laws (first enacted in 1912) to protect against the importation of non-native agricultural pests.

Currently this country has a mix of federal and state laws that cover the importation and distribution of potential invasive species. These laws are generally focused on subsets of invasive species usually defined around which resources are at risk. The general categories include human health, agricultural plant and animal health, ecosystem health, and socio-economic well being.

There is broad recognition that the current U.S. regulatory system for addressing invasive species must become more efficient and cost effective. As the United States becomes more aware of its economic dependence on a global market and the impact that invasive species have in the movement of people, products, and supplies, so too will the role of the nation’s socio-economic well-being become a part of the equation in managing invasive species. World commerce has increased sixfold globally since 1950, and current trends indicate that it will continue to grow. This growth in the world market will underpin economic security and stability of the United States. An unfortunate, but real side affect of this growth will be the increased potential for the unintentional movement of invasive species.



The approach to protecting ecosystem health as it relates to invasive species is fragmented both the regulatory level and from a philosophical point of view. But the issue is real. As pointed out in a recent article in *Science* magazine, invasion by non-native species is one of the four most significant drivers of environmental degradation in both terrestrial and aquatic systems.

The history of past invasions teaches that current agency missions and authorities, based on who or what might be damaged, are artificial and only partly effective. Rarely does an invasive species that causes major environmental damage impact just the environment. Fire ants and gypsy moths are excellent examples. Both are such effective invaders that not only do they affect the environment, they also affect agricultural plant and animal resources, human health, and the socio-economic well being of the public. Other such examples are the invasive weeds that have taken over more than 25 million hectares in western North America and fueled devastating wildfires that damage wildlife habitats, livestock forage, homes, and cultural resources. It is estimated that the zebra mussel will have caused more than \$5 billion in damage to pipes, boat hulls, and other exposed surfaces in the Great Lakes region of North America by the end of 2000. The infrastructure to prevent equally major ecological invaders is not currently in place.

Invasive species care little about politics and human values, and the process of invasion is often extremely complex, resulting in considerable scientific uncertainty. Invasions are facilitated both intentionally and unintentionally by the movement of people, goods, and services. Current land-use practices and climate change also add to the establishment and spread of invasive species.

To prevent the introduction and control the spread of invasive species presents social, scientific, political, and ethical challenges. U.S. laws directed toward invasive species do make a difference, but the problem is still far too onerous to ignore. Immediate, comprehensive, strategic action is needed to ensure the nation's food, public health, and environmental security.

## **Future Trends**

We are changing the world in unprecedented ways. As a consequence, preventing and controlling invasions of non-native species will become an even more challenging task in the future. Some current U.S. policies, as well as those of other countries, actually facilitate the introduction and spread of invasive species. For example, a number of our development assistance programs have introduced species which can become invasive in other parts of the world. Many people in the United States desire to have exotic pets and to be able to shop at their local grocery store for exotic produce harvested from around the globe. Unless we change some of the ways in which we do business and how we live our lives, we face managing invasive species in a world with greater uncertainties and even more significant risks.

## **Social and Economic Changes**

"Every minute, 40,000 gallons of foreign ballast water is dumped into U.S. harbors. This water contains a multitude of non-indigenous organisms which could alter or destroy America's natural marine ecosystems."

James Baker  
Under Secretary, U.S. Department of Commerce

**Commerce: Trade, Tourism and Transport.** As "globalization" of society and the economy continues, the historic boundaries to trade and the movement of species around the world will be further diminished. Commerce markets will continue to expand, moving larger volumes of people, goods, and

services and extending to a greater number of destinations. More species will be moved purposefully in the form of commodities—livestock, nursery stock, produce, and pets. And, more species will be inadvertently relocated as hitchhikers on these commodities or their means of transport.

**Technology.** All major development goals—economic growth, improved human and environmental health, social equality—depend on the ability of countries to adopt and apply advances in science and technology. Unforeseen technological breakthroughs will have profound and unpredictable impacts. Some technologies will enable better prevention of the introduction and spread of invasive species. Other technologies will enable the transport of organisms further and faster than ever before. The Internet is an example of both a "good" and "bad" technology where invasions are concerned. We can quickly share information on the occurrence and biology of invasive species with people all over the world. We could use the Internet to send "invasive alerts" and to mount rapid responses to invasions. However, the Internet has created a very efficient, multiple destination, pathway for invasions. You can buy pets, plants, and other forms of "invadable commerce" off the Internet and have them delivered directly to your front door. Biotechnology is another phenomenon adding an entirely new dimension to our opportunities and challenges. Through genetic modification we might develop strains of crops that are more resistant to invading insects or diseases. However, in cases where genetic modification enhances the invasive qualities of organisms, some argue the altered organisms may out-compete other species at the sites where they were released, spread, and even reproduce with native organisms.

**Wealth.** Trade and technology are not always equitable and can facilitate divisions in economic stature. Trade- and technology-based contributions to the economy will enable many people to demand even more, and often even more exotic, from the market place. An increasing number of people will be able to travel the world, carrying on them and within them a cornucopia of organisms. On the other hand, many developing countries are already, literally, unable to afford the costs of preventing and controlling the spread of invasive species. Developed countries will have to finance a larger share of the "clean" commerce burden to protect themselves. Alternatively, they might decide to direct more of their commerce to countries with policies and programs to prevent the spread of invasive species or that the economic benefits of commerce outweigh the costs incurred from invasion. Either alternative presents additional challenges to developing country environments, economies, and human health.

### **Environmental Changes**

A recent study ranked the five most significant drivers of environmental change on land over the next century. From the most significant to the least, they are changes in land use, climate change, increases in nitrogen deposition, invasions of non-native species, and elevation of carbon dioxide levels. In freshwater systems, invasive species will probably have an even greater impact. All of these factors are interrelated; they are influenced by and influence each other. They are also inescapably intertwined with social and economic patterns and trends.

**Land Use.** The spread of invasive species is primarily driven by changes in the way we use natural resources and the consequent alteration of habitats. As the human population continues to grow and place even greater demands on natural resources, land uses will further intensify and change. Trends in land-use change are apparent globally—increasing urbanization, deforestation, and ecosystem fragmentation, as well as agricultural intensification in some areas, and the abandonment of agricultural land in others. These changes in landscapes will benefit some, but not all, species. Typically, human-induced disturbances of these kinds increase the opportunities for invasion. After all, invasive species can usually tolerate a wide range of conditions and are often particularly adept at colonizing or

expanding their populations after habitat disturbances. Land-use changes can themselves be brought about by the purposeful introduction of non-native organisms—new forage or plantation species, for example. Land-use change thus works in two directions to promote invasive species: it can promote changes in the landscape that increase the opportunities for invasion and it can purposefully bring non-native species into altered ecosystems.

**Climate Change.** An international group of climate experts, known as the Intergovernmental Panel on Climate Change, has concluded that human activities are having a discernible impact on the world's climate. Carbon dioxide and other compounds have been increasing in the atmosphere, primarily through the burning of fossil fuels, thereby contributing to the so-called greenhouse effect. Even a seemingly small rise in temperature can have profound impacts world-wide. Already, major ice shelves are breaking away from Antarctica, the breeding and blooming times of some animals and plants have changed, and the ranges of some species are significantly reduced. The golden toad of Costa Rica's cloud forests is an example of one species that may already have gone extinct as an indirect result of recent warming and related changes in moisture.

It seems highly likely that invasive species are going to have even more opportunities to establish and spread under changing climatic conditions. Changes in temperature, moisture, and seasonality can effectively create new habitats and dramatically modify the relationships among species. For example, predator populations might become decoupled in time and space from prey populations. And, flowers might bloom in the absence of their pollinators. Thus, climate change could open up new opportunities for invasive species. If the native species are no longer adapted to the environmental conditions of their habitat, which species will replace them? Invasive species might be especially capable of taking advantage of these new habitats. It is already apparent that shifts in climate help create conditions that can lead to outbreaks in infectious disease. This is due in part to greater success rates of invasion by non-native pathogens and their hosts.

**Nitrogen Deposition.** Nitrogen levels have significantly risen in the atmosphere as a result of industrial pollution, automobile emissions, and increases in the use of agricultural fertilizers. When this nitrogen is deposited back on the ground it is taken up by plants, enhancing their growth. Especially in naturally nutrient-poor soils, nitrogen deposition can accelerate the spread of fast growing grasses and other species. Elevated levels of nitrogen deposition have already been implicated in the invasion of grassland ecosystems in California and Central Europe.

**Invasive Species.** Invasive species are themselves agents of global change. They can alter the dynamics of ecosystems, force land-use changes, and even influence local and regional climatic conditions. For example, invading trees can transform a grassland into a forest and thus greatly reduce the supply of surface water available for drinking and irrigation. Invading grasses can increase rates of fire disturbances, adding more carbon into the atmosphere, changing a forest into a grassland, and placing private property at greater risks.

**Carbon Dioxide.** The burning of fossil fuels and destruction (especially burning) of forests releases large amounts of carbon dioxide into the atmosphere. This rise in carbon dioxide concentrations directly influences the ability of plants to process light, water, and nutrients (carry out photosynthesis), and thus impacts growth. Increasing carbon dioxide concentrations may enable some plants, particularly annual grasses, to more efficiently use water and extend their ranges into more arid landscapes. Leguminous shrubs might be able to process nitrogen more efficiently and thus grow faster. On the other hand, perennial grasses might perform less well. All other factors aside, increased levels of carbon dioxide are expected to cause annual grasses and legumes to become more invasive, while making

grasslands more susceptible to invasion by other plant species.

## **Responses to Change and Uncertainty**

All of these changes have the potential to influence invasive species at their source, along their pathways, and at their destinations, thus compounding the already substantial uncertainties characteristic of the invasion process. Sources for agricultural products that we now consider pest free may no longer be. Invasion pathways have typically been defined by commerce routes rather than environmental patterns and trends. However, climate-included changes in major weather patterns have the potential to influence the medium and long range dispersal of organisms and their progeny. Successful invasion depends on a number of factors at the site of an organism's ultimate destination; environmental change will influence the establishment, direction and rate of spread, population dynamics, and geographic range of invasive species.

Even with the best projections, the direction and degree of the changes discussed here will be somewhat unpredictable and they may contain yet unrecognized threats. As we enter a world with larger unknowns and greater risks, we need to develop strategies to prevent and control invasive species that clearly recognize that we are managing dynamic landscapes rich in local variability, employ a variety of approaches, promote cautious decision making, conduct experiments and monitor the results, and continually adapt policy and management decisions to reflect the best available information.

## **II. Federal Response**

A range of treaties, multi-lateral agreements, laws and their implementing regulations and policies determine the current scope of invasive species prevention, control, and restoration activities (and their necessary adjuncts—research and technology development, risk analysis, and public outreach and education) in the United States and elsewhere. Protection has historically focused on agricultural production lands, including forest lands, through agricultural quarantines, plant pest interception and direct disease or pathogen control and eradication interventions.

Entry of invasive species is generally detected by federal agency staff (the Animal and Plant Health Inspection Service for plants and insects; U.S. Customs and the Environmental Protection Agency for any living organisms that are intended as pesticides and potentially for organisms having certain consumer and industrial uses; the U.S. Fish and Wildlife Service for wildlife and fish; the U.S. Coast Guard for ballast water; U.S. Customs for general shipments; and the U.S. Postal Service for shipments by mail), state eradication boards, and state or local agency scientists. Use of biological or chemical control agents requires approval by the Environmental Protection Agency.

Lands and waters of mixed production and other uses such as recreation have not received the same attention. Natural areas managed specifically for biodiversity conservation (rare species and habitats) have received the least protection, in part to reduce ancillary impacts from control efforts by chemical spraying or uncertain risks posed by the introduction of other non-native organisms for biological control. But this also occurs because funding is so limited in comparison to the scope and scale of the problem on public lands managed for a diversity of conservation goals.

At least 22 federal agencies and bureaus fund or conduct research on one or more major groups of invasive organisms. The departments of Agriculture, Commerce, and the Interior have the largest programs. Research supports the missions of particular agencies and needs of their public constituencies.

Several existing institutions and databases provide information on invasive species. For example, the Florida Caribbean Science Center of the U.S. Geological Service's Biological Resources Division

has established a useful and developing data base on the Internet for nonindigenous aquatic nuisance species. The Animal and Plant Health Inspection Service maintains a relevant database, and invasive species are included in the fixed-site monitoring network databases under the Forest Service's National Forest Health Monitoring Program and the Natural Resources Conservation Service's National Resources Inventory. Information to support management and control of invasive weeds is provided in the FICMNEW Home Page, the U.S. Army Corps of Engineers' Plant Information System, and the Agricultural Research Service database on biological control agents.

Voluntary efforts, in collaboration with state resource agencies and private landowners, have become more widespread in recent years. These are based upon incentives; for example, state aquatic nuisance species management plans that are eligible for funding support by the Aquatic Nuisance Species Task Force and the National Fish and Wildlife Foundation's Pulling Together Initiative that provides matching grants for local partnerships to control weeds. Other voluntary practices such as certified "weed-free" hay for livestock have been encouraged by policies implemented on some public lands in the West, notably on national forests.

Public health agencies, in cooperation with the Centers for Disease Control and various state wildlife management and environmental protection agencies, lead efforts to control vector-borne diseases such as last summer's West Nile virus outbreaks involving migratory birds.

International cooperative responses to date have focused on U.S. government support of various scientific policy collaborations and support for sectoral and policy efforts. Examples include Global Invasive Species Programme and multi-party voluntary compliance agreements such as the protocol on invasive species developed for North Atlantic States members of the International Council for Exploration of the Seas, as well as U.S. leadership in the International Maritime Organization and bilaterals with countries such as South Africa to strengthen efforts against invasives.

## **Federal authorities**

The following discussion is a preliminary analysis focused largely on the federal government's authority to restrict the intentional importation of invasive species. Analyses of legal authorities relating to unintentional pathways of importation and interstate movement are also necessary, as are examination of the authorities at federal and state levels relating to land and water management. Federal legal counsel will review current authorities to examine which of the proposed recommendations may require supplementary or new authority for implementation. These reviews will be completed for the final draft management plan.

Since the turn of the century and the passage of the Lacey Act, various legal authorities have been established to address invasive species problems (Appendix 2). These regulatory regimes generally fall into three categories: (1) statutes and treaties that restrict importation through trade regulation (and sometimes interstate movement) of intentional introductions or organisms brought into the United States for specific purposes; (2) statutes that address unintentional introductions of organisms as an adjunct to other commercial activity; and (3) environmental legislation for land management (organic acts) and other conservation and natural resources laws that require consideration of risks and cumulative impacts to natural resources and systems, including species at risk of extinction.

Current legal authorities include the Lacey Act; animal quarantine laws, the Plant Protection Act (consolidating the Plant Quarantine Act, the Federal Plant Pest Act, the Federal Seed Act, the Federal Noxious Weed Act and other authorities), the Nonindigenous Aquatic Nuisance Prevention and Control Act, and Executive Order 13112 and the Water Resources Development Act. Although seldom used, legal authority to address specific invasive species problems may be contained in other statutes. These include the National Environmental Policy Act; the Endangered Species Act; the Migratory Bird Treaty

Act; the Coastal Zone Management Act; the Federal Insecticide, Fungicide, and Rodenticide Act; the Toxic Substances Control Act; the Comprehensive Environmental Response, Compensation, and Liability Act; and the Resource Conservation and Recovery Act.

NOTE: More complete tables listing the various existing authorities are attached in Appendix 1, however the analysis is still under development.

Most of these acts were passed to address specific problems and were not intended to respond to invasive species issues generally. Consequently, there are gaps in legal authority, differences in approach, and potential contradictions. In addition, agencies have not fully implemented some of the regulatory authorities that currently exist. In other instances, processes may be so cumbersome as to effectively prevent the use of some regulatory tools.

Executive Order 11987 was replaced by Executive Order 13112, which amplifies upon many of the same requirements.

## **Possible Response Measures**

### **Lack of Coverage of Taxa, Pathways, and Response Measures**

To date, evaluations of the law and policy related to invasive species are incomplete. The following analysis is a preliminary review which will be supplemented by ongoing work of the policy and regulations working group (in consultation with the other working groups) and federal policy analysts and legal counsel.

Currently, federal authority is limited to prevention of importation and control activities on federal lands; not on private lands or lands subject to state wildlife laws. Local government sets the limits on invasive plant management on private lands. Federal public land management authority applies to lands administered by the Fish and Wildlife Service's National Wildlife Refuge System, the National Park Service, the Forest Service, and the Bureau of Land Management.

While invasive plants have been studied extensively and research continues to improve records of vertebrate animals, many invertebrates—including insects—remain largely unstudied. Diseases of forests and agricultural systems have been the objects of research for years, but efforts to identify most invasive species have only recently begun to receive attention. Given the number of species awaiting identification and study, many experts recognize that inventories and risk analysis of pathways or vectors for invasive species are more auspicious approaches. Pathway analysis poses a considerable challenge because indirect effects may be a significant source of invasive species introductions. An example would be the water surrounding tropical fish in transit from overseas. If not disposed of properly, this water could be the source of invasive species. Pathways change rapidly. Internet sales of plants, for example, represent a significant source of heretofore unregulated commercial movement of species. The most appropriate response may not be the traditional method of attempting to inspect each package. Instead, it may be necessary to gain compliance with voluntary trade guidelines implemented through a trade-association certification "green" sales in non-invasive species. This approach could be tailored to specific regional requirements using database and advanced information sharing technologies via the worldwide web.

Many of the challenges to invasive species control relate to assessing new technologies for mitigation or minimization of risks—ballast water treatment by irradiation or chemical means, for example. Thus, various control technologies (methyl bromide poisoning of Asian long-horned beetles at the point of construction of soft wood pallets, for example), if implemented early enough in the pathway

chain of events, may obviate the need for expensive detection technologies at the port of entry or final destination for unpacking and sales distribution. These efforts will depend upon assessment of risks and cost-benefit analysis to ascertain whether simpler liability insurance practices might be a more cost-effective method for some pathways or species groups.

### **Lack of National Coordination**

National and international information systems have not tracked the full range of aquatic and terrestrial species and pathways and lag far behind systems for native species, especially in taxonomic identification capabilities. Such information is particularly necessary for very harmful invasive species and pathways and should be provided on a regional basis, using academic, nongovernmental, and governmental research institutions as the base of operations. Despite the array of institutions now cooperating in data sharing (for example, the Smithsonian Ecological Research Center recently signed an agreement with the Florida Caribbean Science Center to share aquatic species data acquisition and dissemination responsibilities), the information systems in federal, state, tribal, and local government agencies do not communicate efficiently or effectively. Thus, many experts have called for start-up funds to build regional data warehouses that would support the collection and dissemination of pathways, species, prevention, control, and restoration techniques to government professionals and interested citizens fighting invasive species on their lands and waters.

Policy and planning lag behind the rapid increase in the rate of infestations, despite the fact that technology and sharing of talent have made significant breakthroughs. As one example, U.S. Department of Agriculture port inspectors can take a digital photo of an unknown potential plant pest, send it through e-mail to the Smithsonian Institution or other experts, and receive authoritative identification in less time than it takes to bundle the specimen for shipment to the expert's lab. But laws and regulations have not been revised to take advantage of recent comprehensive analyses, including the Office of Technology Assessment's landmark study of "Harmful Non-Indigenous Species" in 1993. That study identified significant gaps in approaches and authorities and focused intensively on policy and planning issues. Few of those recommendations have been acted upon to any measurable degree. Many of the coordination problems identified in that study still retard effective prevention and control actions among the federal agencies and their state and local partners.

### **Legal Issues**

Numerous federal authorities regulate imports of alien species. However, implementation of two major laws—the injurious wildlife provisions of the Lacey Act of 1900 and the Noxious Weed Act—has not proved effective. Implementation of both currently relies on a "dirty list" approach under which imports of species determined to be nuisances by the U.S. Fish and Wildlife Service and the Animal and Plant Health Inspection Service are prohibited, except under limited specific conditions. The burden of proof to prohibit additional species rests with the implementing agencies, and limited funding and technical resources constrain the timely assessment and listing of harmful species. Given the number of potentially harmful species, this approach would be very expensive to carry out fully.

Current regulations implementing these statutes do not require evaluation of the potential invasiveness of all viable organisms intentionally imported. For instance, only a limited number of potentially invasive weed species are precluded from import by the Noxious Weed Act (now subsumed under the Plant Protection Act), and only two species have been listed by regulation. In the last 10 years, only six species have been added to the injurious wildlife list. Continuous and, in many cases,

increasing commercial demand for novel organisms for agriculture, aquaculture, pets, aquariums, natural resource management, and other purposes increases the risk that invasive alien species will be introduced.

The working group convened to examine policy and regulations submitted several recommendations for consideration by the Invasive Species Council and Invasive Species Advisory Committee, some of which are applicable to the issues described later in this plan.

- Evaluate risks from invasive species prior to approval of importation for all intentional introductions.
- Regulate movement of invasive species through pathways where appropriate.
- Assess the threat from Internet sales of invasive species.
- Allow states to enforce the Lacey Act in state courts and allow greater flexibility for local needs to control invasive species in those areas where federal law currently preempts state and local law.
- Identify early and respond quickly to new invasions.
- Respond to widespread invasions.
- Develop and maintain a sound and usable inventory of invasive species.
- Make invasive species databases maintained by various public and private entities more accessible to the public.
- Conduct public education campaigns on invasive species.
- Fund invasive species control work on private lands.
- Restrict federal use of non-native species on federal lands and in federal programs.

A principal priority of the national Invasive Species Council is to undertake a broad review of the implementation of the laws applicable to invasive species to identify a more effective approach for preventing harm as a result of intentional introductions. The Council is also charged to ensure prompt, harmonized implementation of the new approach. Emergency and rapid response authority and appropriations are crucial to coordinated efforts.

It will likely take several years to develop specific programs to phase in the new approach. Substantial additional funding and staff will also be necessary. These costs must be considered in the context of the additional costs required to implement fully the existing laws and the substantial costs of future invasions that will be avoided through implementation of a more effective approach.

### **Lack of International Coordination**

Management of invasive species is a global endeavor. Efforts to restrict invasive species imports to the United States will be aided by attention to the issue in the countries from which these species come. Moreover, import controls in other countries are essential to give real assurances that species native to the United States will not become invasive species elsewhere. Everyone will be better off to the extent that species of global concern can be identified and addressed multilaterally, based upon shared information, mutual management approaches, and voluntary cooperation.

Although the Convention on Biodiversity (CBD) has recently begun to address the issue from an ecological perspective, most international efforts to address it to date have been sectoral, regional, or otherwise limited to specific aspects of the problem. For example, a protocol on invasive species has been developed for North Atlantic States that are members of the International Council for Exploration of the Seas. This protocol has become European Union policy, but it is voluntary. The International Plant Protection Convention (IPPC) established a framework for limiting import of plant pests that can be animals or plants. However, the IPPC does not address harm to animals, and the consideration of environmental harm is not well defined. At its 10th meeting in June 1997, the Conference of the Parties to the Convention on International Trade in Endangered Species



(CITES) considered invasive species management. The United States delegation submitted a statement highlighting the issue and encouraging cooperation between CITES and the Convention on Biological Diversity, a statement that met enthusiastic response. However, CITES is fundamentally limited committed to prevent threats to a species survival caused by international trade in that species. Other international agreements address importation of pathogens that may harm agricultural animals and plants or human health. However, the fact is that imports are occurring and causing great environmental and economic harm in the face of and consistent with these agreements.

The U.S. government is taking an active role in making international cooperation on invasive species more effective. This is being accomplished through existing agreements and organizations and through new agreements. The objectives of such cooperation are currently based on assurances that party countries are aware of the lists and controls that each of them has established and on a forum for finding efficiencies in shared approaches. The IUCN has almost completed a "most wanted" list of species whose introduction are of global concern. What remains to be seen is how such an inventory will be disseminated and updated with new regional information to make its usefulness pertinent to prevention and control activities in hundreds of different countries.

In addition to regulation, the United States is examining investments in development assistance addressing invasive species where this is a primary threat to biodiversity, human health, or economic and social well-being. Attention is focused on the environmental programs of the U.S. Agency for International Development and the State Department and the work of intergovernmental development organizations of which the United States is a member, including the World Bank, InterAmerican Development Bank, Asian Development Bank, Global Environmental Facility, and United Nations Environmental Programme.

### **Congressional Consultation**

Many of the core recommendations of the Council's working groups can be carried out within existing authorities. However, it is clear that Congress could do much to help achieve the goals and objectives in this plan. One basic question is whether it is time for a comprehensive organic statute on invasive alien species. Current statutes deal with pieces of the issue—weeds, wildlife, aquatic species—but not the entire collection of plants, animals, and other life forms wherever they live. An "Invasive Species Act" could maintain and improve existing agency authorities, programs, and responsibilities while adding new authorities and authorizing funding at levels and through mechanisms not currently available. A unified statute could also help to raise the profile of this critically important issue to the level it deserves.

Consultation with Congress is timely, not only because of the importance of this issue but also because it affects diverse economic and environmental interests and finds support with members of the public that are traditionally at loggerheads. The consensus of interested parties is reflected in support from elected representatives across a broad spectrum.

### **III. Action Plan: Conceptual Framework and Preliminary Recommendations**

"This is a unified, all-out battle against unwanted plant and animal visitors that threaten to wreak major economic and environmental havoc."

Dan Glickman  
Secretary of the U.S. Department of Agriculture and  
Co-chair of the National Invasive Species Council

It was apparent as the Council began its work that the federal government lacks a framework upon which to base a strategy to prevent the introduction and spread of invasive species. The Council therefore developed the following vision statement and guiding principles that serve as the foundation of the management plan.

#### **Vision Statement**

Our vision is of a U.S. citizenry and its governments well prepared for and capable of reducing the impacts of invasive species into the future.

To achieve this vision, national invasive species policy should emphasize coordination of federal government resources to prevent the introduction of invasive species and to eradicate or control, through appropriate measures, the spread of invasive species already established in the United States. Federal action should support nonfederal governments, nongovernmental organizations, research institutions, the private sector, and individuals in their efforts to reduce the effects of invasive species. The federal government should also provide leadership on a global scale, in cooperation with other nations, to resolve problems associated with invasive species.

#### **Guiding Principles**

Six principles were developed by the Council, Invasive Species Advisory Committee, and the associated working groups. These principles reflect the values and experience of numerous interested parties and are intended to support efforts to prevent and control the invasion of non-native species at local, state, national, and international levels.

##### **Principle 1. Take action now.**

Many non-native species are not invasive and are used to support human livelihoods or a preferred quality of life. However, many invasive species cause substantial, negative impacts to the environment, economies, and human health.

Invasions by non-native species are a consequence of human activities such as trade, travel, and alteration of the environment. Changes in human values, beliefs, and behavior are necessary to alleviate the introduction and spread of invasive species.

To protect food, health, and the environment requires strategic action now to reduce the impacts of invasive species.

##### **Principle 2. Be cautious and comprehensive.**

Invasions are often unpredictable. Caution is warranted in the intentional and unintentional relocation of all non-native organisms.

An effective management strategy for invasive species integrates information exchange, public education, prevention, early detection, rapid response, scientifically informed control, and restoration.

A comprehensive strategy to prevent the introduction and spread of invasive species addresses intentional, unintentional, authorized, and unauthorized movement of organisms among and within countries.

To be effective, national and international goals and actions relevant to the management of invasive species need to be congruent, integrated, and mutually supportive.

Policies that address the problem of invasive species will be most effective if they are consistently applied (across pathways, means of invasion, and invaders), are comprehensive in scope, and consider all interested parties.

### **Principle 3. Work smart, be adaptive.**

Efforts to manage invasive species are most-effective when they incorporate goals and objectives that are clearly defined and prioritized and when they are (1) proactive rather than reactive; (2) based on current biological, social, and economic information; (3) applied rapidly, even if "perfect" knowledge is lacking; and (4) provide benefits to numerous interested parties and the public at large.

The impacts of invasive species can be significantly reduced if interested parties work cooperatively to: (1) undertake applied, interdisciplinary research, (2) develop and apply technologies to prevent and control invasive species, and (3) incorporate these advances into management and policy decision making.

A system to coordinate and integrate information concerning invasive species is desirable, as is an organized approach to disseminating data and ensuring that management strategies evolve based on new information.

### **Principle 4. Find balance.**

The prevention and management of invasive alien species can support economic growth and sustainable development and should be incorporated into policies to meet these objectives.

Invasive species policies and incentive programs should encourage voluntary cooperation of public agencies, states, and all other interested parties, as well as the public at large. Such measures should be backed with effective enforcement authorities and capabilities.

Control methods should be scientifically, socially, culturally, and ethically acceptable and provide the desired affect on the target organism while minimizing negative impacts on the environment.

### **Principle 5. Pull together.**

Current capacities of the United States to prevent and manage invasive species are fragmented, inefficient, and lack sufficient enforcement. Coordination and an effective regulatory framework are required at the federal level, and a complementary, flexible approach is needed to address the complex, broad needs of people and institutions at state and local levels.

Cooperative relationships among federal, state, tribal, and county governments and other interested parties need to be encouraged and supported to develop and implement an effective invasive species prevention and control program nationwide.

The United States needs to raise the profile of the invasive species issue, provide leadership in the management of invasive species, share information and technologies, and contribute technical assistance to address the problem on a global scale.

### **Principle 6. Be inclusive, meet specific needs.**

Everyone has a stake in the management of invasive alien species and therefore needs to be involved in efforts to address the problem.

Education and outreach programs on invasive alien species will be most effective when they target the information needs and interests of specific audiences, indicate that positive progress can be made, and recommend specific actions.

Public involvement can be expanded by communicating the inter-relationships between invasive alien species and quality of life issues and by delivering a consistent message through a diversity of messengers and media.

## **Council Mission**

Executive Order 13112 challenged the national Invasive Species Council to coordinate federal resources more effectively through development of an overarching, performance-based invasive species strategy. The order charged the Council with the following tasks:

- Oversee implementation of the order, including coordination of federal agency activities concerning invasive species.
- Encourage planning and action at local, tribal, state, regional, and ecosystem-based levels to achieve the goals and objectives of the management plan.
- Develop recommendations for international cooperation to address invasive species.
- Develop guidance for 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.
- Develop a coordinated network among federal agencies to document, evaluate, and monitor the impacts of invasive species on the economy, the environment, and human health.
- Establish a coordinated, up-to-date information-sharing system that uses, to the greatest extent practicable, the Internet.
- Prepare and issue a national invasive species management plan.
- Update the management plan biennially and evaluate and report on success in achieving the goals and objectives of the plan.

The Executive Order also required federal agencies whose "actions may affect the status of invasive species" to identify such actions, consult with the Invasive Species Council, and act consistent with the management plan developed by the Council.

Executive Order 13112 named the secretaries of the Interior, Agriculture, and Commerce departments as co-chairs of the Invasive Species Council. Secretarial designees of the Treasury, State, Defense, and Transportation departments and a representative of the U.S. Environmental Protection Agency comprise membership on the Council, with the concurrence of the other co-chairs, and provide staff and administrative support for the Council.

## **Recommendations**

### **1. FEDERAL COORDINATION**

To date, the response to invasive species problems has been inhibited in part by limited resources and difficulties in coordinating the activities of a number of different federal agencies. A major cause of these shortcomings is lack of overall coordination of federal invasive species programs. In addition, federal budget initiatives for invasive species management are neither comprehensive nor coordinated.

A cross-cutting budget initiative could address this problem in two ways. First, the current funding process is fragmented among agencies and congressional appropriations subcommittees. While one element of a program may receive adequate support, another may not, and the overall effectiveness of a program may be affected.

A unified budget request would help counteract such fragmentation. Second, a unified budget initiative would encourage cooperation and strategic planning among the agencies involved in invasive species issues and avoid duplication of effort.

## **Recommendations**

- 1.1.** Develop a unified federal budget initiative through cooperation of the federal agencies involved in invasive species issues to identify program elements needed for an effective invasive species program and the resources needed to support such a program. Agencies should provide a realistic estimate of the resources needed to perform the tasks so that the Administration has an accurate assessment of what will be required.
- 1.2.** Coordinate invasive species strategies for all federal land management and science agencies, including agencies engaged in international, nonfederal, and private advisory and technical assistance. Measures of progress and success will be based on a demonstrated ability to:
  - Institutionalize coordinated invasive species strategies to provide consistent long-term coordination on all issues of invasive species management and research.
  - Increase training courses and in-service programs to address invasive alien species.

## **2. COMMUNICATIONS, EDUCATION, AND OUTREACH**

“Our natural landscapes are being altered, crops are being damaged, trees and forest are dying or in decline, rangelands are evolving into expanses of invasive plants, and animals and even people are in danger of contracting costly and sometimes fatal diseases. The global economy now means we must be concerned with a global universe of pest and diseases.”

Dan Glickman  
Secretary of the U.S. Department of Agriculture and  
Co-chair of the National Invasive Species Council

No place on earth is immune to threats from invasive species. All segments of society are affected, and all citizens have a stake in stemming these trends. As world travel and trade have increased and modes of transportation have expanded, invasive species have proliferated. Public

awareness of the problem must be raised to enhance citizen support for invasive species programs and to provide people with information on how their individual actions can reduce the spread of invasive species.

Communicating the relationship between invasive species and quality of life issues is key to the success of a comprehensive strategy to prevent the introduction and control the spread of invasive species. Public education and outreach must be an integral component of a national invasive species management strategy and should include public awareness programs on policies, regulations, risk analysis, and prevention as well as methods to extend research findings to target audiences. Effective long-term strategies will depend on the public's understanding and acceptance of the steps needed to protect natural resources from invasive species.

A proactive approach will build on existing communications, education, and outreach programs at the international, federal, nonfederal, and private-sector levels. It will promote and support the development of an infrastructure that facilitates communication, education, and outreach efforts. It will underscore the necessity to disseminate science-based, unbiased information that addresses invasive species problems while considering constituents' priority issues and needs.

Maximum effectiveness of public education and outreach campaigns depends on a long-term commitment of resources and programs, including a formal coordinating structure and people trained to organize, implement, and evaluate the overall effort.

### **Key Elements of a Comprehensive Communications Strategy**

Preventing and reducing the impacts of invasive species requires changing behaviors, values, and beliefs and changing the way decisions are made regarding policy and management actions that address invasive species issues. Recognizing the need to meet this challenge, the call to raise awareness of invasive species issues is repeated in many of the recommendations in this document.

Clearly, a well-developed communication strategy is one of the key elements in a successful management plan. The strategy must be founded on a clear set of practical invasive species management objectives and a well-researched understanding of the needs, apprehensions, and behaviors of the people it hopes to engage in solutions to the problems. Toward that end, an effective communication, education, and outreach strategy must:

- Increase awareness of the impact invasive species have on people's health, safety and quality of life (cost of living, physical comfort, recreational opportunities), their livelihoods, their cultural practices and history, as well as biodiversity and overall economic productivity.
- Inform the public of the linkage between their actions and the spread of invasive species.
- Enhance public support for domestic and international policies and actions that address invasive species problems.
  
- Support and coordinate with existing local, regional, and national communication programs in the government and private sectors. Coordinate with, and complement the communication strategies of other nations and multi-lateral groups addressing this issue.
- Provide critically needed information to decision makers and program managers to support and strengthen efforts that combat invasive species problems.
- Target specific user groups, such as boaters, fishers, plant buyers, and pet owners, about ways to minimize the impacts of their specific activity.
- Provide measurable goals and as necessary, monitor and evaluate the strategy to ensure

- achievement of those goals.
- Establish support through an ongoing, long-term commitment of funding, staffing, and appropriate infrastructure.

### **Challenges of a Comprehensive Strategy**

Current invasive species communications, education, and outreach programs are poorly coordinated and are often not effective in reaching many segments of the population. Although there are many such programs, ranging from local to global, it is unclear which issues are or are not being adequately addressed. There has been no comprehensive assessment of the existing efforts or available resources. It is difficult to get information on how to obtain educational material and what is available.

Communication, education and outreach efforts often rank low in priority for state, federal agencies, and private organizations. Funding for communication programs is often a small percentage of program budgets. When programs are funded, there is little attempt to evaluate its effectiveness. In addition, lack of cooperation between Federal agencies and the private sector contributes to poor dissemination of program material.

Experience has shown that most people do not understand the potential impact of new pest infestations on their lives or the importance of invasive species eradication and control programs. At public hearings and meetings held in conjunction with pest eradication programs throughout the United States, many participants expressed concern over issues such as exposure to chemicals and disruptions or inconvenience in their travel because of inspections at departure or arrival points. Few understand the link between invasive species and the use of pesticides to control them or the necessity to stop invasive species from crossing borders via the movement of people and goods. To educate the traveling public, information needs to be provided in as many locations and as many formats as possible.

### **Responding to the Challenge**

Addressing the threat of invasive species will continually raise new communication challenges. The following recommendations respond to this challenge by encouraging public and private partnerships, and emphasizing strategies that focus on a broad communication approach as well as a focused or “targeted” approach.

#### **Near-term Recommendations**

- 2.1 Conduct an inventory and evaluate existing communications, education, and outreach programs related to invasive species. The inventory should be used to assess the strengths and weaknesses of the programs to make recommendations for maximizing the impact of future campaigns.
- 2.2 Establish guidelines and training for the social marketing of invasive species programs.

#### **Long Term Recommendations**

- 2.3 Develop a national public awareness campaign with emphasis on public/private partnerships and establish a national (and perhaps state and local equivalents) communications, education, and outreach office with ample funding to vigorously carry out this vital function.

- 2.4 Increase training courses and in-service programs to address invasive species issues.
- 2.5 Fund demonstration projects based on information gained from research activities such as rapid assessments, predictive modeling, and remote sensing of invasive species.
- 2.6 Target and disseminate information to the traveling public and associated travel industries, such as travel agencies and tourist boards, about the role that travelers and tourists play in the transport and introduction of invasive species.
- 2.7 Target consumer audiences, such as plant buyers, recreational fishermen, boaters, and aquarium owners, and inform them of the specific problems associated with invasive species and of how they can avoid contributing to the problem.
- 2.8 Encourage the labeling of plants with pertinent non-native species information, essentially identifying the "content" of the product allowing consumers to make informed choices.
- 2.9 Develop local and regional alternative plant substitution lists that assist consumers who choose to replace invasive species with suitable native and/or non-invasive species in their home and garden landscapes.

#### **Additional recommendations**

- 2.10 Expand appropriate science-based K-12 classroom curricula to include invasive species information and encourage states to survey representative elementary and secondary schools periodically to determine which of their classes address invasive species awareness and what percentages of students take those classes.
- 2.11 Develop invasive species curricula and courses for college students seeking degrees in the disciplines of natural resources management, landscape architecture, biology, or agriculture and survey representative colleges and universities to determine what percentages of their biology, ecology, natural resources, landscape architecture, wildlife, and agriculture curricula address invasive species issues.
- 2.12 Develop and implement interagency invasive species awareness programs based on ecoregions.
- 2.13 Develop a web site, with links to other sites, and a list server to promote coordination among communications, education, and outreach campaigns.
- 2.14 Design and implement a communications strategy aimed at policy makers in the legislative and executive branches of federal, state, and local government. Inform them of the enormous conservation, economic, and social costs associated with invasive species and the potential solutions to the problem, and the vital ways in which government policy, or the lack thereof, helps determine success or failure in addressing invasive species problems. Measures for progress and success will be based on:
  - Surveys to determine policy makers' knowledge about and acceptance of the government's critical role in preventing, controlling, and eradicating invasive species.
  - Caucuses on invasive species caucuses at various levels of government.
  - Site visits by policy makers to places where invasive species are a problem and to places where solutions are being implemented.
  - Hearings and briefings for policy makers at all government levels regarding the costs and solutions related to invasive species.
- 2.15 Develop cooperative programs with other governments, international organizations, industry, development assistance and finance sectors in order to raise awareness of the invasive species issue and facilitate the exchange of information on invasive species.
- 2.16 Emphasize best management practices at international meetings and other education/outreach activities by highlighting programs such as South Africa's working for Water Program, in which



- the management of invasive species has also addressed broader social and economic concerns.
- 2.17** Use international agreements to raise awareness of invasive species problems promote cost-effective, practical solutions.
- 2.18** Educate negotiators on the potential ecological and socio-economic impacts of invasive species and ensure that trade agreements adequately address the risks of invasive species.

### **3. PREVENTION**

The first line of defense against invasive species is prevention. There is little argument that the most cost-effective approach to combating invasive species is to keep them from becoming established in the first place.

The movement of invasive species into and throughout this country is, in many ways, a by-product of how U.S. citizens currently live and do business. The introduction of invasive species from a management point of view is two pronged. First, intentionally introduced species are imported on purpose for the pleasure or benefit of the general public or a smaller group. Some of these species, aside from the benefits that they convey, may also have the potential to become invasive. Second, unintentional introductions occur when non-native organisms move with a commodity, conveyance, or person without notice. There are numerous examples of intentional and unintentional introductions of non-native species that demonstrate the need to address both prongs of the invasive species equation.

A risk-based approach is strongly recommended for both intentional and unintentional introductions because it can provide a standardized process to evaluate the risk of invasive species and their pathways. Risk as it relates to invasive species, equals the likelihood of establishment and the degree of adverse consequences if a species does establish. If done properly, risk assessments can provide a framework where scientific, technical, and other relevant information can be organized into a comprehensible format that is useful to managers, decision makers, and other interested individuals.

It is important that the risk assessment process be flexible and dynamic enough to meet the needs of risk managers. As Invasive Species Advisory Committee member Daniel Simberloff stated, “[T]here is a danger of management grinding to a halt if we attempt to exclude, eradicate, and control every alien species. So we have to have some way to rank them in terms of likely impact. Really, we need to be able to do some version of a risk assessment on each, even if it is a very cursory one, in order to know where to put our energies.” Equally important is that the risk process be open to evaluation and developed in concert with the general public.

An array of well-coordinated exclusion tools and methods is necessary for appropriate prevention of invasive species establishments in North American ecosystems. The following are the key elements needed to provide appropriate prevention from invasive species:

- A risk analysis and screening processes for evaluating new proposed intentional non-native introductions (before entry is allowed) and a realistic plan for applying the same processes to currently moving intentional non-native introductions while minimizing the impact on current business ventures (retroactive phase-in period).
- Identification of high risk invasive species pathways and the development of effective technologies and management practices to reduce the movement of invasive species associated with the identified pathways.
- Identification of high risk invasive species which are not currently present in the country and identify likely pathways of entry for mitigation.
- Appropriate and effective International, Federal, and State regulatory coverage, coupled with voluntary industrial and governmental support (codes of conduct).

- Basic research towards understanding the biology of invasive species and ecosystem vulnerability.
- Applied research on detection and interdiction of invasive species moving through natural and man-made pathways.
- Build support from the general public as to the importance that prevention of invasive species plays in their lives. It will only be with the solid support of the general public that the prevention of invasive species will be achieved.

Many of these elements and recommendations related to them are found in other sections of the management plan. They are noted here because of their underlying importance to successful prevention.

### **Recommendations for addressing intentional non-native introductions**

- 3.1 Where clear statutory authority exists agencies should develop a systematic, effective, and efficient clearance/screening processes for evaluation of all new (proposed) non-native organism prior to allowing importation. The clearance/screening processes will have to be tailored to the intended and final use of the proposed introductions (for example, those organisms allowed free unlimited distribution would be screened differently from those allowed only a limited distribution, or those going to zoos and research facilities).
- 3.2 Where clear statutory authority exists agencies should develop a fair and effective phase-in approach for the above screening processes so that they can be applied to those intentionally introduced non-native organisms currently moving in commerce without unfairly restricting those importations that have not been evaluated.
- 3.3 The lead agencies should fund a workshop to help determine the most efficient science-based process for evaluating non-native organisms to ascertain their potential to do damage.

### **Recommendations for addressing unintentional non-native introductions**

- 3.4 The lead agencies should initiate the process of identifying those pathways which have the greatest potential to cause significant ecological and economic impacts by moving invasive species into and around the country. The goal would not only be to grossly identify the major pathways but to micro-identify as specific as possible what portion, or part, of the pathway that truly presents the greatest risk. Emphasis would also be focused on tools and methods which would help identify new emerging pathways. This task would have to be reexamined on a regular bases because of the dynamic nature of pathways associated with the movement of international and domestic commodities and their conveyances (lead agencies: Departments of Agriculture, Commerce (NOAA), the Interior, and Transportation).
- 3.5 The lead agencies should develop effective, realistic, evaluation processes for identifying weak points in high risk pathways in which current effective mitigation measures can be applied.

### **Recommendations for technical solutions to prevention**

- 3.6 The lead agencies should sponsor a workshop to identify scientific research projects that would expand our knowledge of the factors that contribute to the vulnerability of ecosystems to invasion and re-invasion of invasive species. Emphasis would be on how this information would apply to current land, wetland, fresh water, and marine, management practices.
- 3.7 The lead agencies should develop cost-effective measures to effectively mitigate invasive species

from pathways. Efforts should be concentrated on high-priority pathways. Measures would include appropriate technology, policy, and public education.

- 3.8** The lead agencies, in conjunction with the Smithsonian Institute, need to enhance the existing infrastructure surrounding taxonomic expertise. Accurate and rapid identification of potential unintentional invasive species found on commodities and conveyances entering the United States is critical to the success of current and future prevention programs. Not only do current taxonomic capabilities need to be expanded, but new identification tools need to be developed.

### **Recommendations for policy solutions to prevention**

- 3.9** Conduct a round table discussion and workshop on invasive species as vectors for diseases that could harm humans, domestic livestock (including aquaculture), and wildlife populations (lead agency: Department of State. The main emphasis would be to: 1)develop a preliminary directory of the infectious diseases that may be derived from the biological or mechanical vectors, 2) provide an estimate of the level of risk posed to human, domestic livestock (including aquaculture), and wildlife populations, 3) develop recommendations on current or needed intra-governmental mechanisms that could be effective in limiting transmission and scope of infection, containing outbreaks, and treating infected individuals and populations, 4)develop a list of non-native organisms most likely to be biological or mechanical vectors of highly infectious diseases, 5) propose inter-governmental mechanisms to limit the risk of spread of high-risk pathogens, 6) develop an interagency process to inform and address the Department of State of ongoing domestic action, 7) develop an inventory of potential pathways by which pathogens may enter human, domestic livestock, and wildlife populations.
- 3.10** The lead agencies should sponsor a workshop to help identify governmental incentives for the development of “codes of conduct” for development assistance, industry, and international finance to help minimize the probability of moving invasive species.
- 3.11** All federal and state governments should encourage by decree the use of best management practices within their agencies to reduce the establishment of invasive species.

## **4. EARLY DETECTION AND RAPID RESPONSE**

If there is a single area in which invasive species management has been particularly ineffective, it is in the area of rapid response to incipient invasions. The resources for early detection and rapid response have not kept pace with the multiple pathways available for the transport of invasive species to new habitats. Detection is made more difficult because some invasions are essentially invisible such as the introduction and spread through water bodies or not recognized as potential invasions such as the "silent green" invasion of plants. Failure to respond quickly may result in a species spreading so far that eradication is either not available or is prohibitively expensive.

The primary elements of rapid response are detection, effective information dissemination, and action. To respond in a timely manner, invasive species must be recorded and identified before they become widespread. Even when a problem is identified, the response may be slow because there is not enough knowledge about the species in question, there are not enough resources, there is uncertainty about who has jurisdiction, or bureaucratic obstacles impede action. Because emergency situations cannot be anticipated, budget reallocations are often difficult. In addition, there is no system at the national level to detect incipient invasions and respond in a coordinated manner using all available expertise and resources. This is a result, in large part, of different land ownerships and jurisdictions.

A coordinated system is needed to respond effectively to incipient invasions. Key elements for

such a system are:

- Provide information on resources to allow taxonomic identification of unfamiliar species.
- Include methods for rapid risk assessment.
- Access current scientific and management information.
- Provide a procedure for resolving disputes over jurisdiction or responsibilities.
- Emphasize coordination among federal agencies, state and local agencies, tribal governments, and private entities.
- Provide ready access to policy documents.
- Provide adequate and stable funding.

### **Near-term Recommendations**

- 4.1** Assess identification capacity (lead agency: Smithsonian Institution or Department of Agriculture;). Measures of progress and success will be based on a demonstrated ability to:
- Review existing taxonomic expertise and services in the United States and internationally and provide information on these resources to assist in taxonomic identification by individuals detecting unfamiliar species. Identify current gaps in taxonomic expertise and potential future gaps caused by planned retirements or phase-outs of programs.
  - Identify a range of taxonomic groups with high invasive potential that are in urgent need of systematics research and prioritize those groups.
  - Set standards for voucher specimens and other documentation.
- 4.2** Develop sampling techniques and strategies, as well as the associated infrastructure, to detect, report, and map the presence of "new" species (lead agencies: the Departments of the Interior, Agriculture, and Commerce). These strategies are likely to include both qualitative surveys by experts and incidental reporting by interested parties such as farmers and power plant operators as well as by the general public. Involvement of these people will require training. Measures of progress and success will be based on a demonstrated ability to:
- Develop techniques and infrastructure for emergency responses to map recently released noxious pests (for example, the Asian longhorn beetle).
  - Establish a coordinated federal/nonfederal rapid response "swat" team with the ability to allocate resources rapidly to the appropriate organization(s).
  - Develop sampling and control techniques appropriate to the pest and the spatial scale (for example, use of a stronger pesticide to eliminate a pest from a limited area that would not be acceptable on a large scale because of cost and environmental concerns).

### **Long-term Recommendations**

- 4.3** Establish a coordinated interagency National Invasive Species Emergency Response Program to be conducted cooperatively by federal and nonfederal entities (lead agencies: the Departments of the Interior, Agriculture, and Commerce). Projects will compete for funds based on priority, quality of science, and cost efficiency.

### **Recommendations for identification and early detection systems to encompass plants, animals, and pathogens and parasites**

- 4.4 Compile data on non-native species from existing monitoring and sampling programs and develop new monitoring programs that can provide early detection of invasive species.
- 4.5 Identify locations where introductions are most likely to appear. Usually such high-probability locations are susceptible habitats and destinations or corridors for long-distance travel, including ports, airports, railroads, and logging and construction sites.
- 4.6 Establish expert teams coordinating Federal, State, local, tribal, and regional resources to conduct ongoing and regular scientifically sound surveys for high-probability areas.
- 4.7 Identify and recruit participants for a more general detection network, including public and private land managers, academics, field researchers, and amateurs who have relevant skills and training.
- 4.8 Use new technologies and predictive models and develop new methods of detection technology which will allow the timely interception of invasive species either in their country or region of origin or at their point of entry; for example, genetic probes for specific pathogens. Such methodologies should include identification of species that are likely to serve as vectors of diseases that may affect native plants or animals or humans.
- 4.9 Establish a specific pathogen-free certification system should be set up for high-risk species similar to current procedures for salmonid diseases under the Lacey Act.
- 4.10 Forward information about known or suspected invasive species to an Invasive Species Notification System
- 4.11 Develop and refine user-friendly information (for example, software, hardware, and infrastructure, including the Internet) that effectively provide taxonomic and systematic information for use in “flagging” potentially new invasive species and as an aid in taxonomic identification.

#### **Recommendations for rapid response to emergency outbreaks:**

- 4.12 Develop interagency agreements, prior to introductions of recognized invasive species, to resolve jurisdictional and budget issues and communicate policies to all levels.
- 4.13 Anticipate possible regulatory compliance issues for rapid response such as the National Environmental Protection Act, the Clean Water Act, and the Endangered Species Act.
- 4.14 Seek advance clearance for specific control techniques; for example, use of biocontrol agents to control purple loosestrife.
- 4.15 Identify in advance both federal and non-federal agencies and authorities that must be considered before initiation of emergency control efforts. Develop a system of expedited consideration of rapid response actions without compromising the environment.
- 4.16 Set up a scientific review panel of the affected parties to resolve concerns over issues that may arise.

#### **Recommendations for Current Rapid Response Systems**

- 4.17 Seek authority for a permanent fund which can be tapped as needed or for a system to allow billing-back of costs incurred in emergency responses.
- 4.18 Seek Multi-year spending authority is needed for large area control activities and emergency responses. Such efforts should include, when possible, restoration activities following fire, flooding, catastrophic weather events, and other natural disasters.
- 4.19 Clarify emergency response authorities should be clarified to assure control of incipient invasions before substantial spread and widespread establishment.

## 5. CONTROL

Control of invasive species is often equated with eradication. But control encompasses a wider range of options, including suppression of populations, limiting the spread, and reducing the impacts of invasive species. In some cases, a reduction in the size of a population may decrease the associated economic and ecological impacts. In others, the principal control activity may be to prevent the spread of an organism beyond the areas in which it is already established. This raises issues about jurisdiction and authority for control efforts on adjoining lands and waters. For some invasive species, infestation is so widespread that the major effort is to reduce the adverse impacts. Zebra mussels, for example, have spread so far that eradication is not feasible. Instead, control efforts are focused on the development of technologies to prevent the mussels from clogging water intake pipes at public utilities.

Control is usually less effective and more costly than prevention of introductions, which is the first line of defense against invasive species. Control incorporates measures such as physical restraints (fences and electric dispersal barriers as examples) or mechanical removal (hand-pulling, burning, mowing, and so forth). Pesticides and the release of biological control agents such as host-specific predatory organisms or pathogens are also control measures as is interference with reproductive capacity (the use of pheromone baited traps or the release of sterile males as examples). The most effective response combines appropriate measures and creates the least impact on native species and ecosystems.

In some ecosystems where invasive species appear to be a permanent component, it is important to prevent the spread of those species to ecosystems where they are not yet found. Needed tools may include pathway analysis and interdiction, public education, and regulatory action.

Effective control of infestations requires attention to management alternatives that are environmentally sound. It may require changes in relevant laws and regulations and certainly demands better coordination of federal efforts and increased cooperation among federal agencies; state, tribal, and local governments; and other interested parties. Control activities should employ an integrated pest management approach to control based on the best available science and most appropriate technology using current knowledge of the biology of the species and the characteristics of the invaded habitat. Integrated pest management considers all possible control methods—physical, cultural, biological, and chemical. They may involve a combination of methods. As an example, control of the phragmites reed in the Chesapeake Bay region currently involves chemical controls in some areas and physical measures in areas where there are vulnerable species.

Currently, funding for control measures is neither adequate nor stable, and there is a need for heightened public awareness and understanding of the problems posed by invasive species and the methods used to control invasive species. Key elements for control activities should:

- Implement management practices that are based on the principles of adaptive and integrated management which incorporates the best available science and the most appropriate technology for each invasive species.
- Ensure that all eradication and control strategies minimize effects on non-target species and ecological processes.
- Solicit comments and advance from interested parties and the general public in impacted areas.
- Recognize that timing and frequency of control measures may be important. As an example, physical measures may be most appropriate for annual plants before they produce seeds.
- Recognize a lack of complete understanding of an invasive species biology or management

- should not stand in the way of action.
- Increase funding for integrated control programs (such as the National Park Service's invasive species control teams for all federal lands and adjacent private lands when requested by landowners.)

### **Near-term Recommendations**

- 5.1** Develop several pilot projects to demonstrate area-wide pest management in which proven eradication and control strategies are developed for specific properties and transferred to statewide or regional coverage. By definition, these are multi-agency, multi-site cooperative programs that develop comparable and compatible information. Successful examples include TEAM Leafy Spurge and other programs for the codling moth, corn rootworm, and fruit fly.
- 5.2** Develop the capability to initiate available suppressive controls in the event of an introduction of a recognized invasive species into an ecosystem and convene immediately a panel of experts to determine if eradication is feasible. If so, undertake a full eradication effort, emphasizing methods recommended by the panel.

### **Long-term Recommendation:**

- 5.3** Establish a National Invasive Species Control Program as a coordinated interagency effort jointly administered by the department of the Interior, Agriculture, and Commerce. Work would be conducted by state, tribal, and federal agencies (and possibly local governments). Projects would compete for funds based on national priority, quality of science, and cost efficiency.

### **Recommendation for Coordinating of Control Activities with all affected parties**

- 5.4** Determine priority species for control activities on a regional, multi-state basis. Federal agencies should work with state and regional bodies in developing management plans that incorporate the expertise and resources of all participants.
- 5.5** Designate a Federal lead agency to coordinate federal activity in cooperative control efforts on specific invasive species in specific areas. The national Invasive Species Council should establish an efficient process for resolving any questions over jurisdiction or methods.
- 5.6** Promote coordination of management programs among government resource managers and private holders within geographically unified areas. Incentives such as cost-sharing and tax incentives should be provided to private landholders to encourage their participation in coordinated control programs.

### **Recommendation for Management Practices**

- 5.7** Federal land management and resource agencies should develop long-term management plans for invasive species using the methods discussed in 4.2. All management plans should contain a scientifically sound monitoring and evaluation component, and budgets should include such a component.

### **Recommendations to Prevent the Spread of Invasive Species**

- 5.8** Implement prohibitions on interstate movement and sale without the need for quarantine or

- eradication programs to be in place.
- 5.9 Attack satellite infestations and the edges of the core areas of infestation with best suppressive techniques while developing long-term management strategies.
  - 5.10 Adopt sanitation and exclusion methods such as pest-free forage and mulch, decontamination of recreational, construction, and other vehicles, management of ballast water including on intracoastal voyages, and controls on the movement of contaminated soils and fills.
  - 5.11 Prepare a list of connecting waterways such as canals and irrigation projects to prevent movement of aquatic species between watersheds. Research should be conducted on methods to prevent movement of species through such connectors.

### **Recommendations for Biocontrol**

- 5.12 Expand biological control capabilities within the federal government to eradicate or control established populations of invasive species (lead agency: Department of Agriculture).
- 5.13 Accelerate the development, testing, and transfer of biological control agents and techniques using stringent safety protocols. Require post-release, long-term monitoring of effects on targeted and related non-targeted species.
- 5.14 Increase support for overseas laboratories to study invasive species in native habitats and test for host specificity of natural enemies.
- 5.15 Coordinate the development of research and management plans for non-native species in priority ecosystems.
- 5.16 Improve methods to develop and enhance the competitiveness of native species in ecosystem management and restoration efforts.

### **Recommendation for Natural Disaster Actions**

- 5.17 Develop programs to prevent population increases of invasive species and diseases that affect populations of native species in the wake of large-scale natural disasters such as fires or floods.

#### **Partnerships in Action: TEAM Leafy Spurge**

Since its introduction into the United States, the invasive leafy spurge (*Euphorbia esula*) plant has doubled its acreage every ten years. This formidable weed now infests at least five million acres in 29 states. Costs to agricultural producers and taxpayers for production losses, control expenses, and other economic impacts are estimated at \$144 million every year in North Dakota, South Dakota, Montana, and Wyoming alone.

In 1999, the Department of Agriculture's Agriculture Research Service began a demonstration project in the Little Missouri River drainage of the Dakotas, Montana, and Wyoming. Called TEAM Leafy Spurge, this initiative is a five-year research and demonstration partnership. Members of the team include the Agriculture Research Service, Animal and Plant Health Inspection Service, U.S. Forest Service, National Park Service, Bureau of Land Management, U.S. Geological Service, state department of agriculture and other state agencies, land grant universities, county weed managers, and landowners.

The objective is to demonstrate effective, affordable control of leafy spurge through Integrated Pest Management. Tested biological controls serve as the foundation of TEAM Leafy Spurge's Integrated Pest Management strategy. The project is also testing the viability of multi-species Integrated Pest Management through a combination of sheep and cattle grazing and other techniques.

The effectiveness of one biological control, the leafy spurge flea beetle, has been demonstrated at numerous test sites such as in the Bridger Mountains of Montana and at Lake Forget Me Not in Minnesota. The flea beetle has proven so effective, in fact, that it is now known as the "all star" of leafy



spurge control. Montana rancher Glenn Rugg started using the flea beetle ten years ago. "A lot of people want spurge to disappear tomorrow, but that isn't going to happen," he said. "The flea beetles may take a while, but it's a permanent, long-term and low-cost solution."

Only a year into the project, TEAM Leafy Spurge reports progress on several fronts. The rate of successful establishment of flea beetles, for example, is improving because team members are working directly with landowners on the proper methods for release of the insect. Demonstration sites are currently operating, and plans are being made for tours of the sites as part of a comprehensive public education program. In addition, research funded by TEAM Leafy Spurge in the United States and abroad seeks improved understanding of how biological controls work and is attempting to identify new leafy spurge parasites and pathogens for testing.

## **6. RESTORATION**

The effective restoration of invasive species-impacted ecosystems depends upon several underlying capabilities: 1) the establishment of priorities based upon a science-based assessment of risks and opportunities, 2) ready access to current scientific and management information, 3) clarification and resolution of jurisdictional conflicts or responsibilities, 4) strengthening of laws, regulations, and policies, 5) coordination between agencies at a single level of government, between different levels of government, and between the public and private sectors, 6) the development of stable funding to sustain current programs and initiate new projects; and 7) the development of public and stakeholder awareness, support, and buy-in.

Restoration and remediation techniques have improved markedly. Today, some terrestrial systems can be recovered to near-natural states with the proper mix of site preparation, provision of natural hydrology and nutrient cycling, and judicious application of native seeds followed by watchful management until self-sustaining populations stabilize under natural disturbance regimes such as fire and flooding. Although more difficult, restoration of aquatic systems is successfully underway and it is critical to sustain the quality and quantity of aquatic resources.

Restoration planning should be an integral part of invasive species management activities, especially when the loss or displacement of native species occurs. Without restoration, areas may become reinfested with either the same or new invasive species. Detailed site assessments prior to implementing invasive species management actions can help set specific restoration goals and objectives, including the scale at which restoration will take place. Such assessments can identify limiting factors such as the alteration or loss of natural processes that will affect the success of management and restoration actions. And assessments are crucial in selecting proper management and restoration techniques. For very large generally disturbed areas, site assessments can identify remnant patches of native vegetation for sensitive control followed by aggressive treatments of the monocultures, including revegetation with native species, use of biological controls, and extensive spraying.

Restoration should be encouraged whenever feasible, but the costs can be high and the effects temporary. To retain all possible desirable species at any given site during a restoration or reclamation project is often difficult. Success in terrestrial systems, for example, requires inexpensive and accessible seed sources that are not available for most species in most areas.

### **Long-term Recommendations**

- 6.1** Establish a coordinated, interagency National Invasive Species Restoration Program to be carried out by nonfederal and federal agencies (lead agencies: the Departments of the Interior,

Agriculture, and Commerce). Special attention should be given to disturbed areas where there is still time to protect and restore important natural features. Measures of progress and success will be based on a demonstrated ability to:

- Fund significant portions of the proposed program.
- Develop guidelines and protocols for the restoration of native species and ecosystem functions after eradication projects.
- Develop guidelines and protocols for the conservation of native species and ecosystem functions during suppression (control and management) projects and for restoration after such projects.
- Encourage the use of native species in restorations, clearly identify the appropriate uses of desirable non-native and native cultivars, and identify and encourage land management practices that promote regeneration of indigenous species.
- Identify sources of propagation material for native species in the area of restoration or reclamation and use propagation material from local populations where practical.
- Encourage and employ best management practices and integrated pest management using appropriate methods of control based on current science.
- Increase efforts and funding for research related to the enhancement or development of new restoration and reclamation techniques for difficult habitats such as arid, desert, and aquatic environments and highly eroded and disturbed sites.
- Develop recommendations and protocols that minimize impacts on genetic diversity and the ability to move forward on restoration projects.

### **Additional Recommendations**

- 6.2** Identify the appropriate uses of desirable non-native and native cultivars, and identify and encourage land management practices that promote regeneration of indigenous species.
- 6.3** Promote use of native species to the fullest extent possible on public lands and on the grounds of federal facilities (as called for by Executive Order of April 22, 2000) and promote use of native plants in revegetation through procurement requirements:
  - Provide assurance by the Department of Agriculture's Seed Regulatory and Testing Branch that all federal rehabilitation and restoration seed sources contain no noxious weed seeds. Identify the appropriate uses of desirable non-native and native cultivars.
  - Create market incentives for native seed by purchasing on a regular schedule and using native species for land and facilities management.
- 6.4** Encourage land management practices that promote regeneration of indigenous species.
- 6.5** Identify sources of propagation material for native species in the area of restoration or reclamation and use propagation material from local populations where practical.
- 6.6** Encourage and employ best management practices and integrated pest management using appropriate methods of control based on current science during restoration.
- 6.7** Increase efforts and funding for research related to the enhancement or development of new restoration and reclamation techniques for difficult habitats such as arid, desert, and aquatic environments and highly eroded and disturbed sites.
- 6.8** Develop guidelines with the Department of Agriculture and other stakeholders for the collection and propagation of native species.
- 6.9** Establish a federal restoration incentive programs for agriculture, forestry and wildlife that include guidance on identification, control, and monitoring of invasive species. Such programs

should recognize the commitments of landowners to carefully planned and executed control and restoration efforts that include use of native plants for revegetation.

- 6.10** Develop guidance on identification, control, restoration and ongoing monitoring of invasive species for federal restoration incentive programs for agriculture, forestry and wildlife.
- 6.11** Identify sources of propagation material for native species in the area of a restoration or reclamation, and utilize propagation material from local populations where practical.
- 6.12** Increase shared funding opportunities for projects to restore lands and waters impacted by control of spreading invasives by examining and amending, if needed, the Federal Grants and Cooperative Agreements Act (1977).
- 6.13** Reward landowners who make a commitment to carefully planned and executed control and restoration efforts and include use of native plants for revegetation.
- 6.14** Provide tax and other incentives to promote post-control stewardship activities supporting restoration with native species or utilizing non-invasives to restore competitive interactions and ecological balance on protected and managed lands and waters.

## **7. RESEARCH, DATABASE MANAGEMENT, AND MONITORING**

The science of invasion biology is extremely complex, resulting in multiple, persistent uncertainties. Confronting these uncertainties requires efficient management of existing scientific information, monitoring of the current situation, and gathering of new insights. Research and long-term monitoring are widely recognized as essential elements of successful invasive species strategies. Several federal agencies are working toward these goals. The U.S. Forest Service's Forest Health Monitoring Program, for example, has greatly improved monitoring of native and non-native plant diversity. The U.S. Geological Survey has developed monitoring and research expertise in non-native fish and aquatic plants, landscape-scale assessments of invasive terrestrial plants, and exotic diseases. Other agencies are developing similar programs.

Yet more efforts are required to meet challenges such as predicting how and when a species might become invasive, determining the ecological effects of a particular invasive species, investigating the current and potential pathways for future invasions, and devising effective methods to control and eradicate invading species. Challenges in database management and monitoring include the creation of a standardized system of information collection and dissemination to provide the best information in a timely and effective manner and creation of an on-going monitoring process to assess established and establishing invasive species on a predictable and reasonable timeframe. But limited funding for research on invasive species impedes overall understanding of invasion biology. In addition, limited funding effects programs to prevent the introduction and control the spread at least representative taxa from all groups of biological organisms.

Additional research is needed to improve risk assessments of invasive species. Comparable data from coordinated inventory, monitoring, and research programs are badly needed. And far more research must be conducted both within and outside of the United States to study organisms that have already invaded other habitats and glean information about why and how they were able to invade. Research and predictive modeling efforts must be greatly expanded on organisms in their natural habitats to determine their biology, including their host ranges, genetics, and physiology.

While there are many experts on various invasive species that have been identified, a new generation must be educated and trained in research and monitoring methods. The research and monitoring infrastructure, including containment facilities and equipment, needs to be modernized and expanded. Current university, federal, nonfederal, and private research capacity and additional support for critical research gaps such as information resources must be enhanced. An effective invasive

species research, database management, and monitoring strategy will provide much of the information and many of the tools needed to prevent the introduction and control the spread of invasive species.

Key elements include for a successful strategy should:

- Foster research to predict potential invasive species and their pathways.
- Conduct useful risk assessments.
- Determine the current and potential ecological and economic effects of invasive species
- Control existing invasive species.
- Lay the basis for effective database management through standardized data collection methods and terminology that will provide useful information in a timely manner.
- Establish an invasive species monitoring process that takes into account multiple spatial and temporal scales.
- Emphasize the need for a coordinated federal funding plan to support research, data management, and monitoring.

## **Basic Research**

In regard to basic research, there is a significant lack of fundamental knowledge of invasion biology. The gaps in understanding are many, and scientific efforts concerning this topic are relatively recent. As priorities, federal actions should emphasize species, pathways, and control mechanisms.

**Species --** One of the most difficult aspects of invasion biology is predicting the potential invasiveness of a species. Research can help to delineate certain parameters or characteristics of invasive potential, thereby improving the ability to avoid future invasions. For unknown reasons, there is often a lag period between when a non-native species is introduced and when it actually becomes invasive—that is, when it actually begins to cause economic or environmental damage. As there are tens of thousands of terrestrial and aquatic non-native species in this country, it is important to be able to analyze which ones might become invasive. To do so requires a better understanding of the lag period often witnessed and its causal factors. Identify representative species of taxa that are at high risk of introduction or recently introduced into the United States.

## **Recommendations to address these issues:**

- 7.1** Conduct place-based studies to compare biological and ecological factors that enable a species to invade.
- 7.2** Conduct comparative studies in sites of origin, sites of introductions in other countries, and in this country, thereby allowing evaluation of factors involved in invasion of new ecosystems.
- 7.3** Conduct research on the biological characteristics of organisms as they relate to probability of establishment and on the relationships of organisms to potential hosts and environments.
- 7.4** Determine what causes the lag period often observed between incipient populations and outbreak conditions.
- 7.5** Determine what are the dynamics of invasions, especially during the lag phase, and if epidemiological approaches are useful in understanding these dynamics.
- 7.6** Determine what changes occur during invasions (for example, rapid evolution, hybridization, plasticity) in invading species.

**Pathways --** Invasion pathways may carry entire ecosystems or individual species. It is difficult to

predict how a receiving ecosystem will respond to the sudden invasion of another ecosystem, let alone a single invader. Also, the pathway by which a species or ecosystem is introduced adds another confounding variable. For example, is the species released through a single exchange of ballast water or at multiple sites across a longer period of time, as has accidentally happened with non-natives plant species released as ornamentals.

#### **Recommendations to address these issues:**

**7.7** Identify the current and future potential pathways for individual species and entire communities or ecosystems.

**7.8** Identify which environmental characteristics make a community or ecosystem more susceptible to invasion. Identify which biological properties (as examples, community structure and biodiversity) and which kinds of human impacts (as examples, urbanization and environmental stress such as climate change) make communities and ecosystems vulnerable to invasions.

**7.9** Identify the variables that affect how different pathways might enhance or decrease the potential invasiveness of the introduced species or communities and ecosystems.

**Control Mechanisms** -- While basic research must emphasize identification of how and why a species might invade, it must also help determine how a particular invasive species is affecting the environment and how existing and emerging invasions can be controlled.

#### **Recommendations to address these issues:**

**7.10** Determine how invasive species influence populations of native species in response to cumulative stresses, and lead to habitat alteration and loss of native biodiversity, including native genetic diversity. Quantify how invasive species can alter water chemistry, nutrient cycling, and disturbance regimes.

**7.11** Determine how invasive species can influence secondary and higher order effects on ecosystem goods and services.

**7.12** Predict which invasive species can potentially and actually impact human health, including both direct effects (for example, invasive species that are exotic diseases or vectors for disease) and indirect effects (for example, increased exposure to pesticides used to control invasive species).

**7.13** Determine what causes the lag period often observed between incipient populations and outbreak conditions.

#### **Applied Research**

Basic research is the foundation for applied research. But as the foundation of basic research grows, it is necessary to make that information operational. Knowledge from the lab is a needed first step, yet without commensurate action in the field we will not be successful against the existing or incoming invasive species. More applied research is needed to develop predictive models for invasiveness based on clearly delineated biological and ecological factors.

**Pathways and Control Mechanisms** -- For applied research, a discussion of pathways directly coincides with a discussion of control mechanisms. Applied research on the control of invasive species needs to concentrate on timely, effective, and environmentally sound control methods for use in the short

and long term. Improved modeling abilities are need for better assessments of interactions of invasive species and their long-term cumulative impacts—for example, modeling of the interactions among invasive species and native species at a landscape scale aid both risk assessment and mitigation strategies. One of the significant pathways into aquatic ecosystems is ballast water exchange. Methods to treat ballast water to remove targeted and potentially unknown organisms must be developed and validated.

#### **Recommendations to address these issues:**

- 7.14** Validate methods to ensure removal efficiency, cost-effectiveness, ship safety, and practicality under real-world conditions.
- 7.15** Develop effective ballast water treatments, which might include but are not limited to filtration and centrifugation, biocides, ultra-violet, heat, shore-side or onboard treatments, and providing clean ballast water.
- 7.16** Test approaches that have been tested using standardized methodologies for effectiveness.
- 7.17** Base predictive models for invasiveness that are based on clearly delineated biological and ecological factors.

#### **Monitoring and Assessment**

Coordinated national monitoring of existing and emerging invasive species is a crucial element of any successful management or eradication program. Existing monitoring programs are incomplete and not sufficiently coordinated, and there is a need for standardized data collection, management, and analysis of invasive species information. This information will help identify potential invasive species and their pathways of introduction and provide essential management decision support once an invasive species has been introduced or established.

**Monitoring** -- An effective invasive species monitoring system will provide timely and comprehensive information on what invasive species currently exist, and will quickly identify emerging invasive species. To these ends, an invasive species monitoring system should represent enhanced monitoring coordination among state, federal and international agencies that includes integration across geographic regions, taxa, and habitat types and represent an improved ability to monitor and model the distribution and spread of many invasive species across multiple spatial and temporal scales.

#### **Recommendations to address these issues:**

- 7.18** Develop an easily accessible invasive species monitoring data acquisition system that links monitoring data with research results, identification information, and ecological and control information about invasive species.
- 7.19** Develop survey strategies and protocols to support rapid detection in a variety of urban and rural landscapes, including the interface of these landscapes.
- 7.20** Develop improved detection technologies. These techniques should use the latest technology as appropriate.
- 7.21** Monitor ecosystems for impacts of invasive species.
- 7.22** Monitor the invasive species for genetic and physiological changes upon introduction and for evolutionary changes by comparison of populations that invaded previously.

**Assessment** -- Monitoring provides data from the field. Proper database management gets that data to the necessary agencies and decision-makers, and proper assessment deciphers hard data into useable information.

**Recommendations to address these issues:**

- 7.23** Assess the economic impacts of invasive species (costs from loss of natural resources or loss of ecosystem services, costs of combating invasive species, and costs of providing incentives to change behavior and reduce threats).
- 7.24** Assess the potential economic benefits of invasive species. Develop information needed to compare economic advantages of treatment and prevention alternatives.
- 7.25** Assess control and management options, including what technological options are feasibly available and what scientific resources are needed or lacking.

**Collaboration in the Delaware River Basin**

The departments of the Interior, Agriculture, and Defense and the Environmental Protection Agency have joined states and New York City in a pilot project to test the integration of their environmental monitoring programs in the Delaware River Basin. One objective of the project is to develop monitoring systems for invasive plants, insects, and pathogens as part of forest health and water quality monitoring. Areas chosen include the forested upper portion of the basin (the base of New York City's water supply), the agricultural-dominated mid basin, the Delaware estuary, and the wildland/urban interface and urban areas of the lower basin and New York City.

**Research-related Policy**

To address the current and future threats posed by invasive species presents considerable challenges in research, database management, and monitoring. It is obvious that much work is needed in the nascent field of invasion biology. Little is known about the ability of species to invade new habitats, the factors that enable them to invade, the kinds of habitats or habitat changes that enhances invasion, and spatial and temporal details on the process of an invasion. Better methods are needed to analyze and model invasive species dynamics and impacts. The current system for research, database management, and monitoring is fragmented and current funding levels and directions are insufficient. Concerted and coordinated efforts across the federal government are needed to ensure adequate funding for research, database management, and monitoring.

**Recommendations to address these issues:**

- 7.26** Establish an interagency national invasive species research program to assist with managing government funds dedicated to invasive species research.
- 7.27** Establish a research steering committee, under the above program, linked to existing interagency invasive species task forces and committees for both terrestrial and aquatic species and composed of federal and non-federal representatives. The steering committee would identify priority research deficiencies and agendas and ensure that the needed next steps are completed.

## **8. INFORMATION MANAGEMENT**

Information sharing and management is a key element to carry out a effective national response to invasive species. There is a need to identify and evaluate strategies, especially in the area of database development and access, to address existing needs and foster the integration of knowledge for management and risk assessments.

Federal databases of invasive species information need to be coordinated, comprehensive, and easily accessible by all interested parties. These databases should include all information relevant to the eradication, control, identification and management of an invasive species. The first step is coordination of existing information and identification of information that is lacking and the means and protocols through which it can be obtained. There has never been a thorough assessment of the current capacity to provide core knowledge, identify key gaps, and describe limitations.

Invasive species are known to endanger many native species, and information on both is needed to appreciate the trends and causes involved. The Nature Conservancy has suggested formation of such an integrated database in Hawaii. For the most part, however, native species in the United States are described by many databases and centers for information storage and retrieval, including networks established by federal and state agencies, natural history institutions, universities, and nongovernmental organizations such as The Nature Conservancy. These information sources are far from complete or coordinated, and not all are accessible on the Internet.

Existing information on invasive species is also collected and maintained by many different agencies and organizations, in many different locations, and in many different forms and formats. There is no comprehensive understanding of what information is already available from which agencies and organizations, where and in what form the information is stored, and what information is needed.

The ability to support coordinated collection, management, dissemination, exchange, and application of information on invasive species is limited by a lack of agreed-upon guidelines and standards. This includes a lack of standards for data collection, reporting, and verification; taxonomic identification; and information accessibility and exchange.

In general, it is difficult to effectively overlay and integrate invasive species information with other types of information, including information on the biological and physical environment and socio-economic information. Information on invasive species is sparse, incomplete, temporally and spatially limited, and usually uncoordinated across interested and responsible agencies. Such circumstances limit the scientific understanding needed for effective prevention, monitoring, management, and control.

### **Near-term Recommendations**

- 8.1** Conduct a survey of existing information resources in the U.S. and abroad. Summarize and assess the status of the resources, evaluate the quality and the reliability of the information, identify data gaps, develop a plan to address missing information and eliminate redundancies. (Lead: Department of Agriculture and Department of Interior) Measures of progress of success will be based on a demonstrated ability to:
- Evaluate invasive species information (coverage by agency and organization, by taxa, and by geographic region).
  - Quantify which resources (funding and staffing) are invested in information management.
  - Identify duplicative activities.
  - Identify the highest priority data sources.



- Identify major gaps and missing information based on the overall information needs.
- 8.2 Determine what invasive species information standards and guidelines are needed and develop a comprehensive list. Key elements include:
  - Develop the minimal level of standardization needed to allow for flexibility among information sources, while providing the needed common level for inter-operability. The guidelines will include: (1) documentation standards (metadata) for cataloguing datasets and information for maximum accessibility; (2) inter-operability standards to link, integrate, and combine the various data sets (for example, consistent, integrated, and data-standard compliant registries and vocabularies); and (3) metadata and inter-operability standards need to be applied to two types of information.
  - Provide concrete evidence that: (1) metadata and inter-operability standards are accepted and used by those producing and managing data; (2) the ability to access information and use it in making risk-based safeguarding and management decisions results in fewer invasive species becoming introduced in the United States; and (3) the data are used to make management decisions on controlling invasive species and re-establishing habitats damaged by invasive species.
- 8.3 Continue development of the interagency web site ([www.invasivespecies.gov](http://www.invasivespecies.gov)) initiated by the Department of Agriculture and the Department of the Interior. The site will be a key gateway for current invasive species data and information from government agencies and non-governmental organizations and can be the initial cornerstone of the national invasive species information system.

### **Long-term Recommendations**

- 8.4 Develop a National Invasive Species Information Network that is, a system that increases access to and integration/inter-operability of existing information from many sources for many different audiences. The network will:
  - Link information such as bibliographies, case studies of control and restoration projects, decision aids such as taxonomic checklists, “black lists” (for example, federal and state noxious weed lists), and “white lists” as developed.
  - Serve as a clearinghouse for descriptive information about available databased and relevant technologies (that is, metadata), including methodologies for control of invasive species and restoration of affected areas; provide access to actual monitoring data, distributions maps, research data, impact analyses and assessments, and other databases developed and managed by many participants who will contribute to and help coordinate the system; feature cost/benefit analyses for prevention, control, and restoration programs; enable users to integrate data and information from many sources to characterize problems, identify research needs, assess threats, and develop effective responses; and provide useful tools to facilitating local action. Such tools will include photographs and electronic keys to enable individuals to accurately and easily identify invasive species as well as methodologies to help select appropriate control methods.
- 8.5 Provide needed standards and tools to facilitate the integration of invasive species information with other key information sets.

- 8.6** Develop and distribute the standards to resource managers, academics, private industry, all levels of government, and the public. To integrate invasive species data with existing local and national information sets such as habitat, water quality, land use, economics, and environmental/natural resource data sets with socio-economic data sets such as census data, agricultural statistics, and shipping and transportation data.
- 8.7** Develop and maintain a sound and usable inventory of invasive species that could be used for planning, setting priorities, or explaining needs, including funding needs. Such an inventory is crucial to rational policy, planning, and implementation. Some data are available, although they have been collected by different public and private entities and are not comprehensive or uniform in criteria, structure, or coverage and are not available from one location.
- 8.8** Develop information systems that track established populations of invasive species, including shared databases.

## **9. INTERNATIONAL COOPERATION AND CAPACITY BUILDING**

"Invasive species are truly an international problem. Every country is a source and every country is a recipient of invasive species."

Hal Mooney  
Stanford University and  
the Global Invasive Species Program

In a large country like the United States, problems sometimes arise when we relocate organisms within our own borders. This section, however, focuses on the invasion of non-native species into the United States and other countries. In a country as large as the U.S., ecological invasions can occur from one region to another. Despite this fact, the process of invasion is typically international in scale and efforts to control invasions and inhibit introductions will require increased levels of international collaboration, facilitated by the import of products and the influx of people. Invasion into the U.S. and other countries is facilitated by the import of products and the influx of people. The United States has learned the hard way that commerce is not "free." We are not alone. Every country has been invaded by non-native species and many, literally, can not afford the costs.

The ability to prevent invasive species from entering the United States depends a great deal on the capability of other countries to effectively manage invasive species and invasion pathways domestically. If an invasive species never leaves another country, it will never become a problem in the United States. Of course, invasive species do not respect jurisdictional boundaries; they can walk, fly, swim, and hitchhike from one country to another. Invasive species, thus, can pose a threat to an entire region once they become established within one country.

In many cases, the invasive species problems faced by other countries are the direct result of U.S. actions. Despite helpful intentions, government actions have introduced invasive species to other countries through development assistance programs, military operations, and famine relief projects. To meet and expand demands for U.S. products, we export organisms that are invasive here and have the potential to be invasive elsewhere; the American bullfrog is one example. U.S. tourists travel the world, relocating who knows what.

**International Assistance: An Invasive Pathway**

Invasive species are sometimes transported around the world through development assistance programs, famine relief projects, and military operations. What begin as well-intentioned efforts can have unexpected and persistent negative consequences. Unfortunately, U.S. activities offer many examples.

#### **Intentional Introductions**

- The United States and other developed nations have, for aquaculture purposes, introduced Madagascar and Nile tilapia into lakes and ponds all over the world, as well as carp, bass, trout, and other invasive fish species.
- The golden apple snail, a South American species, was introduced into East and Southeast Asia as a food development project and has devastated Asian rice fields. The snail has already cost Philippine rice farmers approximately a billion dollars in crop losses.
- The U.S. Agency for International Development is planting invasive eucalyptus for erosion control and firewood in Haiti.
- Several forestry projects promote the use of *Leucaena leucocephala*, a fast growing Central American leguminous tree, which can be used as "green fertilizer" and forage crop but can also be invasive.

#### **Unintentional Introductions**

- U.S. military involvement in the Balkans brought a corn rootworm into the area along with food and assistance shipments. The rootworm is now affecting corn production throughout the area and may spread across Central Europe.

#### **A Pathway to Prevent Invasions**

The United States also offers a wide variety of international assistance programs that are specifically aimed at preventing the introduction and controlling the spread of invasive species. Some examples from the U.S. Agency for International Development include:

- A program in Ecuador to study control techniques for invasive species in the Galapagos.
- A project in Bangladesh to re-establish native fish in the canals.
- An effort in Uganda to conduct environmental impact studies on water hyacinth controls.

Both the U.S. Department of the Interior and U.S. Agency for International Development have provided resources to support the Working for Water Program in South Africa. This project is widely regarded as one of the leading worldwide models of "best practices" to prevent the introduction and control the spread of invasive species.

It is clear that to ensure an adequate supply of food and water, minimize threats to human health, and prevent costly environmental catastrophes, all countries must now take strategic action to prevent and control the spread of invasive species. It is in the United States's best interest to take a leadership role in the development of approaches for international cooperation and in building the capacity of other governments and international organizations to deal with the problems caused by invasive species.

#### **The International Landscape**

"There won't be success if the region isn't working toward the same goals."

Guy Preston  
Ministry of Water Affairs and Forestry  
South Africa

In December 1999, the U.S. Department of State surveyed other countries in order to determine their priorities and policies on invasive species. The survey revealed that the United States faces many challenges to addressing the invasive species issue internationally:

- Only a few countries (Australia, New Zealand, South Africa, Canada, and Norway, for example) consider invasive species a high priority, have coordinated policies in place specifically aimed at minimizing the problem, and dedicate substantial resources to efforts to prevent and control the spread of invasive species.
- In other countries high-level government officials are largely unaware of the threats that invasive species pose to the environment, economy, and human health.
- Government officials who are aware of the problem, frequently consider it a low priority.
- Developing countries that recognize the gravity of the situation and want to take immediate action, are hampered by a lack of scientific, technological, and financial resources.
- Within and among governments, efforts to address invasive species problems are typically not well coordinated. In most governments, aspects of the invasive species problem are under the jurisdiction of multiple ministries and, in some cases, also with regional governments. These governing units often have different priorities, goals, and objectives. Most governments lack a mechanism for coordination and cooperation.
- It is not uncommon for neighboring countries to be unaware of each other's policies and practices to prevent and control the spread of invasive species. In some cases, these countries have different priorities and invasions occur across jurisdictional boundaries. This "migration of problems" has the potential to create regional friction.

The good news is that an increasing number of countries are strategically moving to recognize and resolve their invasive species problems. Bolivia, for example, is preparing a supreme decree to create a National Service for Agricultural Sanitation under which invasive species will be a top priority. Eritrea recently drafted a regulation on invasive species as part of its National Biodiversity Strategy and Action Plan. During the process of the Department of State's survey, many countries requested U.S. guidance and assistance to address their problems.

### **International Responses**

"I hope the U.S. government can show leadership on this issue and that we will be there when we need to be there. We need to do more and understand more in the broadest sense of this issue."

Frank Loy

Under Secretary for Global Affairs

U.S. Department of State

Recognizing that there are significant differences in the willingness and capabilities of countries to prevent and control the spread of invasive species, the blueprint for U.S. efforts to build international cooperation and capacity, focuses on actions to:

- Raise awareness
- Promote well-coordinated, cooperative approaches
- Develop and amend policies
- Share information and technologies
- Provide technical and financial assistance

### **International Opportunities for Engagement**

Many countries do not have national policies that regulate the import and export of invasive species. Some countries do have set policies, but their decisions are made independent of the needs of their trading partners or regional neighbors. In many countries, including in the United States, the trade agreements that we already have in place were developed at a time when invasive species had not yet become a significant concern. Some of these agreements may not adequately reflect current priorities or scientific and technical capacities to limit the invasion of non-native species. Given the risks that invasive species pose to all countries, it is clear that we need international consistency and adequate standards in policies to prevent and control the spread of invasive species.

Governments and international organizations have started to use conventions, treaties, and other agreements to take steps to limit the spread of invasive species. For example, Article 8H under the Convention on Biological Diversity (CBD) calls for governments to "prevent the introduction of, control or eradicate those alien (non-native) species which threaten ecosystems, habitats, or species." A working group of the International Plant Protection Convention (IPPC) recently recommended that the IPPC develop a set on standards on the trade of invasive species that threaten plants. International agreements that specifically address invasive species, and are particularly relevant to the United States, are summarized Appendix 3.

### **Recommendations for International Engagement**

- 9.1** Raise awareness of the invasive species issue within other governments by highlighting it in diplomatic and technical meetings between the United States and other countries.
- 9.2** Highlight the importance of the invasive species issue for intergovernmental organizations, such as International Maritime Organization (IMO), Food and Agriculture Organization (FAO), and United Nations Environment Program (UNEP) and encourage them to use their resources to address the problem.
- 9.3** Encourage and assist other governments to coordinate their policies and programs relevant to invasive species and to develop national policies and international agreements that will effectively prevent and control the spread of invasive species.
- 9.4** Review the United States 's existing trade agreements for conformity with goals of Executive Order 13112 and ensure that new U.S. trade agreements do not have provisions that will limit a country's abilities to prevent the spread of invasive species.
- 9.5** Identify the limitations of existing international agreements to adequately prevent and control the spread of invasive species and work with other government and international organizations to improve the effectiveness of these agreements.
- 9.6** Develop and participate in programs that foster international, voluntary initiatives to raise awareness of the invasive species problem and develop cooperative approaches to problem resolution.
- 9.7** Provide financial support to international meetings of policy makers, as well as regional and global programs of cooperation, that are working to establish and implement mechanisms to limit the spread of invasive species.

### **Information and Technology Sharing and Technical Assistance**

People need up-to-date scientific and technical information if they are going to make decisions and take actions to effectively limit the spread of invasive species. In all countries, time and money are limited resources. Information critical to one country's success in controlling a particular invasive species may already be available in the country where the organisms originated or in another country where it has already been a problem. Countries that openly exchange information and technologies relevant to

invasive species are best poised to prevent the introduction of invasive species and respond rapidly when invasions do occur. In order to be readily useable by all countries, scientific and technical information needs to be collected and shared according to the same standards and protocols.

Unfortunately, most countries do not inventory or monitor the invasive species with their borders. If relevant information does exist, it is typically in widely scattered collections and databases. Most of these collections have different management standards and few are widely accessible to the public.

On a global scale, one organization is solely focussed on solving these challenges. In 1997, three international organizations joined together to create the Global Invasive Species Program (GISP). GISP's mission is to provide information that can help fulfill the mandate on invasive species under the Convention on Biological Diversity and other international agreements.

### **The Global Invasive Species Program (GISP)**

The Global Invasive Species Program is a consortium of the Scientific Committee on Problems of the Environment (SCOPE), the International Union on the Conservation of Nature (IUCN), and the Commonwealth Agricultural Bureau International (CABI). GISP provides information and new tools for understanding and dealing with invasive species. Their expert guidance and products are especially focussed on programs conducted under multilateral environmental agreements, such as the Convention on Biodiversity. In its process, GISP seeks to engage all those involved with the invasives problem, including natural and social scientists, educators, lawyers, resource managers, and people from both industry and government. GISP has developed a comprehensive approach to deal with invasive species. The first phase of GISP's work focussed on synthesizing current knowledge about the ecology of invasive species, the current status of invasive species and methods for assessing their changing distributions and abundance, the views and values society places on invasive species, the impact of global change on invasives, and identification of legal and institutional frameworks for dealing with invasives. The second phase of GISP will build upon the first, and focus on the development of new tools and approaches. For example, development of a global early warning system, analysis of changing pathways of trade as they provide vectors for invasive species, assessment of best practices for the management and control of invasives; and development of new public educational approaches. In July of 2000, the U.S. Department of State awarded GISP \$278,000 to: 1) support the participation of developing country officials in an international meeting in Cape Town, South Africa to review the findings of Phase I and initiate Phase II., 2) hold four regional meetings of policy makers in order to establish regional strategies to manage invasive species, and 3) print and distribute a Global Strategy Document and Policy Maker's Guidelines. Through these activities, GISP will help the United States and other governments establish the Cooperative Government's Initiative on Invasive Species (CGIIS). Web Site: <http://jasper.stanford.edu/GISP/>

The United States and some other governments recognize that programs that openly share information and technologies can greatly reduce the risks of invasions by non-native species and lower the costs of controlling established invasive species. For many years, various agencies of the U.S. government have assisted countries with scientific information on the invasive species that threaten their economies and human health and also provided technologies such as biocontrol agents that have helped countries eradicate and control invasive species. While most of this information and technology sharing has been from the United States to a specific developing country, this country is now developing regional networks throughout the Western Hemisphere that will enable exchanges of information and technologies in a timely and effective manner.

### **The Inter-American Biodiversity Information Network (IABIN)**

IABIN, the result of an initiative of the November 1996 Santa Cruz Summit for Sustainable Development, is a forum through which countries and institutions collaborate to identify and meet information needs for conserving and sustainably using biological resources. IABIN's goal is to increase the amount of information on biodiversity shared among the nations of the Western Hemisphere. Guided by an intergovernmental working group, in concert with other ongoing initiatives, the network shares biological information relevant to decisionmaking, science, and education. IABIN's website provides U.S.-sourced data, but also has links to networks in Brazil, Canada, Costa Rica, and Mexico. The U.S. Geological Survey works closely with IABIN, whose objectives are shared by the United States. This network seeks to build on, not substitute for, other information-sharing initiatives. In July 2000, the U.S. Department of State awarded the U.S. Geological Survey \$132,000 to support the collection and assessment of invasive species information in eleven countries participating in IABIN. Website: [www.NBII.gov/IABIN/](http://www.NBII.gov/IABIN/)

### **The North American Biodiversity Information Network (NABIN)**

NABIN, an initiative of the North American Commission for Environmental Cooperation (CEC), seeks to promote open access to biodiversity data and collaboration among biodiversity scientists in North America (Canada, Mexico and the U.S.). The NABIN data network is developing an infrastructure for search and retrieval of information available electronically on biological collections, and has developed a tool, Species Analyst, for predicting species distributions based on information drawn from distributed databases. The U.S. Geological Survey is on the NABIN steering committee. Providing greater access to biodiversity information should improve and inform policy-makers in their decisions and further education efforts. In July 2000, the U.S. Department of State awarded the U.S. Geological Survey \$40,000 to provide Species Analysis to eleven countries participating in the IABIN network. Website: <http://www.cec.org>

## **Recommendations for Information and Technology Sharing and Technical Assistance**

- 9.8** Review, amend existing and, as appropriate, create new Science and Technology Agreements to enable the United States to openly exchange information and technologies and provide technical assistance that will help limit the spread of invasive species.
- 9.9** Conduct an inventory of U.S. foreign exchange and assistance programs that address invasive species and develop mechanisms for sharing this information and coordinating these programs in an ongoing manner.
- 9.10** Apply information from all parts of the world to develop cost-effective approaches to preventing invasions of non-native species and managing existing invasive species.
- 9.11** Expand opportunities to exchange scientists with other countries in order to improve their training in technologies and techniques to prevent and control the spread of invasive species.
- 9.12** Work with other countries and international organizations to create regional and global networks that conduct of surveillance invasive species and invasion pathways and rapidly respond to new invasions.
- 9.13** Develop international research collaborations to study the biological, social, and economic aspects of invasive species ecology and management.
- 9.14** Provide financial and technical support the Global Invasive Species Program (GISP), as well

other global and regional programs, that facilitate international sharing of information and technology.

### **Codes of Conduct**

Non-native species have played a significant role in international development. They have, for example, been used to increase food and clean water supplies. The U.S. government has sponsored and participated in a wide variety of foreign assistance programs that either intentionally or unwittingly introduced non-native species that became invasive in other countries. In these situations, it is might be the case that the long-term costs of U.S. assistance to developing countries could outweigh the short-run benefits. At times, foreign assistance programs are driven by social and economic crises and do not evaluate the long-term implications of U.S. actions on the environment, economies, or human health.

Certainly, there are economic benefits from increased international commerce. It is now clear that there are also significant long-term costs to controlling the invasive species intentionally or unintentionally spread by the efforts to globalize trade, tourism, and transport. Industries, international organizations, and governments have begun to voluntarily use codes of conduct and other "soft law" tools to minimize the spread of invasive species (Appendix 4). For example, the World Conservation Union (IUCN) offers general guidance to governments and other institutions in its IUCN Guidelines for the Prevention of Biodiversity Loss Caused by Alien Invasive Species.

### **Recommendations for Codes of Conduct**

- 9.15** Conduct adequate risk assessments for the purposeful and accidental introduction of non-native species through U.S. foreign assistance programs and encourage other countries and international organizations to do the same.
- 9.16** Encourage and assist the development assistance, industry, international finance, and government sectors to develop and implement codes of conduct that minimize the risk of introduction and spread of invasive species.
- 9.17** Work with other governments and international organizations to establish regional and global networks that promote "model projects" which voluntarily use the best information and practices available to prevent and control the spread of invasive species.



## **IV. Council Progress and Next Steps**

Executive Order 13112 assigned the Invasive Species Council seven tasks in addition to development of this plan and required that the Council include in the plan a description of how to carry out the tasks. The discussion below reports on the Council's progress to date, along with actions the Council will take over the next two years before revision of the plan.

### **Task 1. Coordination**

**Oversee implementation of Executive Order 13112, including coordination of federal agency activities concerning invasive species.**

#### **Progress**

This broad-based directive requires the Council to develop the means to coordinate the efforts of all federal departments that participate in invasive species programs or whose actions may have direct or indirect effects on the introduction and spread of invasive species.

As the first step, the Council established permanent staff positions and the Council co-chairs appointed liaisons from their departments to the Council staff. The other departments with responsibilities for invasive species were asked to appoint technical liaisons to the Council staff. These people represent an informal but effective interdepartmental group that works directly with Council staff to complete activities assigned by the Council and that has been instrumental in assisting the Council. The group also functions as an information flow and exchange mechanism among the Council, Council staff, and the departments.

The following actions are designed to strengthen the technical liaison group and its ties to the Council, thereby increasing the opportunities for effective coordination of federal invasive species programs.

#### **Next Steps**

- 1.1** Council staff will bring membership in the interdepartmental technical liaison group to full complement by asking the federal departments to appoint representatives from all appropriate departmental agencies or divisions. This task should be completed by September 30, 2000.
- 1.2** Council staff will meet with the interdepartmental technical liaison group on a regular basis and no less than once every three months. The purpose is to ensure that the directives of Executive Order 13112 with respect to federal agencies are being followed, including the directive to undertake the actions recommended in the Council's invasive species management plan. The liaisons will inform the Council of progress on these actions, make recommendations that require Council action, and continue to serve as an information mechanism among the Council, Council staff, and departments.
- 1.3** After each meeting with the technical liaison group, Council staff will summarize the results of the session, including any recommendations for improvements in coordination of federal invasive species efforts that require Council action.
- 1.4** Council staff will develop a process for conflict resolution should problems arise during implementation of recommendations in this plan or in responding to concerns from nonfederal entities and the general public regarding invasive species. This process should be in place by March 2001.

- 1.5 During a special session in October 2000, the Council, Council staff, appropriate federal agency representatives, and the Invasive Species Advisory Committee will prepare a strategy to implement the actions recommended in this plan. The strategy will serve as the basis for federal action and for the Council staff and Technical Liaison group to assess progress.

## **Task 2. Support of nonfederal efforts**

### **Encourage planning and action at local, tribal, state, regional, and ecosystem-based levels to achieve the goals and objectives of the invasive species management plan.**

#### **Progress**

There is little doubt that many of the most effective measures to combat invasive species are occurring at the regional, state, and local levels, often in partnership with federal agencies. The Council believes that except in cases of national emergency and national security, the most appropriate role for the federal government in meeting the invasive species challenge is to support nonfederal efforts through cooperation, research, and free and open technology transfer and dissemination of information.

Executive Order 13112 recognized that the success of any program to address invasive species problems depends on nonfederal partners. The order therefore required the Council to involve the general public and interested parties, including state, tribal, and local governments, in developing this plan. The Council established the nonfederal Invasive Species Advisory Committee, as directed by the order and in accordance with procedures of the Federal Advisory Committee Act, and organized six expert nonfederal/federal working groups to assist in development of this plan. The Council also heard from federal employees and their partners across the country who are engaged in on-the-ground projects to control invasive species and from members of the public at large. These people have had a significant role in shaping the management plan and providing insight for improvements in federal invasive species programs.

#### **Next Steps**

- 2.1 Council staff will convene meetings of the advisory committee on a regular basis and no less than four times prior to the first revision of the plan in early 2003. At least two of the sessions will be held in conjunction with Council meetings.
- 2.2 After each meeting of the advisory committee, Council staff will summarize the proceedings and present any recommendations to the Council that require Council action.
- 2.3 On a continuing basis, Council staff will work with the National Governors' Association, managers of state invasive species programs, tribal governments, the National Association of Counties, regional compacts such as the Great Lakes Panel on Aquatic Nuisance Species and the Intermountain Noxious Weed Advisory Committee, and other appropriate nonfederal entities to solicit their advice and expertise. Staff will prepare a two-year work plan to accomplish this task and present it to the Council in October 2000.

#### **Partnerships in Action: Controlling *Melaleuca* in Southern Florida**

*Melaleuca* (*Melaleuca quinquenervia*) was first introduced into Florida in 1885. Unbridled by natural controls, this Australian evergreen tree spread through the "useless swampland" in southern

Florida, replacing tree islands, marshes, and prairies in the Everglades. A century later, melaleuca—by then widely reputed as the "tree from Hell"—had created a crisis throughout the region. The tree dominated almost a half million acres in southern Florida and showed no signs of halting its advance. Biologists predicted ecological collapse in the Everglades. As well, the high oil content of the tree posed significant fire danger. IN 1985, FIRES in melaleuca stands in Florida caused power outages that cost Florida Power and Light hundreds of millions of dollars in damages.

Early in 1990, the Florida Exotic Pest Plant Council and the South Florida Water Management District convened a task force of scientists and federal, state, and local land managers, among others. The charge was to develop a comprehensive, interagency plan for managing this notorious Everglades invader. The result was the first edition of the Melaleuca Management Plan.

In the ten years since, the plan has guided actions to protect natural areas infested by melaleuca. It has facilitated interagency cooperation and coordination of control efforts, improved efficiency, increased public awareness of the problem, and inspired legislative support.

The plan's strategy is based on finding and controlling outliers (isolated seed-bearing trees) to prevent the advance of melaleuca populations and then progressively eliminate trees toward the source of the infestation. This quarantine approach has been highly successful. Melaleuca acreage declined by nearly one-third over the past decade, primarily at Big Cypress National Preserve, Everglades National Park, the Everglades Water Conservation Areas, and Lake Okeechobee. More than 78 million mature trees and saplings have been treated or removed since control efforts began.

Biological control agents play an essential role in limiting the melaleuca's ability to reproduce and spread. More than 400 insects are known to damage melaleuca in its native Australia. The first melaleuca biocontrol insect released into Florida after intense study by the U.S. Department of Agriculture was a tip-feeding weevil. Field populations of this insect have grown subsequent to initial introduction in 1997, and melaleuca saplings are already being highly stressed at some sites where the weevil was released.

The melaleuca management program in Florida represents a successful work in progress. Resource managers faced seemingly insurmountable obstacles when the fight began, but interagency cooperation is turning the tide. The project has a price tag— about \$25 million to date for biological, mechanical, chemical, and physical controls. But failure to act would have cost the region an estimated \$169 million a year in lost revenues. Potential ecological losses are incalculable.

### **Task 3. International Cooperation**

#### **Develop recommendations for international cooperation in addressing invasive species.**

##### **Progress**

The Council formed an International Working Group under the Invasive Species Advisory Committee. Conclusions and recommendations of this working group form the basis of the sections on International Cooperation and Capacity Building in the draft management plan.

Through a variety of international agreements (Appendix X) and assistance programs, the United States is cooperating with other governments to raise awareness of the problems posed by invasive species and to prevent their introduction and spread. For example, in February 2000, the U.S. and South Africa held a joint meeting on best management practices for the prevention and control of invasive species and issued Kirstenbosch Declaration as a result.

The United States is also working with other countries to create a cooperative governments initiative on invasive species that would develop a collaborative framework for open-ended, intergovernmental cooperation in the management of invasive species.

### **Next Steps**

- 3.1** Hire an Assistant Director for International Policy and Programs on the Invasive Species Council staff. This individual would serve as the U.S. government liaison to the International Working Group and the Global Invasive Species Program.
- 3.2** Create and maintain a web-based system for reporting on the U.S. government's international programs and activities relevant to invasive species.
- 3.3** Create and maintain a library and a web-based bibliography of documents relevant to preventing and controlling the invasion of non-native species internationally. This would include documents produced by international organizations as well as information on the policies and programs of other governments.
- 3.4** Create an interagency working group to identify opportunities, coordinate positions, and monitor progress to improve efforts for preventing the introduction and controlling the spread of invasive species through international agreements.

## **Task 4. NEPA guidance**

**Develop guidance for 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.**

### **Progress**

The Council is preparing a guide based on precepts of the National Environmental Policy Act in cooperation with the President's Council on Environmental Quality. The first draft will be available by the end of August 2000.

### **Next Steps**

- 4.1** Council staff, in conjunction with the federal interdepartmental liaison group, will organize a series of regional workshops for federal invasive species program managers and researchers and their nonfederal partners to discuss the contents of the draft guide and its implications. The workshops will be scheduled between November 2000 and February 2001.
- 4.2** Council staff will report to the Council on the outcome of the workshops by March 31, 2001, including recommendations that may arise from the workshops and that require Council action.
- 4.3** The final guide will be available by June 2001.

## **Task 5. Inventory and monitoring network**

**Develop a coordinated network among federal agencies to document, evaluate, and monitor impacts from invasive species on the economy, the environment, and human health.**

### **Progress**

Assessments and long-term monitoring of invasive species are essential to control the spread of established invasive species. Without assessments and monitoring, it is virtually impossible to determine

the type and extent of the invasion and the damage that these species cause or whether control measures are having an impact.

Experts from around the country and within the federal government delivered this message often during the process of preparing this draft plan, and many of their comments are reflected in the Action Plan section. To develop the coordinated assessment and monitoring network called for in Executive Order 13112, the Council is taking the following steps.

### **Next Steps**

- 5.1** The Council will prepare a Memorandum of Understanding among all appropriate federal departments to establish an invasive species assessment and monitoring network comprised of on-the-ground managers of federal invasive species programs. The memorandum will be in place by November 2000.
- 5.2** The monitoring network leadership will work with appropriate federal agency personnel to coordinate implementation of the monitoring recommendations in this plan.
- 5.3** Council staff will meet periodically, but at least once every six months, with the leadership of the monitoring network to discuss progress and challenges in carrying out the recommendations.
- 5.4** Council staff will assist the monitoring leadership in preparing annual progress reports to the Council. The reports will include any issues that may require Council action.

## **Task 6. Information network**

**Establish a coordinated, up-to-date information-sharing system that utilizes, to the greatest extent practicable, the Internet.**

### **Progress**

The fact that a wealth of information about invasive species exists is encouraging. The fact that the information comes in several often-incompatible formats, stems from a variety of disconnected sources, and may be duplicative or even contradictory presents a challenge. The advantages of computer technology can go far to meet this challenge. However, recent and well-publicized attempts by Hispanic and tribal leaders to encourage hardware and software donations from U.S. corporations demonstrate that not all Americans have ready access to computers in their homes, schools, or local libraries.

The Council has established an information "gateway" that is accessible through the Council's web site on the Internet. As well, the information is available in hard copy for interested people who lack ready access to the Internet.

The gateway contains information about the Council, Council staff, the Council's activities, and other related material. The Council has requested information from each federal department on the invasive species they regulate for inclusion in the gateway. Council staff are developing a user-friendly map that enables visitors to the web site to click on their state or county and learn about invasive species in their area, what is being done to control or eradicate those species, and how they can help. Another feature will provide a list of all invasive species in this country. Clicking on any one of those species leads to extensive information as well as links to the web sites of governmental and nongovernmental entities that are engaged in preventing the introduction and spread of invasive species.

### **Next Steps**

- 6.1** The Council will oversee continued development of the information gateway with the involvement of state, tribal, and local governments; regional compacts; nongovernmental organizations; the private sector; and the public at large. The long-term goal is to provide accessible, updated, comprehensive, and comprehensible information that covers the vast array of measures used to prevent the introduction and spread of invasive species. The Council directs the staff to develop a "case studies" feature that highlights successful regional, statewide, local, and international management practices for possible emulation elsewhere. The Council also encourages:
- federal agencies to make good use of the information gateway as a component of the public education campaign recommended in this plan;
  - the creation of links among the Council's information gateway and databases that the Council recommends federal agencies establish in this plan; and
  - the inclusion of data and information on international efforts to prevent the introduction and control the spread of invasive species and the creation of links to the information gateways of other countries that are involved in invasive species issues.
- 6.2** Council staff will report to the Council on progress regarding the information gateway every six months, commencing in September 2000. The reports will identify needed improvements and the means for incorporating such improvements, including recommendations for Council action.

## **Task 7. Accountability**

### **Update the management plan biennially and evaluate and report on success in achieving the goals and objectives of the plan.**

The Council fully appreciates the need to hold itself accountable for carrying out the actions and recommendations in this plan. The following actions are designed as accountability measures.

- 7.1** The Council will revise the plan every two years in conjunction with the Invasive Species Advisory Committee, all interested parties, and the general public. The revision process will provide an opportunity to make any necessary adjustments. In addition, the Council will submit annual progress reports to federal departmental Secretaries, beginning with the first in February 2001.
- 7.2** Executive Order 13112 requires the Invasive Species Council to "assess the effectiveness of this order no less than once each five years after the order is issued and...report to the Office of Management and Budget on whether the order will be revised." The Council will submit such an assessment to the Office of Management and Budget every five years along with copies of all prior annual progress reports, revised versions of the management plan, and any recommendations for changes to the Executive Order that, in the Council's judgment, are needed.
- 7.3** Many of the recommendations for federal action ask the federal departments to submit reports, assessments, proposals, and other relevant materials to the Council. It is the Council's responsibility to review such materials to ensure that the departments are acting to carry out the recommendations to the best of their ability.

## Appendix 1

### Executive Order 13112 of February 3, 1999 Invasive Species

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.

**Sec. 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.

**Sec. 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.

**Sec. 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; 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.

**Sec. 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 Co-Chairs 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.

**Sec. 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 2. Federal Acts, Agencies, and Authorities Pertaining to Invasive Species

| Department/Agency  | Authority                            | Provisions   | Organisms Addressed                           | Pathways/Mean<br>s of Transport<br>Addressed | Web Site  |
|--|--------------------------------------|--|---|--|---|
| -Dept. of Interior/FWS<br>-Dept. of Transportation/Coast Guard<br>-EPA<br>-Dept. of Defense/Army Corps of Engineers<br>-Dept. of Commerce/NOAA | National Invasive Species Act (1996) | <p>Amended NANPCA to mandate regulations to prevent introduction and spread of aquatic nuisance species into Great Lakes through ballast water</p> <p>Authorized funding for research on aquatic nuisance species prevention and control (Chesapeake Bay, Gulf of Mexico, Pacific Coast, Atlantic Coast, San Francisco Bay-Delta Estuary)</p> <p>Required ballast water management program to demonstrate technologies and practices to prevent nonindigenous species from being introduced</p> <p>Modified composition of Aquatic Nuisance Species Task Force</p> <p>Required Task Force to develop and implement</p> | Aquatic nuisance species and brown tree snake | Unintentional introductions: ballast water   | <a href="http://www.nemw.org/nisa.htm">http://www.nemw.org/nisa.htm</a> |

| Department/Agency  | Authority   | Provisions   | Organisms Addressed      | Pathways/Means of Transport Addressed      | Web Site  |
|--|---|--|--------------------------|--|---|
|  |   | comprehensive program to control the brown tree snake in Guam  |                          |  |   |
| <ul style="list-style-type: none"> <li>-Dept. of Interior/FWS</li> <li>-Dept. of Transportation/Coast Guard</li> <li>-EPA</li> <li>-Dept. of Defense/Army Corps of Engineers</li> <li>-Dept. of Commerce/NOAA</li> </ul> | Non-indigenous Aquatic Nuisance Prevention and Control Act (1990) | <p>Established Aquatic Nuisance Species Task Force to: identify areas where ballast water does not pose an environmental threat, assess whether aquatic nuisance species threaten the ecological characteristics and economic uses of US waters (other than the Great Lakes), determine the need for controls on vessels entering U.S. waters (other than Great Lakes), identify and evaluate approaches for reducing risk of adverse consequences associated with intentional introduction of aquatic species</p> <p>Directs Coast Guard to issue regulations to prevent the introduction and spread of aquatic nuisance species into the Great Lakes through ballast water</p> | Aquatic nuisance species | Unintentional introductions: ballast water | <a href="http://www.anstaskforce.gov/toc.htm">http://www.anstaskforce.gov/toc.htm</a> |

| Department/Agency          | Authority   | Provisions  | Organisms Addressed   | Pathways/Mean of Transport Addressed   | Web Site |
|----------------------------|---|---|---|--|----------|
|                            |   | Directs Corps of Engineers to develop a program of research and technology to control zebra mussels in and around public facilities and make available information on control methods                                   |   |  |          |
|                            | Alien Species Prevention and Enforcement Act (1992) | Makes illegal the shipment of certain categories of plants and animals through U.S. mail  | Plants and animals whose shipment is prohibited under 18 U.S.C. 42;43, or the Lacey Act<br><br>Plants or plant matter whose shipment is prohibited under the Federal Plant Pest Act or Plant Quarantine Act | Intentional introductions:<br>U.S. Mail  |          |
| Dept. of Agriculture/APHIS | Federal Plant Pest Act (1957)                       | Prohibits the movement of plant pests from a foreign country into or through the U.S. unless authorized by Sec. of Agriculture<br><br>Gives APHIS authority to inspect, seize, quarantine, treat, destroy or dispose of | Plant pests   | Unintentional and intentional introduction<br>Importation<br><br>Packing and shipping materials, as well as containers and |          |

| Department/Agency          | Authority                       | Provisions   | Organisms Addressed                      | Pathways/Mean of Transport Addressed                        | Web Site |
|----------------------------|---------------------------------|--|--|---|----------|
|                            |                                 | imported plant and animal materials that are potentially harmful to U.S. agriculture, horticulture and forestry  |  | ships are unregulated                                       |          |
| Dept. of Agriculture/APHIS | Plant Protection Act (1998)     | <p>Will consolidate and modernize all major statutes pertaining to plant protection and quarantine (Federal Noxious Weed Act, Plant Quarantine Act)</p> <p>Permit APHIS to address all types of weed issues<br/> Increase maximum civil penalty for violation<br/> Authorize APHIS to take both emergency and extraordinary emergency actions to address incursions of noxious weeds</p> | Plants and plant material<br>Plant pests | Unintentional and intentional introduction                  |          |
| Dept. of Interior          | Water Resources Development Act | Sec. 506(a)- "In conjunction with the Great Lakes Fishery Commission, the Secretary is authorized to undertake a program for the control of sea lampreys in and around waters of the Great Lakes. The program undertaken   | Sea lamprey                              | Control of existing organisms in and around the Great Lakes |          |

| Department/Agency          | Authority                       | Provisions   | Organisms Addressed | Pathways/Mean of Transport Addressed | Web Site  |
|----------------------------|---------------------------------|--|---------------------|--------------------------------------|---|
|                            |                                 | pursuant to this section may include projects which consist of either structural or nonstructural measures or a combination thereof.”  |                     |                                      |   |
| Dept. of Agriculture/APHIS | Federal Noxious Weed Act (1974) | <p>No person shall import or enter any noxious weed identified in regulation into or through the United States</p> <p>Defines noxious weeds: “any living stage (including, but not limited to, seeds and reproductive parts) of any parasitic or other plant of a kind, or subdivision of a kind, which is of foreign origin, is new to or not widely prevalent in the United States, and can directly or indirectly injure crops, other useful plants, livestock, or poultry or other interests of agriculture, including... the fish and wildlife resources of the United States or the public health”</p> | Noxious weeds       | Intentional introductions: import    | <a href="http://refuges.fws.gov/FICMNEWFile/FederalNoxiousWeedAct.html">http://refuges.fws.gov/FICMNEWFile/FederalNoxiousWeedAct.html</a> |

| Department/Agency           | Authority  | Provisions   | Organisms Addressed  | Pathways/Mean of Transport Addressed   | Web Site   |
|-----------------------------|--|--|--|--|--|
|                             |  | <p>Authorizes APHIS to restrict the introduction and spread of non-native noxious weeds through port-of-entry and follow-up activities</p> <p>Authorizes permanent restrictions and emergency regulations</p>  |  |  |  |
| -Dept. of Agriculture/APHIS | International Plant Protection Convention (1952) | Applies primarily to quarantine pests in international trade. Creates an international regime to prevent spread and introduction of plant and plant product pests premised on exchange of Phytosanitary certificates between importing and exporting countries' national plant protection offices. Parties have national plant protection organizations established according to the Convention with authority in relation to quarantine control, risk analysis and other measures required to prevent the establishment | <p>Pests of plants or plant products: "any form of plant or animal life, or any pathogenic agent, injurious or potentially injurious to plants or plant products"</p> <p>Quarantine pests involved with international trade: "pest of potential national economic importance to the country endangered thereby and not yet present there, or present but not</p> | <p>"Storage places, conveyances, containers and any other object or material capable of harbouring or spreading plant pests, especially where international transportation is involved."</p> <p>-Packing material or matter of any kind accompanying plant products</p> <p>-Storage places</p> <p>-Transportation facilities</p> | <p><a href="http://www.fao.org/legal/treaties/004t-e.htm">http://www.fao.org/legal/treaties/004t-e.htm</a></p> |



| Department/Agency        | Authority                                  | Provisions   | Organisms Addressed                               | Pathways/Means of Transport Addressed       | Web Site |
|--------------------------|--|--|---|---|----------|
|                          |  | and spread of all invasive alien species that, directly or indirectly, are pests of plants. Parties agree to cooperate on information exchange and on the development of International Standards for Phytosanitary Measures.   | widely distributed and being actively controlled” |   |          |
| -Dept. of Agriculture/FS | Hawaii Tropical Forest Recovery Act (1992) | <p>Authorizes Sec. of Agriculture and USFS to establish biological control agents for non-native species</p> <p>Creates task force to develop action plan to:<br/> “promote public awareness of the harm caused by introduced species”<br/> develop recommendations on “the benefits of fencing or other management activities for the protection of Hawaii’s native plants and animals from non-native species, including the identification and priorities for the areas where these activities are appropriate”</p> | Non-native species: not specified further         | Unintentional and intentional introductions |          |

| Department/Agency | Authority   | Provisions   | Organisms Addressed                            | Pathways/Meanings of Transport Addressed            | Web Site  |
|-------------------|---|--|--|---|---|
|                   | Convention on Great Lakes Fisheries Between the United States and Canada (1955) | The Convention established the Great Lakes Fisheries Commission whose purpose is to control and eradicate the non-native, highly invasive Atlantic sea lamprey from the Great Lakes  | Sea lamprey                                    | Introduction through tributaries to the Great Lakes | <a href="http://www.gllfc.org/pubs/conv.htm">http://www.gllfc.org/pubs/conv.htm</a> |
| Dept. of Interior | Coastal Zone Management Act (1972)  |  |  |   |   |
| Dept. of Interior | Lacey Act (1900; amended in 1998)   | <p>Prohibits import of:</p> <ul style="list-style-type: none"> <li>- A list of designated species</li> <li>- Other vertebrates, mollusks, and crustacea that are “injurious to human beings, to the interests of agriculture, horticulture, forestry, or to wildlife or the wildlife resources of the United States”</li> </ul> <p>Declares importation or transportation of any live wildlife as injurious and prohibited, except as provided for under the Act<br/>BUT<br/>Allows import of almost all species for scientific.</p> | Species injurious to human beings or resources | Intentional introduction<br>Trade                   |   |

| Department/Agency                           | Authority  | Provisions  | Organisms Addressed   | Pathways/Means of Transport Addressed | Web Site  |
|---|--|---|---|---------------------------------------|---|
|   |  | medical, education, exhibition, or propagation purposes   |   |                                       |   |
| -Dept. of Agriculture<br>-Dept. of Interior | Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement) (1995) | A supplementary agreement to the World Trade Organisation Agreement. Provides a uniform interpretation of the measures governing safety and plant and animal health regulations. Applicable to all sanitary and Phytosanitary measures directly or indirectly affecting international trade. Sanitary and Phytosanitary measures are defined as any measure applied a) to protect animal or plant life or health within (a Members' Territory) from entry, establishment or spread of pests, diseases, disease carrying organisms; e) to prevent or limit other damage within the (Members Territory) from the entry, establishment or spread of pests (annex A). | Pests, diseases, disease-carrying organisms, or disease-causing organisms | Importation                           | <a href="http://www.wto.org/goods/spsagr.htm">http://www.wto.org/goods/spsagr.htm</a> |
| Dept. of Agriculture/APHIS                  | Plant Quarantine Act (1912)  | Gives APHIS authority to regulate importation and   | Plants (field-grown florists'   | Unintentional and intentional         |   |

| Department/Agency          | Authority  | Provisions  | Organisms Addressed   | Pathways/Means of Transport Addressed  | Web Site  |
|----------------------------|--|---|---|--|---|
| S                          |  | interstate movement of nursery stock and other plants that may carry harmful pests and diseases<br><br>Preempts state quarantines in interstate commerce  | stock, trees, shrubs, vines, etc.)<br>Plant diseases and pests  | introduction   |   |
| Dept. of Agriculture/APHIS | Organic Act of 1944  | Gives APHIS the authority to conduct pest eradication programs  | Pests of plants   | Unintentional introduction   | <a href="http://www.reeusda.gov/1700/legis/org44.htm">http://www.reeusda.gov/1700/legis/org44.htm</a>                   |
| Dept. of Defense           | Convention on the prohibition of the development, production and stockpiling of bacteriological (biological) and toxin weapons and on their destruction (Biological Weapons Convention) (1975) | Article I prohibits parties from developing, producing, stockpiling, acquiring or retaining microbial or other biological agents which are not justified by exclusively peaceful purpose.<br>Article II requires parties to destroy or divert to peaceful purpose all such agents within 9 months of entry into force of the Convention | “Microbial or other biological agents... whatever their origin or method of production, of types and in quantities that have no justification for prophylactic, protective or other peaceful purposes”<br><br>Allows for “international exchange of bacteriological Agents and toxins | “Weapons, equipment or means of delivery designed to use such agents or toxins for hostile purposes” | <a href="http://sun00781.dn.net/nuke/control/bwc/text/bwc.htm">http://sun00781.dn.net/nuke/control/bwc/text/bwc.htm</a> |

| Department/Agency          | Authority  | Provisions   | Organisms Addressed  | Pathways/Mean of Transport Addressed | Web Site  |
|----------------------------|--|--|--|--------------------------------------|---|
|                            |  |  | and equipment for the processing, use or production of bacteriological agents and toxins for peaceful purposes.” |                                      |   |
| Dept. of Agriculture/APHIS | Animal Damage Control Act (1931)                             | <p>Gives APHIS authority to control wildlife damage on federal, state, or private land</p> <p>Protects: field crops, vegetables, fruits, nuts, horticultural crops, commercial forests; freshwater aquaculture ponds and marine species cultivation areas; livestock on public and private range and in feedlots; public and private buildings and facilities; civilian and military aircraft; public health</p> | Damaging species (nutria, blackbirds, European starlings, monk parakeets)  | Unintentional introductions          |   |
|                            | North American Agreement on Environmental Cooperation (1994) | Article 10 (2)(h): the Council of the Commission on Environmental Cooperation may develop recommendations regarding exotic species which may   | “Exotic” species: not specified further  | Not specified                        | <a href="http://www.cec.org">http://www.cec.org</a> |

| Department/Agency          | Authority   | Provisions   | Organisms Addressed                               | Pathways/Means of Transport Addressed                      | Web Site  |
|----------------------------|---|--|---|--|---|
|                            |   | be harmful   |   |  |   |
| EPA                        | Federal Insecticide, Fungicide, and Rodenticide Act | Gives EPA authority to regulate importation and distribution of substances, including organisms, that are intended to function as pesticides   | Biological control agents                         | Intentional introduction                                   | <a href="http://www.epa.gov/pesticides/fifra.htm">http://www.epa.gov/pesticides/fifra.htm</a> |
| Dept. of Agriculture/APHIS | Federal Seed Act (1939)                             | Requires accurate labeling and purity standards for seeds in commerce<br><br>Prohibits importation and movement of adulterated or misbranded seeds   | Seeds   | Intentional introduction through trade                     |   |
| All                        | National Environmental Protection Act (1970)        | Requires federal government agencies to consider the environmental effects of their actions through preparation of environmental impact statements- effects of non-native species, if harmful to the environment, must be included in the EIS<br>A. BUT<br>APHIS may approve and issue permits for importing nonindigenous species following preparation of an environmental assessment rather than an | Non-native species posing harm to the environment | Intentional introductions related to major federal actions | <a href="http://es.epa.gov/oea/ofa/nepa.html">http://es.epa.gov/oea/ofa/nepa.html</a>         |

| Department/Agency                   | Authority  | Provisions  | Organisms Addressed   | Pathways/Means of Transport Addressed  | Web Site   |
|-------------------------------------|--|---|---|--|--|
|                                     |  | environmental impact statement—permits for importing nonindigenous species into containment facilities or interstate movement between containment facilities are excluded from NEPA requirements  |   |  |  |
| Dept. of Interior                   | Convention on International Trade in Endangered Species (CITES) (1975) | Represents alternate model for regulating invasive species not already covered by the IPPC or other agreements. Convention intended to prevent harm in <i>exporting</i> country; however, can be applied when species is endangered in exporting country and considered an invasive in importing country. | Species of flora and fauna which are threatened or endangered in exporting countries (Appendices I, II and III) | Intentional introductions through trade: export, re-export, import and introduction from the sea | <a href="http://international.fws.gov/global/citext.html">http://international.fws.gov/global/citext.html</a><br><br>(For appendices, see: <a href="http://international.fws.gov/global/cites.html">http://international.fws.gov/global/cites.html</a> ) |
| Dept. of Interior                   | Wild Bird Conservation Act (1992)                                      | Regulates importation of foreign wild birds   | Birds<br>Non-native parasites and diseases transported by foreign birds   | Importation  | <a href="http://international.fws.gov/global/law102.html">http://international.fws.gov/global/law102.html</a>  |
| -Dept. of Interior/FWS<br>-Dept. of | Endangered Species Act   | Protects endangered species   | Non-native species posing a danger to local   | Not specified  | <a href="http://endangered.fws.gov/esa.html">http://endangered.fws.gov/esa.html</a>  |

| Department/Agency | Authority                         | Provisions   | Organisms Addressed | Pathways/Mean of Transport Addressed                         | Web Site  |
|-------------------|-----------------------------------|--|---------------------|--|---|
| Commerce/NMFS     |                                   | When non-native invasive species threaten endangered species, this act could be used as basis for their eradication  | endangered species  |  |   |
| All               | Executive Order 13112 (Feb. 1999) | <p>Defines invasive species (“any species, including its seeds, eggs, spores, or other biological material capable of propagating that species, that is not native to that ecosystem”)</p> <p>Directs all federal agencies to:</p> <ul style="list-style-type: none"> <li>-Address invasive species concerns</li> <li>-Refrain from actions likely to increase invasive species problems</li> </ul> <p>Creates interagency Invasive Species Council</p> <p>Calls for National Invasive Species Management Plan to better coordinate federal agency efforts</p> |                     | Unintentional and intentional introductions: escape, release | <a href="http://refuges.fws.gov/FICMNEWFile/eo.html">http://refuges.fws.gov/FICMNEWFile/eo.html</a> |
|                   |                                   |  |                     |  |   |





## Appendix 3. International Legal Instruments With Programs/ Activities Pertaining to Invasive Species<sup>2</sup>

### Global Conventions/ Treaties

| International Agreement                          | Relevance to Invasive Species   | Dates of Action                               | Has US Ratified?     | Organisms Addressed   | Pathways/Means of Transport Addressed   | Participating Entities | Web Site  |
|--|---|---|----------------------|---|---|------------------------|---|
| International Plant Protection Convention (IPPC) | Applies primarily to quarantine pests in international trade. Creates an international regime to prevent spread and introduction of plant and plant product pests premised on exchange of Phytosanitary certificates between importing and exporting countries' national plant protection offices. Parties have national plant protection organisations established according to the Convention with authority in relation to quarantine control, risk analysis and other measures required to prevent the establishment and spread of all invasive alien species that, directly or indirectly, are pests of plants. Parties agree to co- | 1951 adopted<br>1952 in force<br>1987 amended | Yes<br>18 Aug.<br>72 | Pests of plants or plant products:<br>“any form of plant or animal life, or any pathogenic agent, injurious or potentially injurious to plants or plant products.”<br><br>Quarantine pests involved with international trade:<br>“pest of potential national economic importance to the country endangered thereby and not yet present there. | “Storage places, conveyances, containers and any other object or material capable of harbouring or spreading plant pests, especially where international transportation is involved.”<br><br><sup>3</sup> -Packing material or matter of any kind accompanying plant products<br>-Storage places<br>-Transportation | National governments   | <a href="http://www.fao.org/legal/treaties/004t-e.htm">http://www.fao.org/legal/treaties/004t-e.htm</a> |

<sup>2</sup> Adapted and updated from OTS (1993), UNEP (1996), Glowka and Klemm (1996), Bright (1998), and products of the IUCN Environmental Law Centre

| <b>International Agreement</b>                                    | <b>Relevance to Invasive Species</b>   | <b>Dates of Action</b>        | <b>Has US Ratified?</b> | <b>Organisms Addressed</b>   | <b>Pathways/Means of Transport Addressed</b>  | <b>Participating Entities</b>  | <b>Web Site</b>   |
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|   | operate on information exchange and on the development of International Standards for Phytosanitary Measures, which include agreements on definitions (terminology), and ways of working (procedures). Supplementary agreements on regions, pests, plants or plant products, and methods of international transport. Regional agreements exist for Europe and the Mediterranean region; the Asia-Pacific region, and the Near East |                               |                         | or present but not widely distributed and being actively controlled.”  | facilities  |  |   |
| Agreed Measures for the Conservation of Antarctic Fauna and Flora | Article IX (1-4): Participating governments shall prohibit introduction of non-indigenous plants and animals into the Treaty Area except in accordance with a permit. Further, permits under paragraph 1 of this Article shall be drawn in terms as specific as possible and shall be issued to allow importation only of the animals and plants listed in annex C.  | 1964 adopted<br>1982 in force |                         | Any species of animal or plant not indigenous to the Area<br><br>Does NOT apply to food “so long as animals and plants used for this purpose are kept under controlled conditions” | Importation and unintentional introduction (permits granted for the following: sled dogs, domestic animals and plants, laboratory animals and plants) | National governments: Governments entitled to participate under Article IX of the Antarctic Treaty | <a href="http://www.antarc.utas.edu.au/opor/Treaties/aff64.html">http://www.antarc.utas.edu.au/opor/Treaties/aff64.html</a> |
| The Convention on Wetlands (Ramsar)                               |  | 1971 adopted                  | Yes<br>18 Dec.          | Not specified  | Not specified   | “Any member of the United  | <a href="http://www.ramsar.org/index.html">http://www.ramsar.org/index.html</a>   |

| International Agreement  | Relevance to Invasive Species   | Dates of Action                               | Has US Ratified?    | Organisms Addressed   | Pathways/Means of Transport Addressed  | Participating Entities  | Web Site  |
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| Convention)  |   | 1975 in force                                 | 1986                |   |  | Nations or of one of the Specialised Agencies or of the International Atomic Energy Agency or Party to the Statute of the International Court of Justice” |   |
| Convention on the prohibition of the development, production and stockpiling of bacteriological (biological) and toxin weapons and on their destruction (=Biological Weapons Convention (BWC | Article I prohibits parties from developing, producing, stockpiling, acquiring or retaining microbial or other biological agents which are not justified by exclusively peaceful purpose.<br>Article II requires parties to destroy or divert to peaceful purpose all such agents within 9 months of entry into force of the Convention | 10 Apr. 1972 adopted<br>26 Mar. 1975 in force | Yes<br>26 Mar. 1975 | “Microbial or other biological agents... whatever their origin or method of production, of types and in quantities that have no justification for prophylactic, protective or other peaceful purposes”<br><br>Allows for “international exchange of bacteriological Agents and toxins and equipment for the processing. | “Weapons, equipment or means of delivery designed to use such agents or toxins for hostile purposes” | National governments  | <a href="http://sun00781.dn.net/nuke/control/bwc/text/bwc.htm">http://sun00781.dn.net/nuke/control/bwc/text/bwc.htm</a> |

| International Agreement   | Relevance to Invasive Species   | Dates of Action                               | Has US Ratified?       | Organisms Addressed   | Pathways/Means of Transport Addressed  | Participating Entities  | Web Site   |
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|   |   |   |                        | use or production of bacteriological agents and toxins for peaceful purposes.”                                  |  |   |  |
| Convention on International Trade in Endangered Species (CITES) | Represents alternate model for regulating invasive species not already covered by the IPPC or other agreements. Convention intended to prevent harm in <i>exporting</i> country; however, can be applied when species is endangered in exporting country and considered an invasive in importing country. Regulates only intentional movements.                 | 03 Mar. 1973 adopted<br>17 Jan. 1975 in force | Yes<br>14 January 1974 | Species of flora and fauna which are threatened or endangered in exporting countries (Appendices I, II and III) | Intentional introductions through trade: export, re-export, import and introduction from the sea | National governments  | <a href="http://international.fws.gov/global/citestxt.html">http://international.fws.gov/global/citestxt.html</a><br><br>(For appendices, see: <a href="http://international.fws.gov/global/cites.html">http://international.fws.gov/global/cites.html</a> ) |
| Convention on Migratory Species of Wild Animals                 | Article III (4)(c): Range State Parties of Endangered Migratory Species (Annex1) to the extent feasible and appropriate to endeavour to prevent, reduce or control factors that are endangering or likely to further endanger the species, including strictly controlling the introduction of or, controlling or eliminating already introduced exotic species. | 23 June 1979 adopted<br>1 Nov. 1983 in force  | No                     | Exotic species which endanger migratory species   | Not specified  | National governments or any regional economic integration organizations constituted by sovereign states | <a href="http://www.wcmc.org.uk/cms/index2.htm">http://www.wcmc.org.uk/cms/index2.htm</a>  |

| International Agreement   | Relevance to Invasive Species   | Dates of Action                             | Has US Ratified?    | Organisms Addressed                             | Pathways/Means of Transport Addressed | Participating Entities   | Web Site  |
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|   | Annex II Article V (4): Agreements for Annex II Migratory Species “where appropriate and feasible should provide for strict control of the introduction of, or control of already introduced exotic species detrimental to the migratory species.                               |   |                     |   |                                       |  |   |
| Convention on the Conservation of Antarctic Marine Living Resources | Article II (3)(c): Parties should prevent changes or minimise the risk for changes in the marine ecosystem not potentially reversible over two or three decades, taking into account the state of available knowledge including the effect of the introduction of alien species | 20 May 1980 adopted<br>7 Apr. 1982 in force | Yes<br>18 Feb. 1982 | Species posing a danger to the marine ecosystem | Not specified                         | National governments and regional economic integration organizations: “any State interested in research or harvesting activities in relation to the marine living resources to which this Convention applies” and “regional economic integration organizations constituted by sovereign States | <a href="http://sedac.ciesin.org/pidb/texts/antarctic_marine_resources_1980.html">http://sedac.ciesin.org/pidb/texts/antarctic_marine_resources_1980.html</a> |

| <b>International Agreement</b>                               | <b>Relevance to Invasive Species</b>  | <b>Dates of Action</b>                        | <b>Has US Ratified?</b> | <b>Organisms Addressed</b>   | <b>Pathways/Means of Transport Addressed</b>      | <b>Participating Entities</b>  | <b>Web Site</b>   |
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|  |   |   |                         |  |   | which include among their members one or more States Members of the Commission”        |   |
| United Nations Convention on the Law of the Sea (UNCLOS)     | Article 196: States to take all measures necessary to prevent, reduce and control the intentional or accidental introduction of species, alien or new, to a particular part of the marine environment, which may cause significant and harmful changes thereto. | 10 Dec. 1982 adopted<br>16 Nov. 1994 in force | No Signed 29 July 94    | Species causing “significant and harmful changes” to the marine environment      | Unintentional and intentional introductions       | National governments   | <a href="http://www.antrc.utas.edu.au/opor/Treaties/unclos.html">http://www.antrc.utas.edu.au/opor/Treaties/unclos.html</a> |
| Protocol to the Antarctic Treaty on Environmental Protection | Article 4 (1) of Annex II: No species of animal or plant not native to the Antarctic Treaty Area shall be introduced onto land or ice-shelves, or into water in the Antarctic Treaty Area except in accordance with a permit.                                   | 1991 adopted<br>1998 in force                 |                         | Non-native animal and plant species<br>Micro-organisms<br>Does NOT apply to food | Importation (regulated by permit: see Appendix B) | National governments: “any State which is a Contracting Party to the Antarctic Treaty” | <a href="http://www.umweltbundesamt.de/antarktis-e/gzusp.htm">http://www.umweltbundesamt.de/antarktis-e/gzusp.htm</a>       |
| Convention on Biological Diversity (CBD)                     | Article 8 (h): Contracting Party, as far as possible and as appropriate to “prevent the introduction of, control or eradicate those alien species which threaten ecosystems.  | 5 June 1992 adopted<br>29 Dec. 1993 in force  | No Signed 04 June 93    | Modified organisms and alien invasive species which threaten “ecosystems.        | Unintentional and intentional introductions       | National governments   | <a href="http://www.biodiv.org/">http://www.biodiv.org/</a>   |

| <b>International Agreement</b>                             | <b>Relevance to Invasive Species</b>  | <b>Dates of Action</b>                      | <b>Has US Ratified?</b> | <b>Organisms Addressed</b>                                      | <b>Pathways/Means of Transport Addressed</b> | <b>Participating Entities</b>  | <b>Web Site</b>   |
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|  | habitats or species.<br><br>Article 8 (g): Parties to establish or maintain means to regulate, manage or control the risks associated with the use and release of living modified organisms resulting from biotechnology which are likely to have adverse environmental impacts that could affect the conservation and sustainable use of biological diversity, taking also into account the risks to human health. |   |                         | habitats or species”  |  |  |   |
| Framework Convention on Climate Change                     | Strives to stabilize (and eventually reduce) greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. [Changes in temperature and rainfall patterns can induce new invasions and exacerbate existing invasions].   | 9 May 1992 adopted<br>21 Mar. 1994 in force | Yes<br>15 Oct. 1992     | Not specified   | Not specified                                | National governments and regional economic integration organizations | <a href="http://www.unfccc.de">http://www.unfccc.de</a>                               |
| Agreement on the Application of Sanitary and Phytosanitary | A supplementary agreement to the World Trade Organisation Agreement. Provides a uniform interpretation of the   | 1994 adopted<br>1995 in force               |                         | Pests, diseases, disease-carrying organisms, or disease-causing | Importation                                  | National governments   | <a href="http://www.wto.org/goods/spsagr.htm">http://www.wto.org/goods/spsagr.htm</a> |



| International Agreement  | Relevance to Invasive Species   | Dates of Action                               | Has US Ratified? | Organisms Addressed                   | Pathways/Means of Transport Addressed   | Participating Entities | Web Site  |
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| Measures (SPS Agreement)   | measures governing safety and plant and animal health regulations. Applicable to all sanitary and Phytosanitary measures directly or indirectly affecting international trade. Sanitary and Phytosanitary measures are defined as any measure applied a) to protect animal or plant life or health within (a Members' Territory) from entry, establishment or spread of pests, diseases, disease carrying organisms; e) to prevent or limit other damage within the (Members Territory) from the entry, establishment or spread of pests (annex A). |   |                  | organisms                             |   |                        |   |
| Agreement concerning Cooperation in the Quarantine of Plants and their Protection against Pests and Diseases | Article VI: Parties undertake to apply measures to prevent the introduction from one country into another, in exported consignments of goods or by any other means, of quarantinable plant pests and diseases and weeds specified in lists to be drawn up by agreement between the parties concerned.   | 14 Dec. 1959 adopted<br>19 Oct. 1960 in force | No               | Plant pests and diseases: see Annex A | Unintentional and intentional introductions<br>-Imports<br>-Packing material (leaves, hay specifically) | National governments   | <a href="http://sedac.ciesin.org/pidb/texts/quarantine.of.plants.1959.html">http://sedac.ciesin.org/pidb/texts/quarantine.of.plants.1959.html</a> |

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|  | Annex -- List of the Principal Quarantinable Pests, Diseases and Noxious Weeds   |                        |                         |   |  |  |   |
| Convention on the Law of Non-navigational Uses of International Watercourses | Article 22: Watercourse states shall take all necessary measures to prevent the introduction of species, alien or new, into an international watercourse which may have effects detrimental to the ecosystem of the watercourse resulting in significant harm to other watercourse states.   | 1997 adopted           |                         | Species “detrimental to the ecosystem of the watercourse” | Unintentional and intentional introduction   | National governments and regional economic integration organizations | <a href="http://www.un.org/law/ilc/texts/nnavfra.htm">http://www.un.org/law/ilc/texts/nnavfra.htm</a> |
| Program on Action for the Development of Small Island Developing States      | Paragraph 41: Introduction of certain non-indigenous species noted as one of a number of significant causes of biodiversity loss.<br>Paragraph 45 (A)(I):Formulate integrated strategies at national level for conservation and sustainable use of marine and terrestrial biodiversity including protection from certain non-indigenous species.<br>Paragraph 45(B)(I): At regional level encourage countries to give priority to sites of biological significance; strengthen community support for their protection. including | 1994                   |                         | Not specified   | Not specified                                | National governments   | <a href="http://www.unep.ch/islands/dsidscnf.htm">http://www.unep.ch/islands/dsidscnf.htm</a>         |

| International Agreement                  | Relevance to Invasive Species   | Dates of Action | Has US Ratified? | Organisms Addressed   | Pathways/Means of Transport Addressed | Participating Entities  | Web Site  |
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|  | <p>their protection from non-indigenous species introduction.<br/>           Paragraph 55(A)(iii):Address quarantine problems at national level and requirements stemming from changing transport situations and climate change<br/>           Paragraph 55(B)(ii):Regionally develop effective quarantine services; upgrade existing plant protection and related programs.<br/>           Paragraph 55(C)(ii): Internationally co-operate with national bodies to design and enforce effective quarantine systems<br/>           Paragraph 99: Undertake study of effects of trade liberalisation and globalisation on Small Island Developing State sustainable development.</p> |                 |                  |   |                                       |   |   |
| Biosafety Protocol (Protocol to the CBD) | Article 4: “This Protocol shall apply to the transboundary movement, transit, handling and use of all living modified organisms that may have adverse effects on the conservation and sustainable use of biological diversity”  | 1998            | No               | <p>“living modified organisms”</p> <p>Living modified organisms intended for direct use as food or feed, or for</p> | Importation Transport and packaging   | National governments: States and regional economic integration organizations (represented by one national focal | <a href="http://www.biodiv.org/biosafe/Biosafe-Prot.html">http://www.biodiv.org/biosafe/Biosafe-Prot.html</a> |

| International Agreement | Relevance to Invasive Species  | Dates of Action | Has US Ratified? | Organisms Addressed            | Pathways/Means of Transport Addressed | Participating Entities                                | Web Site |
|-------------------------|--|-----------------|------------------|--------------------------------|---------------------------------------|---|----------|
|                         | <p>Article 17.1: “Each Party shall take appropriate measures to notify affected or potentially affected States, the Biosafety Clearing-House and, where appropriate, relevant international organizations, when it knows of an occurrence under its jurisdiction resulting in a release that leads, or may lead, to an unintentional transboundary movement of a living modified organism”</p> <p>Article 18.1: “Each Party shall take necessary measures to require that living modified organisms that are subject to intentional transboundary movement within the scope of this Protocol are handled, packaged and transported under conditions of safety”</p> <p>UNEP International Technical Guidelines for Safety in Biotechnology- guidelines used as interim mechanism during the development of the Biosafety Protocol and now used for the purpose of “facilitating the</p> |                 |                  | processing, treated separately |                                       | point and one or more competent national authorities) |          |

| <b>International Agreement</b> | <b>Relevance to Invasive Species</b>  | <b>Dates of Action</b> | <b>Has US Ratified?</b> | <b>Organisms Addressed</b> | <b>Pathways/Means of Transport Addressed</b> | <b>Participating Entities</b> | <b>Web Site</b> |
|--------------------------------|---|------------------------|-------------------------|----------------------------|--|-------------------------------|-----------------|
|                                | development of national capacities to assess and manage risks, establish adequate information systems and develop expert human resources” |                        |                         |                            |  |                               |                 |

**I. Regional Conventions/ Treaties**

| <b>International Agreement</b>   | <b>Relevance to Invasive Species</b>   | <b>Dates of Action</b>                       | <b>Has US Ratified?</b> | <b>Organisms Addressed</b>  | <b>Pathways/Means of Transport Addressed</b> | <b>Participating Entities</b>   | <b>Web Site</b>   |
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| Convention for the Establishment of the European and Mediterranean Plant Protection Organisation | Article V(a)<br>The functions of the Organisation shall be: 2) to advise Member Governments on the technical, administrative and legislative measures necessary to prevent the introduction and spread of pests and diseases of plants and plant products; | 18 Apr. 1951 adopted<br>1 Nov. 1953 in force | N/A                     | Pests and diseases of plants and plant products, with special attention to:<br>Colorado beetle; potato root eelworm; San Jose scale; potato wart disease; insect, fungus and rodent pests of stored foods and rodent pests of crops; fall webworm | Not specified                                | National governments:<br>Restricted to those countries listed in Schedule III of the Convention | <a href="http://sedac.ciesin.org/pidb/register/reg-008.rrr.html">http://sedac.ciesin.org/pidb/register/reg-008.rrr.html</a> |

| International Agreement  | Relevance to Invasive Species   | Dates of Action                              | Has US Ratified? | Organisms Addressed   | Pathways/Means of Transport Addressed  | Participating Entities   | Web Site  |
|--|---|--|------------------|---|--|--|---|
| Plant Protection Agreement for the Southeast Asia and Pacific Region | <p>Preamble: The Contracting Governments, desiring to prevent, through concerted action, the introduction into and spread within the South East Asia and Pacific Region of destructive plant diseases and pests, have concluded the following Agreement, which is a supplementary agreement under Article III of the International Plant Protection Convention.</p> <p>Article III: Measures regarding the importation of Plants from outside the region. For the purpose of preventing the introduction into its territory or territories of destructive diseases and pests, and in particular those listed in Appendix A to this Agreement, each Contracting Government shall use its best endeavours to apply with respect to the importation of any plants, including their packing and containers, and any packing and containers of plant origin.</p> | 27 Feb. 1956 adopted<br>2 July 1956 in force | No               | <p>Destructive plant diseases and pests--</p> <p>Destructive pests and diseases not yet established in the Southeast Asia and Pacific Region- SEE APPENDIX A for listings</p> <p>Particular attention given to South American Leaf Blight of Heava<br/>SEE APPENDIX B</p> <p>Does NOT include:<br/>-plants imported for food or analytical, medicinal, or manufacturing purposes<br/>-seeds of annual, biennial field crops</p> | Importation of plants, packing and containers accompanying plants, or packing and containers of plant origin from outside the Region | National governments:<br>Any State situated in the region or any Government which is responsible for the international relations of any territory or territories in the region | <a href="http://sedac.ciesin.org/pidb/register/reg-016.rrr.html">http://sedac.ciesin.org/pidb/register/reg-016.rrr.html</a> |

| International Agreement | Relevance to Invasive Species  | Dates of Action | Has US Ratified? | Organisms Addressed   | Pathways/Means of Transport Addressed | Participating Entities | Web Site |
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|                         | <p>from anywhere outside the Region, such measures of prohibition, certification, inspection, disinfection, disinfestation, quarantine, destruction or other measures as may be recommended by the Committee, taking into consideration the provisions of Articles V and VI of the International Plant Protection Convention.</p> <p>Article V -- Measures regarding the Movement of Plants within the Region: For the purpose of preventing the spread within the Region of destructive diseases and pests, each Contracting Government shall use its best endeavours to apply, with respect to the importation into its territory of any plants, including packings and containers, and any packings and containers of plant origin, from another territory within the Region, such measures or prohibition certification.</p> |                 |                  | <p>or vegetables, all seeds or cut flowers of annual, biennial, or perennial ornamental plants which are herbaceous -processed plant products</p> |                                       |                        |          |

| <b>International Agreement</b>                            | <b>Relevance to Invasive Species</b>   | <b>Dates of Action</b>                        | <b>Has US Ratified?</b> | <b>Organisms Addressed</b>            | <b>Pathways/Means of Transport Addressed</b> | <b>Participating Entities</b>                                       | <b>Web Site</b> |
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|   | inspection, disinfection, disinfestation, quarantine, destruction or other measures as may be recommended by the Committee, in addition to measures already adopted by each Contracting Government.  |   |                         |                                       |  |   |                 |
| Convention Concerning Fishing in the Waters of the Danube | Article 10: acclimatisation and breeding of new fish species, other animals and aquatic plants prohibited in Danube waters without consent of Convention Commission.   | 29 Jan. 1958 adopted<br>20 Dec. 1958 in force | N/A                     | Fish and other animals                | Intentional introductions                    | National governments of the Danubian Region                         |                 |
| Phyto-sanitary Convention for Africa                      | Preamble: Heads of African State and Government of the Organisation of African Unity: Considering that all possible steps should be taken -<br>(a) to prevent the introduction of diseases, insect pests, and other enemies of plants into any part of Africa;<br>(b) to eradicate or control them in so far as they are present in the area; and<br>(c) to prevent their spread to other territories within the area.<br><br>Article V: Each Member State shall take such action as may | 1967 adopted<br>1974 in force                 | N/A                     | Plant diseases and insect plant pests | Importation<br>Packing material              | National governments belonging to the Organization of African Unity |                 |



| International Agreement  | Relevance to Invasive Species   | Dates of Action                                | Has US Ratified? | Organisms Addressed  | Pathways/Means of Transport Addressed   | Participating Entities  | Web Site  |
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|  | be desirable to deal effectively with diseases, insect pests and other enemies of plants in its territory which the OAU considers have become, or are likely to become, a serious danger within Africa.   |  |                  |  |   |   |   |
| African Convention on the Conservation of Nature and Natural Resources | Article III (4)(a)(ii) and (b): any act in a strict nature reserve or national park likely to harm or disturb the fauna and flora, including the introduction of zoological or botanical specimens, whether indigenous or imported, wild or domesticated, is to be strictly prohibited. | 15 Sept. 1968 adopted<br>16 June 1969 in force | N/A              | Non-indigenous plants and animals: not specified further   | Intentional introduction  | National governments: Independent African states  |   |
| Convention on the Conservation of Nature in the South Pacific          | Article V (4): Parties shall carefully consider the consequences of deliberate introduction into ecosystems of species not previously occurring therein.  | 12 June 1976 adopted<br>28 June 1990 in force  | N/A              | Not specified (“species not previously occurring therein”) | Intentional introductions (“deliberate introduction”) : Not specified further | National governments: “all States members of the South Pacific Commission or eligible to be invited to become members of that Commission” | <a href="http://sedac.ciesin.org/pidb/texts/nature.south.pacific.1976.html">http://sedac.ciesin.org/pidb/texts/nature.south.pacific.1976.html</a> |
| Convention on  | Article 11(2)(b): Each  | 19 Sept.                                       | N/A              | “Non-native  | Not specified   | National  | <a href="http://www.coe.fr/eng/">http://www.coe.fr/eng/</a>   |

| International Agreement  | Relevance to Invasive Species  | Dates of Action                             | Has US Ratified? | Organisms Addressed             | Pathways/Means of Transport Addressed              | Participating Entities   | Web Site  |
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| the Conservation of European Wildlife and Natural Habitats         | contracting Party undertakes to strictly control the introduction of non-native species.   | 1979 adopted<br>1 June<br>1982 in force     |                  | species”                        |  | governments:<br>“member States of the Council of Europe and non-member States which have participated in (the Convention’s) elaboration and by the European Economic Community”  | <a href="http://legaltxt/104e.htm">legaltxt/104e.htm</a>  |
| Benelux Convention on Nature Conservation and Landscape Protection |  | 8 June 1982 adopted<br>1 Oct. 1983 in force | N/A              | Not specified                   | Not specified                                      | National governments of Belgium, the Netherlands, and Luxembourg   | <a href="http://sedac.ciesin.org/pidb/texts/benelux_landscape.protection.1982.html">http://sedac.ciesin.org/pidb/texts/benelux_landscape.protection.1982.html</a> |
| Protocol Concerning Mediterranean Specially Protected Areas        | Article 7(e): Parties to progressively take measures to prohibit the introduction of exotic species into marine protected areas. | 1982 adopted<br>1986 in force               | N/A              | Not specified: “exotic species” | Intentional introduction:<br>Not specified further | National governments and regional economic organizations:<br>“any State invited to the Conference of Plenipotentiaries on the Protocol concerning Mediterranean Specially Protected Areas” and “any regional economic grouping of which at | <a href="http://sedac.ciesin.org/pidb/texts/acrc/mspecp.txt.html">http://sedac.ciesin.org/pidb/texts/acrc/mspecp.txt.html</a>                                     |

| International Agreement  | Relevance to Invasive Species   | Dates of Action                              | Has US Ratified? | Organisms Addressed                 | Pathways/Means of Transport Addressed | Participating Entities   | Web Site  |
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|  |   |  |                  |                                     |                                       | least one member is a coastal State of the Mediterranean Sea Area” |   |
| ASEAN Agreement on the Conservation of Nature and Natural Resources                        | Article 3(3): Parties shall endeavour to regulate and, where necessary, prohibit the introduction of exotic species.  | 9 July 1985 adopted<br>Not yet in force      | N/A              | Not specified: “exotic species”     | Not specified                         | National governments: members of ASEAN                             | <a href="http://sunsite.nus.edu.sg/apcel/kl treaty.html">http://sunsite.nus.edu.sg/apcel/kl treaty.html</a> |
|  |   |  |                  |                                     |                                       |  |   |
| Protocol Concerning Protected Areas and Wild Fauna and Flora in the Eastern African Region | Articles 7 and 10(f): Parties to take all appropriate measure to prohibit intentional or accidental introduction of alien or new species which may cause significant or harmful changes to the Eastern Africa Region, and that Parties shall regulate any act likely to harm or disturb fauna and flora in marine protected areas, including introduction of non-indigenous plants and animals. | 21 June 1985 adopted<br>30 May 1996 in force | N/A              | “Non-indigenous plants and animals” | Not specified                         | National governments   |   |
| Protocol for the Conservation and Management of Protected Marine and                       | Parties shall take measures to prevent, reduce and control environmental deterioration in marine protected areas including, to the extent possible, the introduction of   | 1989 adopted                                 |                  |                                     |                                       |  |   |

| <b>International Agreement</b>  | <b>Relevance to Invasive Species</b>  | <b>Dates of Action</b>                  | <b>Has US Ratified?</b> | <b>Organisms Addressed</b>                               | <b>Pathways/Means of Transport Addressed</b> | <b>Participating Entities</b>   | <b>Web Site</b>   |
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| Coastal Areas of the South East Pacific   | exotic species of flora and fauna.  |   |                         |  |  |   |   |
| Protocol Concerning Specially Protected Areas Wildlife to the Convention for the Protection and development of the Marine Environment of the Wider Caribbean Area | Articles 5.2 (f) and 12: Each Party to take all appropriate measures to regulate or prohibit the intentional or accidental introduction of non-indigenous or genetically altered species to the wild that may cause harmful impacts to the natural flora, fauna and other features of the wider Caribbean Region. | 1990 adopted                            |                         | Non-indigenous and genetically altered species           | Unintentional and intentional introductions  | National governments  | <a href="http://www.cep.unep.org/pubs/legislation/spaw.html">http://www.cep.unep.org/pubs/legislation/spaw.html</a> |
| Convention for the Conservation of the Biodiversity and the Protection of Wilderness Areas in Central America   | Article 24: Parties agree that all mechanisms shall be established for the control or eradication of all exotic species which threaten ecosystems, habitats and wild species.   | 5 June 1992 adopted<br>Not yet in force | N/A                     | Alien species which endanger Central American ecosystems | Not specified                                | National governments: Central American states and other states of the Mesoamerican region |   |
| North American Agreement on Environmental Cooperation   | Article 10 (2)(h): the Council of the Commission on Environmental Co-operation may develop recommendations regarding exotic species which   | 14 Sept. 1993 adopted<br>1 Jan. 1994 in | Yes                     | “Exotic” species: not specified further                  | Not specified                                | National governments: US, Canada, Mexico  | <a href="http://www.cec.org">http://www.cec.org</a>   |

| <b>International Agreement</b>  | <b>Relevance to Invasive Species</b>   | <b>Dates of Action</b>                   | <b>Has US Ratified?</b> | <b>Organisms Addressed</b>         | <b>Pathways/Mean s of Transport Addressed</b> | <b>Participating Entities</b>                                 | <b>Web Site</b> |
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|   | may be harmful   | force                                    |                         |                                    |   |   |                 |
| Agreement for the Establishment of the Near East Plant Protection Organisation  | Article IV (a): promote the implementation of the provisions of the International Plant Protection Convention with particular attention to measures for the control of pests, and advise Governments on the technical, administrative and legislative measures necessary to prevent the introduction and spread of pests of plants and plant products; | 18 Feb. 1993 adopted<br>Not yet in force | N/A                     | Pests of plants and plant products | Not specified                                 | National governments:<br>States belonging to Near East Region |                 |
| Protocol for the Implementation of the Alpine Convention in the Field of Nature Protection and Landscape Conservation | Article 17: Parties guarantee that species of wild fauna and flora not native to the region in the recorded past are not introduced; exceptions possible when introduction needed for specific use will not “disadvantage” nature and landscape.   | 1994 adopted                             |                         |                                    |   |   |                 |
| Agreement for the Preparation of a Tripartite Environmental Management Programme for Lake Victoria                    | Article 1, Attachment I, para. 7:<br>Kenya, Tanzania and Uganda agree to implement a 5 year programme to strengthen regional environmental management of Lake Victoria including control of water  | 1994 adopted<br>1994 in force            | N/A                     |                                    |   |   |                 |

| International Agreement  | Relevance to Invasive Species  | Dates of Action      | Has US Ratified? | Organisms Addressed   | Pathways/Means of Transport Addressed  | Participating Entities                           | Web Site  |
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|  | hyacinth; biological control to proceed when environmental risks are found acceptable by national authorities; other forms of control to be explored.  |                      |                  |   |  |  |   |
| Convention for the Establishment of the Lake Victoria Fisheries Organization | <p>Article II(3)(f): To consider and advise on the effects of the direct or indirect introduction of any non-indigenous aquatic animals or plants into the waters of Lake Victoria or its tributaries and to adopt measures regarding the introduction, monitoring, control or elimination of any such animals or plants;</p> <p>Article XII (3): Parties hereby agree to adopt, enforce and maintain in effect laws and regulations prohibiting the introduction of non-indigenous species to Lake Victoria, other than in accordance with a decision of the Council of Ministers pursuant to Article VI.1(m)</p> | 30 June 1994 adopted | N/A              | Any non-indigenous aquatic animals or plants<br>Specifically mentioned:<br>Nile Tilapia, Nile Perch, and water hyacinth | Unintentional or intentional, direct or indirect introductions into Lake Victoria or its tributaries | National governments:<br>Kenya, Uganda, Tanzania | <a href="http://www.inweh.unu.edu/lvfo/convention.htm">http://www.inweh.unu.edu/lvfo/convention.htm</a> |
| North American Free Trade Agreement (NAFTA)                                  | General provisions in Chapter 18, Articles 1802(2) and 1803(1), require the US to publish in advance. proposed   | 1 Jan. 1994          | Yes              | Not specified   | Not specified  | National governments                             | <a href="http://www.sice.oas.org/tradee.asp">http://www.sice.oas.org/tradee.asp</a>                     |
|  |  |                      |                  |   |  | US, Canada, Mexico                               |   |
|  |  |                      |                  |   |  |  |   |

| <b>International Agreement</b>  | <b>Relevance to Invasive Species</b>  | <b>Dates of Action</b> | <b>Has US Ratified?</b> | <b>Organisms Addressed</b> | <b>Pathways/Means of Transport Addressed</b>      | <b>Participating Entities</b>  | <b>Web Site</b>   |
|---|---|------------------------|-------------------------|----------------------------|---|--|---|
|   | measures and to notify its NAFTA trading partners of any proposed ban on imports. Provisions seek to give NAFTA trading partners an opportunity to comment and the US time to take such comments into account, before the measure goes into effect.   |                        |                         |                            |   |  |   |
| Protocol Concerning Specially Protected Areas and Biological Diversity in the Mediterranean | Articles 6(d) and 13 (l): Parties shall regulate in specially protected areas “the introduction of any species not indigenous to the specially protected areas in question, or of genetically modified species, as well as the introduction or reintroduction of species that are or have been present in the specially protected area, and that Parties shall take all appropriate measures to regulate the intentional or accidental introduction of non-indigenous species or genetically modified species to the wild and prohibit those that may have harmful impacts on the ecosystem, habitats, or species in the protocol area. | 1995 adopted           |                         |                            |   |  |   |
| Agreement on the Conservation of African-Eurasian   | Article III(2)(g): Parties shall prohibit the deliberate introduction of non-native waterbird species into the environment and take all   | 16 June 1995 adopted   | N/A                     | Non-native bird species    | Intentional introduction<br>Unintentional release | National governments of Range states and regional economic integration | <a href="http://www.wcmc.org.uk/cms/aew_bkrd.htm">http://www.wcmc.org.uk/cms/aew_bkrd.htm</a> |

| International Agreement   | Relevance to Invasive Species   | Dates of Action                         | Has US Ratified? | Organisms Addressed   | Pathways/Means of Transport Addressed       | Participating Entities   | Web Site |
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| Migratory Waterbirds  | <p>appropriate measure to prevent the unintentional release of such species if this introduction or release would prejudice the conservation status of wild fauna and flora; when non native waterbird species have already been introduced, the Parties shall take all appropriate measures to prevent these species from becoming a potential threat to indigenous species.</p> <p>Action Plan §2.5</p> <p>Parties to prohibit non-native animal and plant introductions if detrimental to listed species, to take precautions to prevent accidental escape of captive non native birds and take measures to ensure that already introduced species do not pose a potential hazard to listed species.</p> |   |                  |   |   | organizations with at least one Range state member   |          |
| Protocol concerning Protected Areas and Wild Fauna and Flora in the Eastern African | Article 7: Introduction of Alien or New Species - The Contracting Parties shall take all appropriate measures to prohibit the intentional or accidental introduction of alien or  | 21 June 1985 adopted 30 May 96 in force | N/A              | “Alien or new species which may cause significant or harmful changes to the Eastern African Region” | Unintentional and intentional introductions | National governments: “any State invited as a participant to the Nairobi Conference... and to any regional |          |



| International Agreement  | Relevance to Invasive Species   | Dates of Action  | Has US Ratified? | Organisms Addressed                       | Pathways/Means of Transport Addressed | Participating Entities  | Web Site  |
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| Region   | new species which may cause significant or harmful changes to the Eastern African region.<br><br>Article 10: Protection Measures - The Contracting Parties, taking into account the characteristics of each protected area, shall take, in conformity with international law, the measures required to achieve the objectives of protecting the area, which may include: (f) the regulation of any activity likely to harm or disturb the fauna or flora, including the introduction of non-indigenous animal or plant species; |                  |                  |   |                                       | intergovernmental integration organization invited to the Conference which exercise competence in the field covered by the Convention and having at least one member which belongs to the Eastern African region” |   |
| Council of Europe  |   |                  |                  |   |                                       |   | <a href="http://www.coe.fr/eng/legaltxt/1e.htm">http://www.coe.fr/eng/legaltxt/1e.htm</a>                               |
| EU Council Directive 79/409/EEC of 2.4.79 on the Conservation of Wild Birds (as amended) | Article 11: Member States shall see that any introduction of species of bird which does not occur naturally in the wild state in the European territory of the Member States does not prejudice the local fauna and flora.  | Not yet in force | N/A              | Non-indigenous birds                      | Not specified                         | National governments:<br>Member states of the EC  | <a href="http://www.ecnc.nl/doc/europe/legislat/birdan21.html">http://www.ecnc.nl/doc/europe/legislat/birdan21.html</a> |
| EU Council Directive   | Article 22(b):Member States shall ensure that the deliberate  | Not yet in force | N/A              | “any species which is not native to their | Intentional introductions             | National governments:   | <a href="http://www.europa.eu.int/eur-">http://www.europa.eu.int/eur-</a>   |

| <b>International Agreement</b>   | <b>Relevance to Invasive Species</b>  | <b>Dates of Action</b>                        | <b>Has US Ratified?</b> | <b>Organisms Addressed</b> | <b>Pathways/Means of Transport Addressed</b> | <b>Participating Entities</b>  | <b>Web Site</b>   |
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| 92/43/ELC of 21.5.92 on the Conservation of Natural Habitats and of Wild Fauna and Flora | introduction into the wild of any species which is not native to their territory is regulated so as not to prejudice natural habitats within their natural range or the wild native fauna and flora and, if they consider it necessary, prohibit such introduction. |   |                         | territory”                 |  | Member states of the EC  | <a href="http://lex/en/lif/dat/1992/en_392L0043.html">lex/en/lif/dat/1992/en_392L0043.html</a>  |
| SPREP Convention   |   | 24 Nov. 1986 adopted<br>22 Aug. 1990 in force | Yes<br>10 June 1991     |                            |  | National governments:<br>“States which were invited to participate in the Plenipotentiary Meeting of the High Level Conference on the Protection of the Natural Resources and Environment of the South Pacific Region” | <a href="http://sedac.ciesin.org/pidb/texts/natural_resources.south.pacific.1986.html">http://sedac.ciesin.org/pidb/texts/natural_resources.south.pacific.1986.html</a> |

#### Bi-lateral Conventions/ Treaties

| <b>International Agreement</b> | <b>Relevance to Invasive Species</b> | <b>Dates of Action</b> | <b>Has US Ratified?</b> | <b>Organisms Addressed</b> | <b>Pathways/Means of Transport Addressed</b> | <b>Participating Entities</b> | <b>Web Site</b> |
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| <b>International Agreement</b>  | <b>Relevance to Invasive Species</b>  | <b>Dates of Action</b>        | <b>Has US Ratified?</b> | <b>Organisms Addressed</b> | <b>Pathways/Means of Transport Addressed</b>        | <b>Participating Entities</b>          | <b>Web Site</b>   |
|---|---|-------------------------------|-------------------------|----------------------------|---|--|---|
| Convention on Great Lakes Fisheries Between the United States and Canada (Basic Instrument for the Great Lakes Fisheries Commission—GLFC) | The Convention established the GLFC whose purpose is to control and eradicate the non-native, highly invasive Atlantic sea lamprey from the Great Lakes | 1954 adopted<br>1955 in force | Yes                     | Sea lamprey                | Introduction through tributaries to the Great Lakes | U.S. and Canadian National governments | <a href="http://www.glf.org/pubs/conv.htm">http://www.glf.org/pubs/conv.htm</a> |

#### Statements/ Agreements/ Organizations

| <b>International Agreement</b>                          | <b>Relevance to Invasive Species</b>   | <b>Dates of Action</b> | <b>Has US Ratified?</b> | <b>Organisms Addressed</b>   | <b>Pathways/Means of Transport Addressed</b> | <b>Participating Entities</b>             | <b>Web Site</b>   |
|---|--|------------------------|-------------------------|--|--|---|---|
| Joint U.S./U.K./Russian Statement on Biological Weapons | The three Governments confirmed their commitment to full compliance with the Biological Weapons Convention | 1992 adopted           |                         | Not mentioned here, but relation to microbial and other biological agents of the 1972 Biological Weapons Conv. | Not specified                                | National governments: UK, US, and Russian | <a href="http://sun00781.dn.net/nuke/control/hwc/text/joint.htm">http://sun00781.dn.net/nuke/control/hwc/text/joint.htm</a> |
| Agenda 21 UNCED1992                                     | Chapter 11:Combating Deforestation<br>11.13(g) - Increase protection                                       |                        |                         | Exotic plant and animal species<br>Diseases and  | Unintentional and intentional introductions  | National governments                      | <a href="http://www.igc.org/habitat/agenda21/">http://www.igc.org/habitat/agenda21/</a>                                     |

| International Agreement | Relevance to Invasive Species   | Dates of Action | Has US Ratified? | Organisms Addressed | Pathways/Means of Transport Addressed | Participating Entities | Web Site |
|-------------------------|---|-----------------|------------------|---------------------|---------------------------------------|------------------------|----------|
|                         | <p>of forests from disease and uncontrolled introduction of exotic plant and animal species.</p> <p>Chapter 12: Managing Fragile Ecosystems -Combating Drought and Desertification<br/>12.18 (b): Accelerate afforestation and reforestation using drought resistant fast growing species, especially native ones.</p> <p>12.19(b): Develop, test and introduce, with due regard to environmental security considerations, drought resistant fast growing and productive plant species appropriate to the environment of concerned regions.<br/>management</p> <p>Chapter 15: Conservation of Biological Diversity -<br/>15.3 Acknowledgement that inappropriate introduction of foreign plants and animals has contributed to biodiversity loss and continues.<br/>15.4 (h): Implement</p> |                 |                  | “pests”             | Ballast water specifically mentioned  |                        |          |

| International Agreement | Relevance to Invasive Species  | Dates of Action | Has US Ratified? | Organisms Addressed | Pathways/Means of Transport Addressed | Participating Entities | Web Site |
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|                         | <p>mechanisms for sustainable use of biotechnology and safe transfer</p> <p>15.7(g): Improve international co-ordination for effective conservation and management of non pest migratory species</p> <p>Chapter 16: Environmentally Sound Management of Biotechnology -</p> <p>16.3(a): Increase optimal possible yield of major crops, livestock and agricultural species</p> <p>16.3(c): increase use of integrated pest management techniques</p> <p>16.23: Biotechnology can be used to study effects exerted by introduced species on organisms within an ecosystem</p> <p>16.32: Internationally agreed principles on risk assessment and management needed for all aspects of biotechnology</p> <p>Chapter 17: Protection of Oceans -</p> <p>17.30(vi): States to assess individually, regionally and</p> |                 |                  |                     |                                       |                        |          |

| International Agreement                        | Relevance to Invasive Species  | Dates of Action | Has US Ratified?             | Organisms Addressed | Pathways/Means of Transport Addressed | Participating Entities | Web Site  |
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|  | <p>internationally, within IMO and other relevant international organisations, need for adopting appropriate rules on ballast water discharge to prevent spread of non-indigenous organisms.</p> <p>17.79(d) strengthen the legal and regulatory framework for mariculture and aquaculture</p> <p>17.83 Analyse aquaculture's potential and apply appropriate safeguards for introducing new species.</p> <p>Chapter 18-Protection of the Quality and Supply of Freshwater Resources: Application of Integrated Approaches to the Development, management and Use of Water Resources.</p> <p>18.40(e)(iv): control of noxious aquatic species that may destroy other aquatic species</p> |                 |                              |                     |                                       |                        |   |
| World Trade Organization (WTO) - formerly GATT | Annex B indicates that when the U.S. proposes a domestic regulation to restrict an import, the US must provide other WTO members with notice of the products to be covered, (together with a brief   | 1995            | Became member on 1 Jan. 1995 | Not specified       | Not specified                         | National governments   | <a href="http://www.wto.org/wto/english/docs_e/legal_e/final_e.htm">http://www.wto.org/wto/english/docs_e/legal_e/final_e.htm</a> |

| International Agreement                    | Relevance to Invasive Species  | Dates of Action     | Has US Ratified?  | Organisms Addressed                            | Pathways/Means of Transport Addressed | Participating Entities      | Web Site   |
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|  | <p>explanation of the objective and rationale of the proposed legislation), but only if the proposed U.S. regulation would substantially differ from international standards, guidelines, or recommendations. The provision only applies, however, if the regulation may have a “significant effect” on trade of other WTO members.</p>  |                     |   |  |                                       |                             |  |
| <p>International Maritime Organisation</p> | <p>IMO Assembly Resolution A.868(20)<br/>           IMO adopts the Guidelines listed below and “requests governments to take urgent action in applying these Guidelines, including the dissemination thereof to the shipping industry, to use them as a basis for any measures they adopt with a view to minimizing the risks of introducing harmful aquatic organisms and pathogens”</p> <p>Annex, “Guidelines for the Control and Management of Ships’ Ballast Water to Minimize the Transfer of</p> | <p>27 Nov. 1997</p> | <p>N/A: non-mandatory guidelines which Member States are urged to adopt voluntarily</p> | <p>Harmful aquatic organisms and pathogens</p> | <p>Ballast water</p>                  | <p>National governments</p> | <p><a href="http://www.imo.org">http://www.imo.org</a></p> |

| International Agreement   | Relevance to Invasive Species   | Dates of Action | Has US Ratified? | Organisms Addressed  | Pathways/Means of Transport Addressed | Participating Entities      | Web Site   |
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|   | <p>Harmful Aquatic Organisms and Pathogens”</p> <p>1.1: Recognition of ballast water as the “most prominent” medium for transferring “harmful aquatic organisms and pathogens which may pose threats to indigenous human, animal and plant life, and the marine environment.”</p> <p>7.1.1: “Every ship that carries ballast water should be provided with a ballast water management plan to assist in the minimization of transfer of harmful aquatic organisms and pathogens.”</p> |                 |                  |  |                                       |                             |  |
| <p>UNCED 1992 Non-Legally binding Authoritative Statement of Principles for a Global Consensus on the Management Conservation and Sustainable Development of all types of</p> | <p>Principle 2(b):Take appropriate measures to protect forests against harmful effects of pests and diseases.</p> <p>6(a):Recognise the potential contribution of indigenous and introduced species to provide wood for fuel and industrial uses.</p>   |                 |                  | <p>Pests and diseases Does NOT regulate introduced trees</p> | <p>Not specified</p>                  | <p>National governments</p> | <p><a href="http://www.un.org/documents/ga/conf151/annex3.htm">http://www.un.org/documents/ga/conf151/annex3.htm</a></p> |



| <b>International Agreement</b>   | <b>Relevance to Invasive Species</b>   | <b>Dates of Action</b>                   | <b>Has US Ratified?</b> | <b>Organisms Addressed</b>   | <b>Pathways/Means of Transport Addressed</b> | <b>Participating Entities</b> | <b>Web Site</b>   |
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| Forests.   |  |  |                         |  |  |                               |   |
| Global Programme of Action for the Protection of the Marine Environment from Land-based Activities | Physical Alterations and destruction of habitats - Paragraph 149: Introduction of alien species acknowledged to have serious effects upon marine ecosystem integrity.  | United Nations Environment Program, 1995 |                         | Alien species which “have serious effects upon marine ecosystem integrity” | Not specified                                | National governments          | <a href="http://www.unep.org/unep/gpa/pol2a.htm">http://www.unep.org/unep/gpa/pol2a.htm</a> |
| International Civil Aviation Organization (ICAO) Resolution  | The ICAO Assembly passed Resolution A-32-9, which urges all member states to use their civil aviation authorities to assist in reducing the risk of introducing potentially invasive species to areas outside their natural range. And requests the ICAO Council to notify other United Nations organizations of its availability to identify approaches that ICAO can take in assisting in reducing the risk of introducing potentially invasive species to areas outside their natural range | 1998                                     |                         | Not specified  | Not specified                                |                               | <a href="http://www.iaco.int.html">http://www.iaco.int.html</a>                             |

## Appendix 4. Codes of Conduct/ Guidelines Pertaining to Invasive Species

| Codes of Conduct/ Guidelines  | Relevance to Invasive Species  | Date in Effect  | Targeted Entities   | Organisms Addressed                                  | Pathways/Means of Transport Addressed  | Web Site  |
|---|--|---|---|--|--|---|
| North American Fisheries Policy   | Article V: "Aquaculture must work closely with federal, state, and provincial regulators to control epizootic disease outbreaks, to prevent the release of exotic species into the wild... Where possible, federal, state, and provincial managers will encourage the aquaculture industry to use indigenous species in its facilities." | 1939 (Amended 1955, 1965, 1970, 1973) Current revision approved Aug. 1995 | Fishery administrators; federal, tribal, state, and provincial managers | Non-indigenous fish and other exotic aquatic species | Unintentional and intentional introductions  | <a href="http://www.fisheries.org/resource/page1.htm">http://www.fisheries.org/resource/page1.htm</a>                     |
| IUCN Position Statement on Translocation of Living Organisms: Introductions, Reintroductions, and Re-stocking | Statement  | 4 Sept. 1987  | National governments  | Plant and animal non-native species                  | Unintentional introductions: use of live fish bait, tourist transfer, cross-regional civil engineering projects<br><br>Intentional introductions: release of captive-bred or newly-domesticated organisms. trade | <a href="http://www.iucn.org/themes/ssc/pubs/policy/transe.htm">http://www.iucn.org/themes/ssc/pubs/policy/transe.htm</a> |

| Codes of Conduct/<br>Guidelines   | Relevance to Invasive Species   | Date in Effect | Targeted Entities    | Organisms Addressed       | Pathways/Mean<br>s of Transport<br>Addressed         | Web Site  |
|---|---|----------------|----------------------|---------------------------|--|---|
|   |   |                |                      |                           | in alien species,<br>reintroductions,<br>re-stocking |   |
| UNEP International<br>Technical<br>Guidelines for<br>Safety in<br>Biotechnology | <p>Used as interim mechanism during the development of the Biosafety Protocol; now used for “purposes of facilitating the development of national capacities to assess and manage risks, establish adequate information systems and develop expert human resources in biotechnology.”</p> <p>Paragraph 26: “there is a need for the exchange and supply of scientific information in cases where organisms with novel traits are intended to be released into new environments and when transfer of such organisms is being considered”</p> <p>Paragraph 42: “The potentially affected country should be given notice of the intended use and the opportunity to state whether particular measures will be needed to protect its interests, in particular its biodiversity: (and) should be</p> | 1995           | National governments | Living modified organisms | Intentional introduction                             | <a href="http://biosafety.ihe.be/Biodiv/UNEPGuid/UNEP_I.html">http://biosafety.ihe.be/Biodiv/UNEPGuid/UNEP_I.html</a> |

| Codes of Conduct/<br>Guidelines   | Relevance to Invasive Species   | Date in Effect | Targeted Entities   | Organisms Addressed            | Pathways/Mean<br>s of Transport<br>Addressed | Web Site  |
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|   | <p>informed immediately in the event of an adverse effect of the use of a organism with novel traits which could affect it”</p> <p>Annex 3: potentially relevant information for introductions</p>  |                |   |                                |  |   |
| FAO International Code of Conduct for Plant Germplasm Collecting and Transfer |   | Nov. 1993      | National governments; collectors, donors, and sponsors of the collection of germplasm | Plant germplasm                | Intentional introduction                     | <a href="http://www.fao.org/ag/agp/agps/pgr/icc/icce.htm">http://www.fao.org/ag/agp/agps/pgr/icc/icce.htm</a> |
| AFS Guidelines for Introduction of Threatened and Endangered Fish             | <p>Recognition that introduction of threatened fish can alter biodiversity and survival of other organisms</p> <p>“Restrict introductions to within the native or historic habitat whenever possible”</p> <p>“Prohibit introductions into areas where the endangered or threatened fish could hybridize with other species or subspecies”</p> <p>“Prohibit introductions into areas where other rare or endemic taxa could be adversely affected”</p> |                | Practitioners of introduction   | Threatened and endangered fish | Intentional introductions                    | <a href="http://www.fisheries.org/resource/page17.htm">http://www.fisheries.org/resource/page17.htm</a>       |

| Codes of Conduct/<br>Guidelines                | Relevance to Invasive Species   | Date in Effect | Targeted Entities  | Organisms Addressed              | Pathways/Mean<br>s of Transport<br>Addressed   | Web Site  |
|--|---|----------------|--|----------------------------------|--|---|
|  | “Examine introduction stock for presence of undesirable pathogens”  |                |  |                                  |  |   |
| IUCN/SSC<br>Guidelines for<br>Re-Introductions | <p>Meant to allow for introduction of endangered species; mentions non-indigenous species as a threat to re-introduction, but also recognizes potential dangers of re-introduction itself</p> <p>Evaluation of re-introduction site (allows and calls for elimination of specific non-indigenous species):<br/>4a (iv): “Identification and elimination...of previous causes of decline: could include disease;...competition with or predation by introduced species”</p> <p>Unintentional introduction of pathogens<br/>4a (v): “Any animals found to be infected or which test positive for non-endemic or contagious pathogens with a potential impact on population levels. must be removed from</p> | May 1995       | Practitioners of species re-introductions (managers, scientists, etc.) | Endangered plant and animal taxa | <p>Intentional introduction of captive-bred individuals</p> <p>Measures taken to prevent unintentional introduction of alien pathogens</p> | <a href="http://www.iucn.org/themes/ssc/pubs/policy/reinte.htm">http://www.iucn.org/themes/ssc/pubs/policy/reinte.htm</a> |

| Codes of Conduct/<br>Guidelines               | Relevance to Invasive Species   | Date in Effect | Targeted Entities   | Organisms Addressed | Pathways/Mean<br>s of Transport<br>Addressed   | Web Site  |
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|   | <p>the consignment”</p> <p>Recognition of transboundary migration<br/>4 (b): “In the case of migratory/mobile species, provisions should be made for crossing of international/state boundaries”</p>  |                |   |                     |  |   |
| FAO Code of Conduct for Responsible Fisheries | <p>Art. 9.2.3: ‘States should consult with their neighboring States, as appropriate, before introducing non-indigenous species into transboundary aquatic ecosystems.’</p> <p>Art. 9.3.1: ‘Efforts should be undertaken to minimize the harmful effects of introducing non-native species or genetically altered stocks... into waters, especially where there is a significant potential for the spread of such non-native species or genetically altered stocks into waters under the jurisdiction of other States as well as waters under the jurisdiction of the State of origin. States should, whenever possible, promote</p> | 31 Oct. 1995   | National governments; fishing entities; sub-regional, regional and global organizations; and “all persons concerned with the conservation of fishery resources” | Fish                | <p>Unintentional and intentional introductions</p> <p>Capture and trade of fish and fishery products</p> | <a href="http://www.fao.org/fi/ageem/codecond/ficonde.asp">http://www.fao.org/fi/ageem/codecond/ficonde.asp</a> |

| Codes of Conduct/<br>Guidelines   | Relevance to Invasive Species   | Date in Effect | Targeted Entities                                | Organisms Addressed                     | Pathways/Means of Transport Addressed | Web Site  |
|---|---|----------------|--|---|---------------------------------------|---|
|   | steps to minimize adverse genetic, disease and other effects of escaped farmed fish on wild stocks.”  |                |  |   |                                       |   |
| IMO Guidelines for the control and management of ships’ ballast water to minimize the transfer of harmful aquatic organisms and pathogens | <p>1.1: Recognition of ballast water as the “most prominent” media of transferring invasive species</p> <p>7.1.1: “Every ship that carries ballast water should be provided with a ballast water management plan to assist in the minimization of transfer of harmful aquatic organisms and pathogens.”</p> <p>8.2.2: “Port States should inform local agents and/or the ship of areas and situations where the uptake of ballast water should be minimized, such as: areas with outbreaks, infestations or know populations of harmful organisms and pathogens...”</p> <p>9.1.1: “When loading ballast, every effort should be made to avoid the uptake of potentially</p> | 27 Nov. 1997   | Member states of the IMO: can apply to all ships | Harmful aquatic organisms and pathogens | Ballast water                         | <a href="http://www.imo.org/">http://www.imo.org/</a> |

| <b>Codes of Conduct/<br/>Guidelines</b>  | <b>Relevance to Invasive Species</b>  | <b>Date in Effect</b> | <b>Targeted Entities</b>                     | <b>Organisms Addressed</b>   | <b>Pathways/Mean<br/>s of Transport<br/>Addressed</b>                            | <b>Web Site</b>   |
|--|---|-----------------------|--|--|--|---|
|  | harmful aquatic organisms, pathogens and sediment that may contain such organisms.”   |                       |  |  |  |   |
| IUCN Guidelines for the Prevention of Biodiversity Loss Caused by Alien Invasive Species     | Guidelines to give effect to Article 8 (h) of the Convention on Biological Diversity: “Prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species.”<br><br>Meant to increase awareness and understanding of the impact of alien species<br>Provides guidelines for: prevention, eradication, control and reintroduction | Feb. 2000             | National governments and management agencies | Non-indigenous plant and animal species that threaten biodiversity | Unintentional and intentional introductions<br>Trade<br>Tourism<br>Ballast water | <a href="http://www.iucn.org/themes/ssc/pubs/policy/invasivesEng.htm">http://www.iucn.org/themes/ssc/pubs/policy/invasivesEng.htm</a> |
| Alien Species: Guiding Principles for the Prevention, Introduction and Mitigation of Impacts | 15 Guiding Principles pertaining to invasive species: Precautionary approach, Three-stage hierarchical approach, Ecosystem approach, State Responsibility, Research and Monitoring, Education and Public Awareness, Border Control and Quarantine Measures, Exchange of Information, Cooperation and Capacity-building. Intentional   | Feb. 2000             | National governments                         | Non-indigenous plant and animal species                            | Unintentional and intentional introductions<br><br>Import<br>Ballast water       | <a href="http://www.biodiv.org/sbstta5/Html/SBSTTA-5-05e.htm">http://www.biodiv.org/sbstta5/Html/SBSTTA-5-05e.htm</a>                 |



| <b>Codes of Conduct/<br/>Guidelines</b>   | <b>Relevance to Invasive Species</b>  | <b>Date in Effect</b>         | <b>Targeted Entities</b>  | <b>Organisms Addressed</b>   | <b>Pathways/Mean<br/>s of Transport<br/>Addressed</b>   | <b>Web Site</b>   |
|---|---|-------------------------------|---|--|---|---|
|   | Introduction, Unintentional Introductions, Mitigation of Impacts, Eradication, Containment, and Control       |                               |   |  |   |   |
| U.S. Coast Guard Voluntary Guidelines for Recreational Activities to Control the Spread of Zebra Mussels and Other Aquatic Nuisance Species | Precautionary techniques for safe removal of aquatic nuisance species from equipment to prevent translocation | Still awaiting public comment | Recreational users of aquatic resources (divers, boaters, anglers, hunters) | Plant and animal aquatic nuisance species<br>Mentioned specifically:<br>Zebra mussel, purple loosestrife, sea lamprey, water hyacinth, Chinese carp, hydrilla, Eurasian water milfoil, Asian swamp eel | Intentional release<br><br>Unintentional introduction:<br>Boats, boat anchors, diving equipment, seaplanes, live bait | <a href="http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=2000_register&amp;docid=fr13ap00-125">http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=2000_register&amp;docid=fr13ap00-125</a> |

