

ANS Task
Force

Aquatic Nuisance Species Task Force

2015 Report to Congress



On a global basis... the two great destroyers of biodiversity are, first, habitat destruction and, second, invasion by exotic species.

-E.O. Wilson (1997), in Strangers in Paradise

**On the Cover: A zebra mussel cluster pulled from Lake Oologah, Oklahoma.
This invasive mussel has steadily spread from the Great Lakes.
David Britton/USFWS**

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Executive Summary

Aquatic Nuisance Species are one of the most significant threats to aquatic ecosystems in the United States.

Aquatic nuisance species (ANS), as defined by the Nonindigenous Aquatic Nuisance Prevention and Control Act in 1990, are nonindigenous species that threaten the diversity or abundance of native species, the ecological stability of infested waters, or commercial, agricultural, aquacultural, or recreational activities dependent on such waters. ANS include nonindigenous species that may occur within fresh, estuarine, or marine waters and that presently or potentially threaten ecological processes or natural resources. The term ANS is often used interchangeably with aquatic invasive species, the preferred term of federal and state managers. Second only to habitat destruction as a cause of global biodiversity loss,ⁱ invasive species have caused the extinction or endangerment of numerous species throughout the world.^{ii/iii} Approximately 40% of the species forced to extinction in aquatic ecosystems are due to predation, parasitism, and competition from ANS.

ANS readily colonize and transform habitats by reducing the abundance of native species or altering ecosystem processes. For example, the feeding behavior of zebra mussels removes large portions of the microscopic plants and animals that form the base of the food web, thus effectively starving native populations of infested lakes and rivers. At least thirty freshwater mussel species are threatened with extinction by the zebra mussel. Invasive aquatic plants such as South American water hyacinth have altered vast expanses of habitat by replacing formerly dominant native plants. Such plants also form dense mats across the water that impede navigation, decrease oxygen concentrations to levels dangerously low for fish, and clog cooling pipes for power plants that may result in massive blackouts.

Aquatic Nuisance Species result in significant economic costs.

In addition to harming ecosystems, ANS hinder economic development; for example, they have adverse effects on fisheries, decrease water availability, block water transport routes, decrease property values, and degrade the aesthetic quality of recreation and tourism sites. For example, Indo-Pacific lionfish have diminished the abundance and diversity of reef fishes that are the foundation of dive tourism. The European parasite that causes whirling disease in fishes spread from a rainbow trout in a hatchery in Pennsylvania and, as a result, trout fishing is nearly nonexistent in several American states. Though the costs attributable to ANS are difficult to calculate, it is estimated at billions of dollars each year. For example, damage and control costs to manage invasive fish in the United States have been estimated at \$5.4 billion per year. Costs to manage the invasion from zebra and quagga mussels may rise above \$1 billion per year. The annual cost of aquatic weed control ranges from \$2,000 to \$6,000 per hectare; resulting in an annual expense of over \$100 million across the Nation.^{iv}

Aquatic Nuisance Species affect human health and safety.

Throughout history, diseases have spread using other species as vectors. This includes malaria, yellow fever, bubonic plague, and, more recently, West Nile virus. The effect on public health extends beyond disease and parasites; human injury may also result from ANS. For instance, hazards may occur from collisions between boaters and jumping silver carp, stings from the venomous spines of lionfish, or wounds from sharp-edged mussel shells on beaches and recreational areas. Some chemicals (e.g., herbicides, piscicides) used to control invasive species may affect soil and water supplies if misused, creating human and wildlife health risks.

The Aquatic Nuisance Species Task Force was established to lessen these impacts.

Congress established the Aquatic Nuisance Species Task Force with the passage of the Nonindigenous Aquatic Nuisance Prevention and Control Act in 1990 and reauthorized it with the passage of the National Invasive Species Act in 1996 (collectively, the Act). The Act charges the ANS Task Force with implementing the Act by developing and executing a program to prevent the introduction and dispersal of ANS; to monitor, control, and study such species; and to disseminate related information. As established in the Act, the ANS Task Force is co-chaired by the U.S. Fish and Wildlife Service and the National Oceanic and Atmospheric Administration and consists of 13 federal agency representatives and 13 *ex-officio* representatives. These members work in conjunction with Regional ANS Panels and issue-specific committees to coordinate efforts among federal and state agencies as well as efforts of the private sector and other North American interests.

Significant progress has been made in the prevention and management of Aquatic Nuisance Species. This report summarizes 10 years of work, focusing on key activities that have occurred since the 2004 Aquatic Nuisance Species Task Force Report to Congress.

The Act requires the ANS Task Force to submit a report to Congress detailing progress in carrying out Section 1202 which charges the ANS Task Force to develop and implement a program for waters of the United States to prevent introduction and dispersal of aquatic nuisance species; to monitor, control and study such species; and to disseminate related information. Aspects of the program, as indicated in the legislation and included in this Report, include:

- Identification of goals, priorities, and approaches for ANS prevention, monitoring, control, education and research to be conducted or funded by the Federal Government;
- Descriptions of the specific prevention, monitoring, control, education and research activities conducted by each Task Force member;
- Coordination of ANS programs and activities of Task Force members and affected State agencies; and
- Recommendations for funding to implement elements of the program.

This report is designed to familiarize readers with the ANS Task Force and to report progress made toward the goals of the ANS Program as outlined in the ANS Task Force Strategic Plans. This report focuses on key activities that have occurred since the 2004 ANS Task Force Report to Congress, using examples from the Task Force's federal and *ex-officio* members and its Regional Panels. *This is by no means a comprehensive list of actions supported by the ANS Task Force or the Regional Panels, but an illustration of the diverse portfolio of the ANS Task Force* in terms of the national significance of ANS challenges, the scope of ANS Task Force work, and targeted geographic focus areas represented by Regional Panels. Activities on state and species-specific management plans are briefly acknowledged in the report, but not specifically discussed, as these actions are not implemented by the ANS Task Force. Rather they are executed across a broad network of federal, state, local, tribal, and non-governmental organizations. Similarly, the numerous activities of individual Regional Panel member agencies or organizations are not specifically addressed in this report, although these entities may be referenced in broader efforts coordinated by the ANS Task Force or Regional Panels.

Progress of the ANS Task Force, its members, and the Regional Panels is summarized and presented in this report at both a national and regional level. Regional-specific accomplishments are organized by the six geographic focus areas represented by the Regional Panels. The national and regional sections are divided into six categories: coordination, prevention, early detection and rapid response, containment and control, research, and education and outreach. Collectively, these categories make up the central mission of the ANS Task Force.

Aquatic Nuisance Species are a continuous and growing threat; many issues remain to be addressed.

Awareness of the problems caused by ANS has dramatically improved, as evidenced by increased ANS prevention, monitoring, and control activities at federal, state, and local levels. However, global trade and development continues to spread ANS into more ecosystems, a trend that is likely to be further augmented by global changes, especially with respect to climate conditions. The ANS Task Force is well positioned to manage these and other challenges through its existing structure, comprehensive strategic plan, and expertise. The ANS Task Force plays an important role in collaboration and communication on ANS issues. The ability of the ANS Task Force to continue to advance efforts to prevent, detect, contain, and control new ANS invasions and to minimize the impacts of ongoing invasions requires the continued commitment of involved agencies and continued coordination and partnership with states, tribes, local governments, and non-governmental organizations.

This report provides recommendations for a more effective national ANS program.

The report concludes with a series of future considerations that the ANS Task Force believes, if acted on, will build a stronger, more effective national ANS program to significantly reduce the environmental, economic, public health, and human safety risks associated with ANS.

The four areas for future consideration identified by the ANS Task Force are:

1. Revise and reauthorize the National Invasive Species Act – The Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 (NANPCA) was last reauthorized and amended in 1996 by the National Invasive Species Act (NISA). Since then, there have been a number of new federal and non-federal participants on the ANS Task Force as well as major advances in scientific knowledge associated with the introduction, management, and impact of ANS across the Nation. Reauthorization of NISA would provide an opportunity to update the Act with respect to the most recent scientific knowledge and to better reflect the broad spectrum of current approaches to prevent, control, and manage ANS needed for Federal member agencies on the ANS Task Force to meet the objectives of the Act. Reauthorization would also provide an opportunity to address outstanding needs for State ANS Management Plans and ANS Task Force Regional Panels, and to place an increased emphasis on prevention, monitoring, rapid response, outreach and education, and research. Specifically this would include:

- A more effective Prevention Program that focuses on high-risk pathways for invasive species not yet established in the United States.
- A comprehensive National ANS Monitoring Program to support early detection and documentation of the establishment and spread of ANS.
- A National Early Detection and Rapid Response Program, as directed in the White House Priority [Agenda on Climate Resilience and Natural Resources](#), to control or eradicate high-risk and newly detected ANS invasions.
- An enhanced National ANS Outreach, Education, and Awareness Program to engage the public and support citizen-science activities to help prevent, monitor, manage and control ANS.
- Expanded Cooperative ANS Research Activities to provide additional opportunities and facilitate partnerships to address high priority prevention and management and research needs.

2. State ANS Management Plan Implementation – Working with the Administration, Congress, states, and other key stakeholders, the ANS Task Force will develop recommendations to more effectively implement State and Interstate ANS Management Plans. This should include the development of guidelines, procedures, and reporting mechanisms for an annual State and Inter-State ANS Management Plan competitive grant program targeting the consistent implementation of management actions across jurisdictional boundaries.

3. ANS Task Force Regional Panel Support – The ANS Task Force will work with relevant stakeholders to develop recommendations to better support each ANS Task Force Regional Panel in their efforts to identify regional ANS priorities, coordinate regional ANS program activities, and provide advice concerning ANS prevention and control.

4. Control and Management of ANS – The ANS Task Force will continue to lead the development of a coordinated strategy by federal member agencies and *ex-officio* member organizations to control and manage high-priority ANS. Commitment from involved agencies, public awareness, and management expertise are critical to success, particularly because ANS can span geographic and jurisdictional boundaries and do not recognize political boundaries or agency jurisdictions.

ANS Task Force by the Numbers



Since 2015, the Tahoe Regional Planning Agency and National Marine Manufacturers Association have been added as members to the ANS Task Force. In addition, representation of the National Association of State Aquaculture Coordinators was replaced by the National Aquaculture Association. Currently, the ANS Task Force is comprised of 13 Federal and 15 ex-officio members.

About This Report

Congress established the Aquatic Nuisance Species (ANS) Task Force with the passage of the Nonindigenous Aquatic Nuisance Prevention and Control Act in 1990 and reauthorized it with the passage of the National Invasive Species Act in 1996 (collectively, the Act). The Act charges the ANS Task Force with developing and implementing a program for waters of the United States to prevent the introduction and dispersal of ANS; to monitor, control, and study such species; and to disseminate related information.

Section 1202(k)(2) of the Act requires the ANS Task Force to submit a report to Congress detailing progress in carrying out the provisions of the Act. This report highlights progress of the ANS Task Force in the development and implementation of a comprehensive program for the United States to combat ANS. It is designed to familiarize readers with the ANS Task Force and to report progress made toward the goals of the ANS Program as outlined in the ANS Task Force Strategic Plans (2007–2012 and 2013–2017).

The ANS Task Force has accomplished much since its inception. It is impossible to report on each individual endeavor, thus this report focuses on key accomplishments from the federal and *ex-officio* members of the ANS Task Force and its Regional Panels. Activities on the state ANS and species-specific management plans are briefly acknowledged in the report, but not specifically discussed as these actions are not implemented by the ANS Task Force directly. Activities of individual Regional Panel member agencies are also not specifically addressed in this report. The report concludes with a series of future considerations that, if acted on, will build a stronger, more effective national program to eliminate or reduce the environmental, economic, public health, and human safety risks associated with ANS.

Nonindigenous Aquatic Nuisance Prevention and Control Act (NANPCA) Section 1202: Aquatic Nuisance Species Program

(a) IN GENERAL – The Task Force shall develop and implement a program for waters of the United States to prevent introduction and dispersal of aquatic nuisance species; to monitor, control and study such species; and to disseminate related information.

(b) CONTENT – The program developed under subsection (a) shall

- (1) Identify the goals, priorities, and approaches for aquatic nuisance species prevention, monitoring, control, education and research to be conducted or funded by the Federal Government;
- (2) Describe the specific prevention, monitoring, control, education and research activities to be conducted by each Task Force member;
- (3) Coordinate aquatic nuisance species programs and activities of Task Force members and affected State agencies;
- (4) Describe the role of each Task Force member in implementing the elements of the program as set forth in this subtitle;
- (5) Include recommendations for funding to implement elements of the program; and
- (6) Develop a demonstration program of prevention, monitoring, control, education and research for the zebra mussel, to be implemented in the Great Lakes and any other waters infested, or likely to become infested in the near future, by the zebra mussel.

About Aquatic Nuisance Species

Aquatic Nuisance Species are organisms that produce harmful impacts on aquatic natural resources in these ecosystems and on the human use of these resources.

Aquatic nuisance species (ANS) are nonindigenous species that threaten the diversity or abundance of native species, the ecological stability of infested waters, or any commercial, agricultural, aquacultural, or recreational activities dependent on such waters. ANS may occur in freshwater, estuarine, and marine waters and, presently or potentially, threaten ecological processes and natural resources. In addition, ANS may adversely impact society by hindering economic development, preventing recreational and commercial activities, decreasing the aesthetic value of nature, or serving as vectors^v of human disease.

ANS can arrive in new ecosystems through many different pathways and vectors, but most species are transported as a result of human activity.

Global trade and intercontinental travel have been cited as major causes of biological invasion. For example, it is widely accepted that zebra and quagga mussels (*Dreissena polymorpha* and *D. rostriformis bugensis*) were introduced to the Great Lakes region through ballast water discharge from ships arriving from foreign ports. Since their introduction, zebra and quagga

mussels have plagued waterways throughout the Great Lakes region and expanded their range across the Nation, all the while disrupting native ecosystems, clogging water intake pipes, and impacting recreational activities. As the world trade network continues to grow, new markets and trade routes continually open. This growth will increase the number of new species that are introduced and the frequency with which such introductions are repeated.

Intentional releases of unwanted pets and aquarium plants may also introduce new ANS to waters of the United States. For example, both the lionfish (*Pterois* species, a venomous marine fish from the Indo-Pacific region) and *Caulerpa* (a marine alga native to the Indian Ocean) were introduced as a result of this pathway. The import of non-native species for food (e.g., Chinese mystery snail (*Cipangopaludina chinensis malleata*), and northern snakehead (*Channa argus*), may also result in the release of ANS into U.S. marine and fresh waters. In spite of the harmful environmental and economic threats posed by such species, live trade - the importation of live animals and plants for food markets or to be used as baitfish and aquarium pets - is largely unregulated and under-enforced.

ANS: No Matter What You Call Them, They're a Growing Problem

Several terms are used to describe organisms living outside their native range. Among these terms, the major difference is between *nonindigenous* and *nuisance*.

The Nonindigenous Aquatic Nuisance Prevention and Control Act (NANPCA) of 1990 defined "*nonindigenous species*" as *any species or other viable biological material that enters an ecosystem beyond its historic range*. This term is often used interchangeably with "*alien*," which was defined by Executive Order 13112 as *any species, including its seeds, eggs, spores, or other biological material capable of propagating that species, that is not native to the particular ecosystem in which it is found*. These terms are also synonymous with *non-native* and *exotic*. In other words, *nonindigenous* = *alien* = *exotic* = *non-native*.

NANPCA further defines an aquatic "*nuisance*" species as *a nonindigenous species that threatens the diversity or abundance of native species or the ecological stability of infested waters, or commercial, agricultural, aquacultural or recreational activities dependent on such waters*. Similarly, Executive Order 13112 defined "*invasive*" species as *an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health*. Thus, *invasive* and *nuisance* species are synonymous and can be used interchangeably.

In brief, a *nuisance* species is, by definition, *nonindigenous*. However, not all *nonindigenous* species are *nuisance*, as not all species that move outside their native range are harmful.

Common Pathways of ANS

Commercial Maritime Industry

The United States receives 95 percent of all foreign goods by weight through ports, creating an immense potential for the introduction of ANS via ballast water discharges and biofouling.

Recreation and Commercial Operations

Recreational vessels and watercraft, fishing equipment, diving gear, and other items can transport ANS between various regional and international water bodies.

Escapes or Release

Escape or intentional release of pets or organisms used in research laboratories and classrooms may be a source of new ANS to local waterways.

Bait Releases

Improper disposal of unused bait can lead to ANS introductions into waterways.

Aquaculture

Aquaculture of ANS has generated concern over pathogens and other impacts that might arise from their escape.

Ornamental Plants Escape or Release

Many ANS are available for purchase in nurseries and water garden shops; only a few problem species are currently banned from sale.

Live Food Industry

The import of live, non-native species for food, if released into the environment, can result in an ANS introduction.

Interbasin Connections

Natural and artificial waterways that create connections between watersheds allow ANS to spread easily from one water body to another.

Biological Surveys and Field Activities

ANS are capable of hitchhiking to new habitats on watercraft, vehicles, clothing, field equipment, and other gear and materials. Consequently, many field activities can become potential pathways for spreading ANS.

Transport of Debris

The long distance transport of debris with biofouling caused by incidents such as the 2011 Japan tsunami have raised awareness of the potential introduction of ANS.

The impacts from ANS are immense, insidious, and often irreversible.

ANS threaten biodiversity. Second only to habitat destruction as a cause of global biodiversity loss,^{vi} aquatic, as well as terrestrial, invasive species have caused the extinction or endangerment of numerous species throughout the world.^{vii/viii} ANS readily colonize and transform habitats; particularly harmful ANS displace native species, change community structure and food webs, and alter fundamental ecosystem processes, such as nutrient cycling and sedimentation. ANS may also harbor disease and parasites that further threaten native fish and wildlife.

ANS result in significant economic costs.

ANS have adverse effects on fisheries, decrease water availability, block water transport routes, decrease property values, and degrade the aesthetic quality of recreation and tourism sites. In the United States, the annual cost of invasive species (both terrestrial and aquatic) is estimated at more than \$120 billion per year^x – a cost exceeding that of all other natural disasters combined.^{xi} Damages and control cost specific to aquatics include \$5.4 billion per year to manage invasive fish and \$1 billion per year to manage the invasion from zebra and quagga mussels in the United States. Spending also demonstrates the high costs, with \$100 million spent annually in the United States to control non-native aquatic weeds.^{xii} The US EPA [Great Lakes Restoration Initiative](#) has invested over \$134.8 million toward prevention and control of Asian carp since 2010.^{xiii}



The noise from the movement of boat propellers can make Silver carp jump up to 10 feet out of the water. Boaters and other recreational users have been seriously injured by jumping fish.

ANS spread disease and harm human health. Throughout history diseases have spread using other species as vectors. This includes malaria, yellow fever, bubonic plague, and, more recently, West Nile virus. The effect on public health extends beyond disease and parasites; human injury may also result from ANS. For instance, hazards may occur from collisions between boaters and jumping silver carp, stings from the venomous spines of lionfish, or wounds from sharp-edged mussel shells on beaches and recreational areas. Some chemicals (e.g., herbicides, piscicides) used to control invasive species may affect soil and water supplies if misused, creating human and wildlife health risks.

Once ANS become established, they can be costly and difficult, even impossible given current technologies, to control or eradicate.

Ideal approaches for dealing with ANS include:

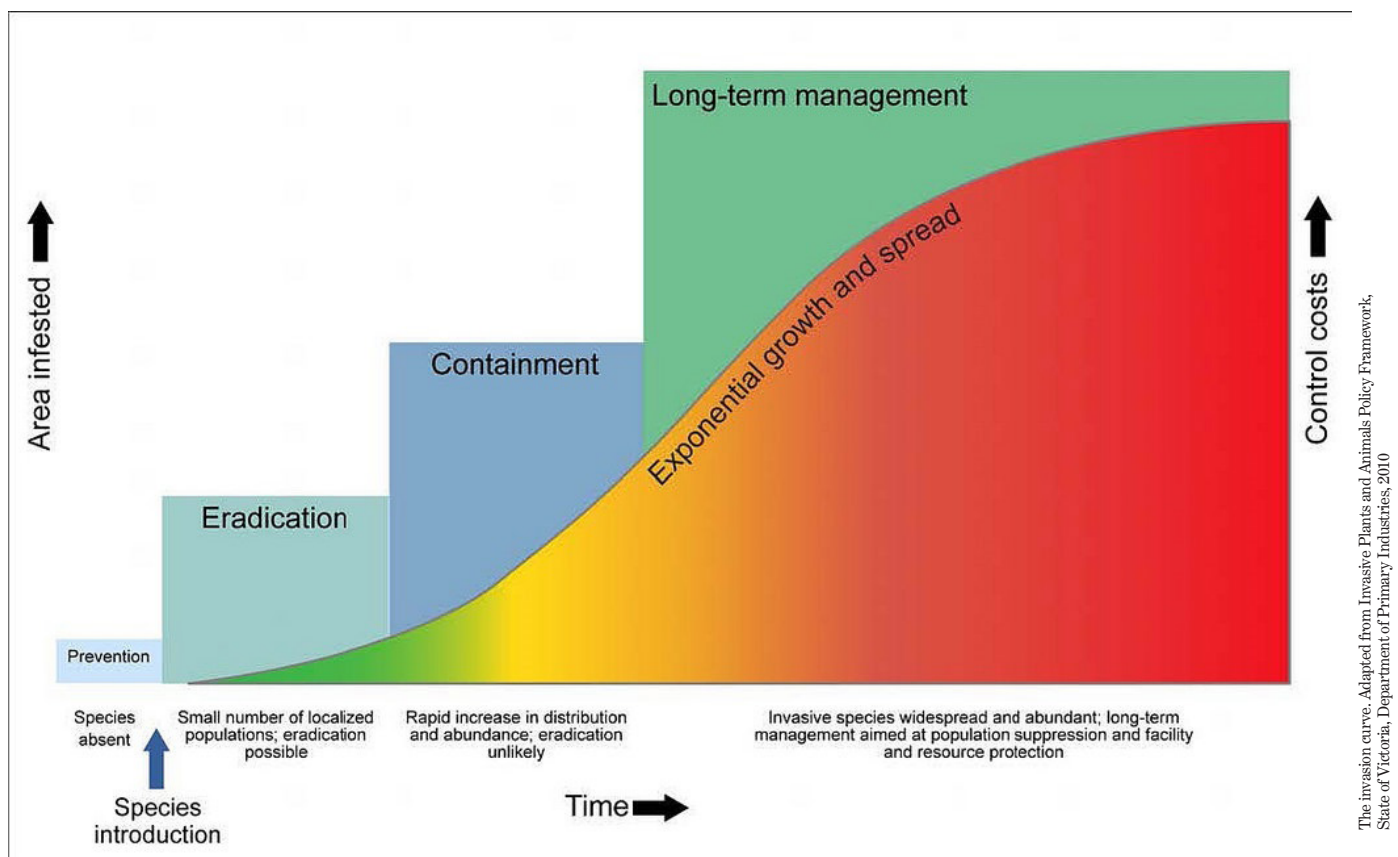
Cultivate partnerships. Coordination and cooperation between federal, state, and local entities is necessary to share information and lessons learned; address possible gaps, weaknesses, and inconsistencies in ANS management; improve resource efficiency; and maximize the geographic scope and overall impact of activities in the United States.

Prevent new introductions. Prevention is the most cost-effective^{xiv} and environmentally protective tool to manage ANS. Preventing the introduction and movement of ANS through the wide range of pathways can be accomplished by employing measures such as decontaminating and treating water, watercraft, and gear that could transport ANS, restricting the importation or release of potentially harmful species, and enforcing current laws and regulations designed to eliminate the introduction and spread of ANS.

Detect and quickly respond to newly detected ANS. Monitoring habitats, reporting sightings of ANS, and working quickly to keep newly introduced species from spreading will increase the likelihood that new ANS will be eradicated and avoid the need for costly long-term control efforts.

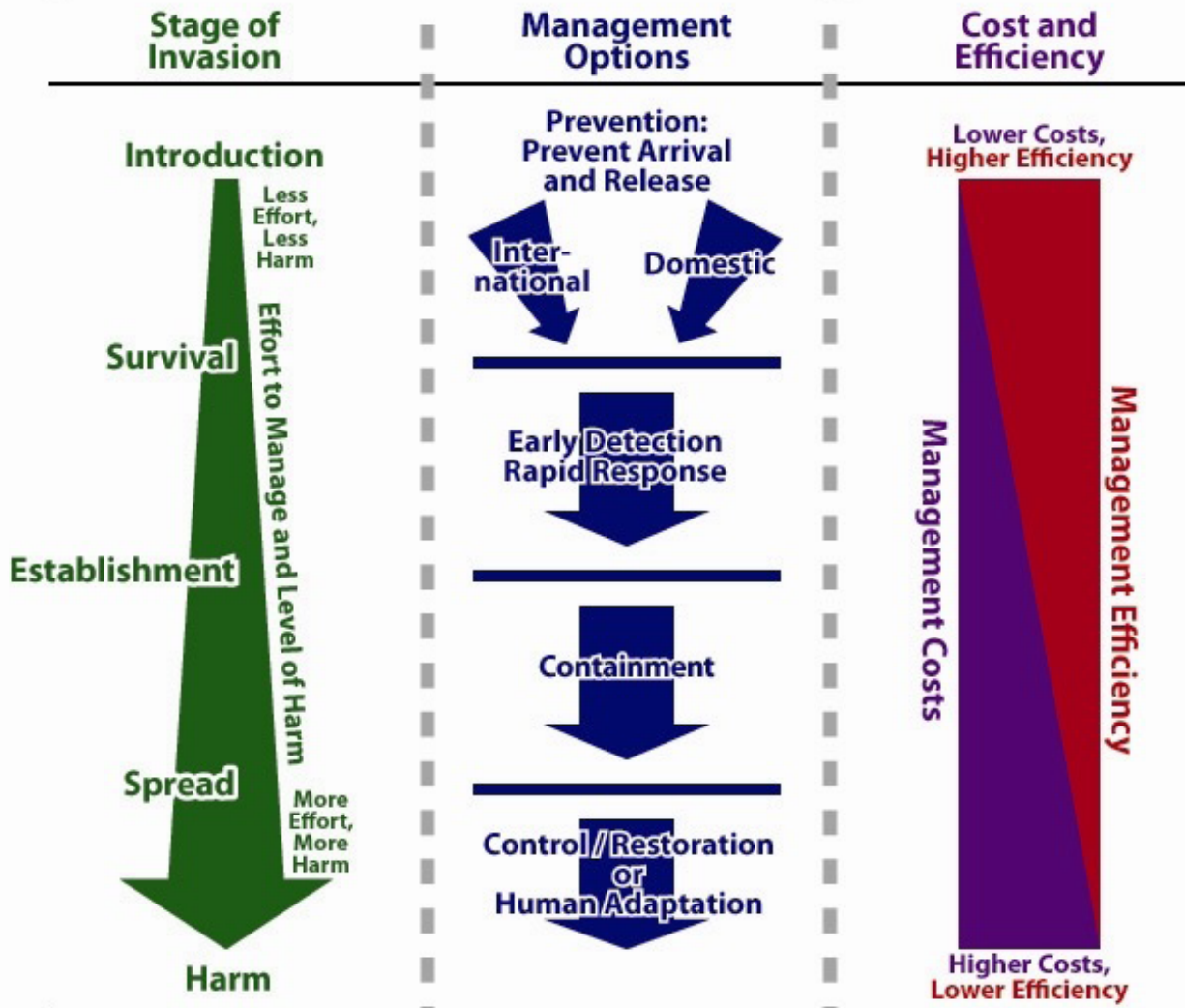
Control existing ANS populations. Control of existing ANS is necessary to slow the rate of range expansion, lessen the impacts to public interests, and increase the likelihood of eradication. Adequate coordination, funding, public awareness, and management expertise are critical to success, particularly because ANS can span geographic and jurisdictional boundaries and do not recognize political boundaries or agency jurisdictions.

Invest in education and public awareness. Many ANS have been introduced through the actions of uninformed people, agencies, and industry; for example, disposing of bait, launching a boat, releasing a pet, or stocking a private pond can all lead to the introduction of ANS if precautions are not taken. These methods of introduction can be eliminated or curtailed by robust public awareness campaigns to educate the public and encourage them to take steps to prevent the introduction and spread of ANS.



Prevention is the most cost-effective means to avert the risk of harmful species introductions. Once a species becomes established, significant and sustained resources are often required; for that reason, there is a potential savings of \$34 for each \$1 invested in prevention and early detection programs.^{ix}

Aspects of the Invasion Management Process



If an invasion is not managed soon after its detection, the introduced species may establish and continue to spread. As shown in the graphic above, the cost to effectively manage ANS will significantly increase as an invasion progresses.

USFWS, adapted from Lodge et al. 2006. Biological Invasions: Recommendations for U.S. Policy and Management. Ecological Applications 16: 2035-2054

Overview of the Aquatic Nuisance Species Task Force

The [Aquatic Nuisance Species \(ANS\) Task Force](#) was established by Congress with the passage of the Nonindigenous Aquatic Nuisance Prevention and Control Act (NANPCA) in 1990 and reauthorized with the passage of the National Invasive Species Act (NISA) in 1996 (collectively, the Act). The role of the ANS Task Force is to develop and implement a federal ANS program for waters in the United States that:

- Prevents the introduction and dispersal of ANS;
- Monitors, controls and studies such species;
- Conducts research on methods to monitor, manage, control and eradicate such species;
- Coordinates ANS programs and activities of ANS Task Force members and affected state agencies; and
- Educates and informs the general public and program stakeholders about the prevention, management, and control of these species.

The ANS Task Force is guided by its [Strategic Plan for 2013–2017](#), which establishes eight goals that serve as a blueprint for action and coordination. This plan builds on the core elements established in the [Strategic Plan for 2007–2012](#) by remaining focused on prevention, monitoring, and control of ANS as well as increasing public understanding of the problems and impacts associated with ANS. In addition to these long-standing goals, the current Strategic Plan calls attention to other areas of ANS management, including habitat restoration and research.

The ANSTF recognizes that many Federal and State agencies, interagency groups, and local entities contribute to the management of invasive species. For example, the National Invasive Species Council (NISC), established by Executive Order 13112, provides national leadership and oversight on both terrestrial and aquatic invasive species and ensures that Federal programs and activities to prevent and control invasive species are coordinated, effective, and efficient. NISC is also responsible for preparing a National Invasive Species Management Plan which directs Federal efforts to prevent, control and minimize invasive species and their impacts. Invasive species management plans prepared by NISC and others provide an opportunity to identify priorities and establish cooperative, well-coordinated approaches to invasive species management. The ANSTF regularly communicates with Federal and State agencies, interagency groups, and local entities ensure that redundancy and overlap does not occur while addressing invasive species-related issues.

ANS Task Force Strategic Plan Goals (2013 – 2017)

Coordination: The ANS Task Force was created to facilitate cooperation and coordinate efforts between Federal, State, tribes, and local agencies, the private sector, and other North American interests. The objectives for the coordination goal include strengthening cooperation at both national and regional levels within the ANSTF and the Regional Panels and encouraging the development and implementation of ANS plans and regulations.

Prevention: Prevention is the first-line of defense against ANS. This goal calls for developing strategies to identify and reduce the risk of ANS introduced by increasing development and use of risk assessments, Hazard Analysis and Critical Control Point programs (HACCP), and pathway assessment and interdiction options.

Early Detection and Rapid Response: Early Detection and Rapid Response programs are designed to monitor habitats to discover new species soon after introduction, report sightings of previously unknown species in an area, and work quickly to keep the species from becoming established and spreading. Objectives for the ANS Task Force include improving detection and monitoring programs and facilitating development and implementation of rapid response contingency plans.

Control and Management: Control and management tools are needed to assess, remove, and contain ANS populations as well as to guide management decisions. The ANS Task Force will implement this goal by evaluating and providing support to management plans, increasing training opportunities, and encouraging the development of management techniques.

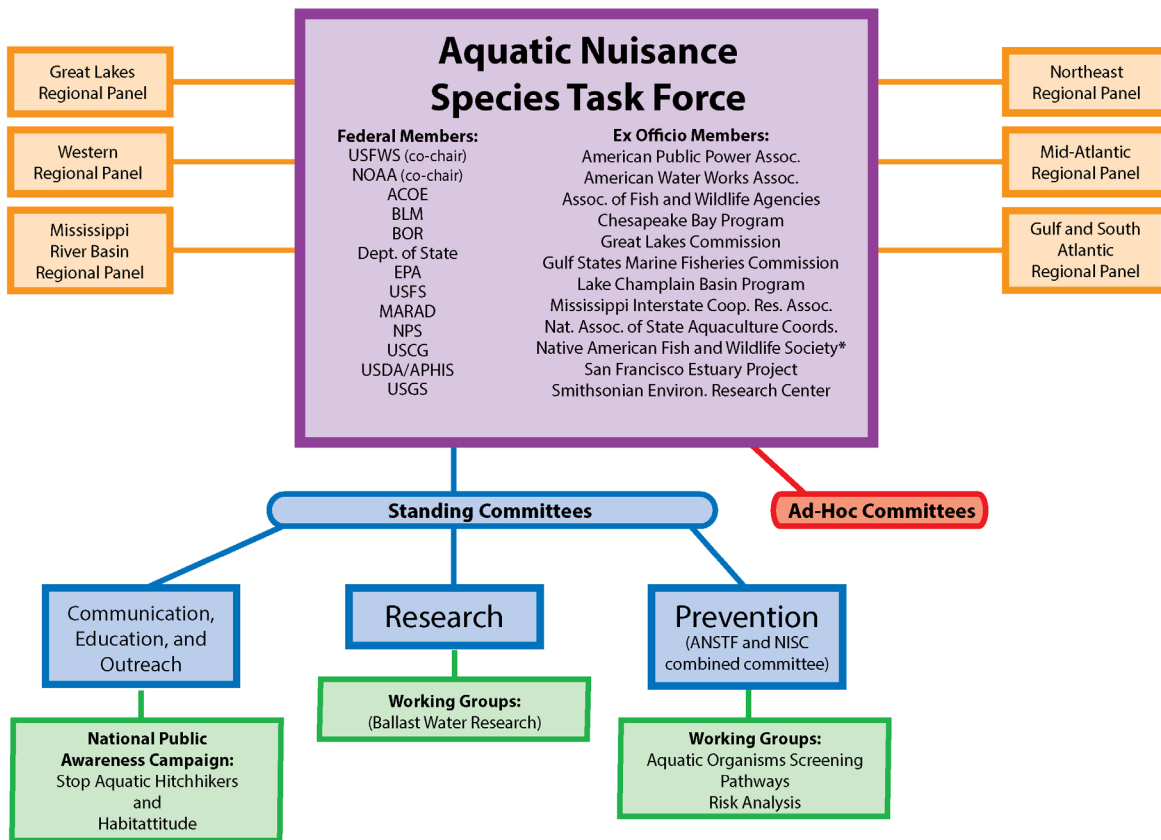
Restoration: Habitat restoration is an essential to guard against future invasions and to minimize harm from invasive species. This goal focuses on restoring impacted ecosystems and consideration of potential ANS during planning and implementation of restoration activities.

Education/Outreach: The lack of awareness concerning ANS impacts is one of the largest management obstacles. Few people understand the threat some nonindigenous species pose and how their actions might introduce them. Objectives by the ANS Task Force for education and outreach include reaching out to the general public, providing technical guidance to targeted audiences, and raising awareness among legislators and decision makers.

Research: Research supports all facets of the Strategic Plan and is necessary to increase the effectiveness of prevention, detection, response, and control and management of invasive species. To help ensure that research addresses critical needs, this goal focuses on coordination among government agencies, academia, and other participating entities.

Funding: Securing dedicated long-term and emergency funding is necessary to achieve the goals laid out in the Strategic Plan. The actions outlined by the ANS Task Force focus on coordinating Federal agency budgets to support ANS Task Force priorities, develop partnerships, and seek opportunities to leverage funds within Federal and State agencies, local governments, tribal entities, industry, as well as other entities including non-governmental organizations.

Aquatic Nuisance Species Task Force Structure



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ANS Task Force Members

The ANS Task Force consists of 13 federal agency representatives and 13 *ex-officio* non-federal members. The 13 ex-officio non-federal members represent organizations and communities that share specific concerns, essential aquatic ecosystems, or have commercial interests in ANS management. These stakeholder members enhance communication and provide insights that strengthen the effectiveness of the ANSTF. Working collaboratively, member actions fulfill the responsibilities of the ANS Task Force outlined in the Act and help meet the challenges identified in the ANS Task Force Strategic Plan.

Federal departments and agencies of the ANS Task Force:

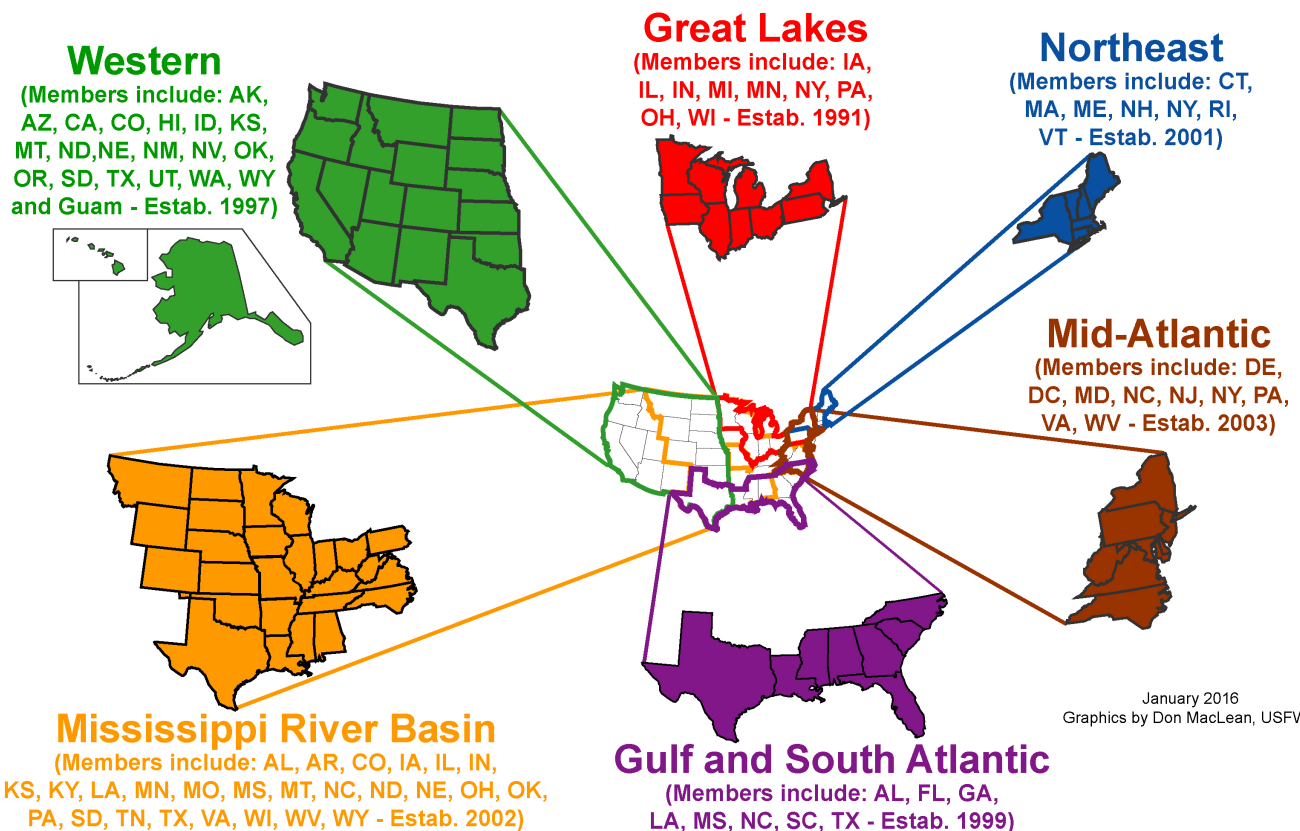
- U.S. Fish and Wildlife Service — co-chair
- National Oceanic and Atmospheric Administration — co-chair
- Bureau of Land Management
- Bureau of Reclamation
- Department of State
- Environmental Protection Agency
- National Park Service
- U.S. Army Corps of Engineers
- U.S. Coast Guard

- U.S. Department of Agriculture, Animal and Plant Health Inspection Service
- U.S. Department of Transportation, Maritime Administration
- U.S. Forest Service
- U.S. Geological Survey

Ex-officio members of the ANS Task Force:

- Great Lakes Commission
- Lake Champlain Basin Program
- Chesapeake Bay Program
- San Francisco Estuary Project
- American Public Power Association
- American Water Works Association
- Association of Fish and Wildlife Agencies
- Gulf States Marine Fisheries Commission
- Mississippi Interstate Cooperative Resources Association
- Native American Fish and Wildlife Society^{xv}
- National Association of State Aquaculture Coordinators
- Smithsonian Environmental Research Center

The Six Regional Panels of the Aquatic Nuisance Species Task Force



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ANS Task Force Regional Panels

The ANS Task Force focuses its work on ANS issues of national concern that require or could benefit from collaborative solutions. The ANS Task Force strives to create opportunities and synergies by sharing information, resources, expertise, and ideas across agency and organizational lines. While the ANS Task Force has a national focus, it recognizes the tremendous importance of actions taken at the regional, state, and local levels to achieve national ANS solutions.

Members within each of the six regional panels include representatives of state and federal agencies, tribes, non-governmental organizations, commercial interests, as well as Mexico and Canada. The roles of each panel include identifying regional ANS priorities, coordinating ANS program activities in the region, and providing advice to public and private interests concerning ANS management and control. Regional coordination efforts have been successful in fostering collaboration among states within watersheds or in similar geographic areas to address regional ANS threats and ongoing invasions. Many Regional Panels share similar concerns or priorities; accordingly, panels often work collaboratively by hosting joint meetings as well as producing collective materials and recommendations to the ANS Task Force.

The Regional Panels established by the ANS Task Force are a critical and effective mechanism for achieving the goals of the ANS Task Force. NANPCA, as amended by NISA in 1996, authorized \$300,000 to the Department of the Interior (DOI), to be used by the Director of the Fish and Wildlife Service (Director) to fund regional panels. Funding for the Regional Panels remained level with an annual allocation of \$300,000 until 2013, when funding was reduced by 20 percent to \$240,000 as a result of budget sequestration. The Panels coordinate ANS program activities across multiple states (and often internationally), which involves travelling to ANS Task Force meetings, convening and hosting Regional Panel meetings, and supporting staff or contractors to manage a range of ANS-related activities. As detailed in the Regional sections of this report, the Panels provide a host of services and products that foster communication, cooperation, and collaboration within the ANS Task Force. In order to maintain and improve the quality of those services and products, the FY 2016 President's budget included an increase of \$42,000 for Regional Panel support. This increase was approved by the Senate, but it was not approved by the House.

The Regional Panels that have been established as committees of the ANS Task Force include:

- Great Lakes Regional Panel (*established 1991*)
- Western Regional Panel (*established 1997*)
- Gulf and South Atlantic Regional Panel (*established 1999*)
- Northeast Aquatic Nuisance Species Regional Panel (*established 2001*)
- Mississippi River Basin Regional Panel (*established 2002*)
- Mid-Atlantic Regional Panel (*established 2003*)

ANS Task Force Committees

To facilitate technical coordination, the ANS Task Force has established three standing committees: the Communication, Education, and Outreach Committee; the Research Committee; and the Prevention Committee (the latter is a joint committee with the NISC). In addition, *ad hoc* committees are formed as needed to focus on a specific discipline or issue that warrants the attention of the ANS Task Force. These committees consist of ANS Task Force members, Regional Panel members, state coordinators, and other interested parties who volunteer time from their regular duties. Examples of previous *ad-hoc* committees include ANS Control, Aquatic Organisms Screening, Ballast Water Research, Detection and Monitoring, and Risk Analysis, as well as committees designated to develop National ANS Management and Control Plans to manage specific species.

State and Interstate ANS Management Plans

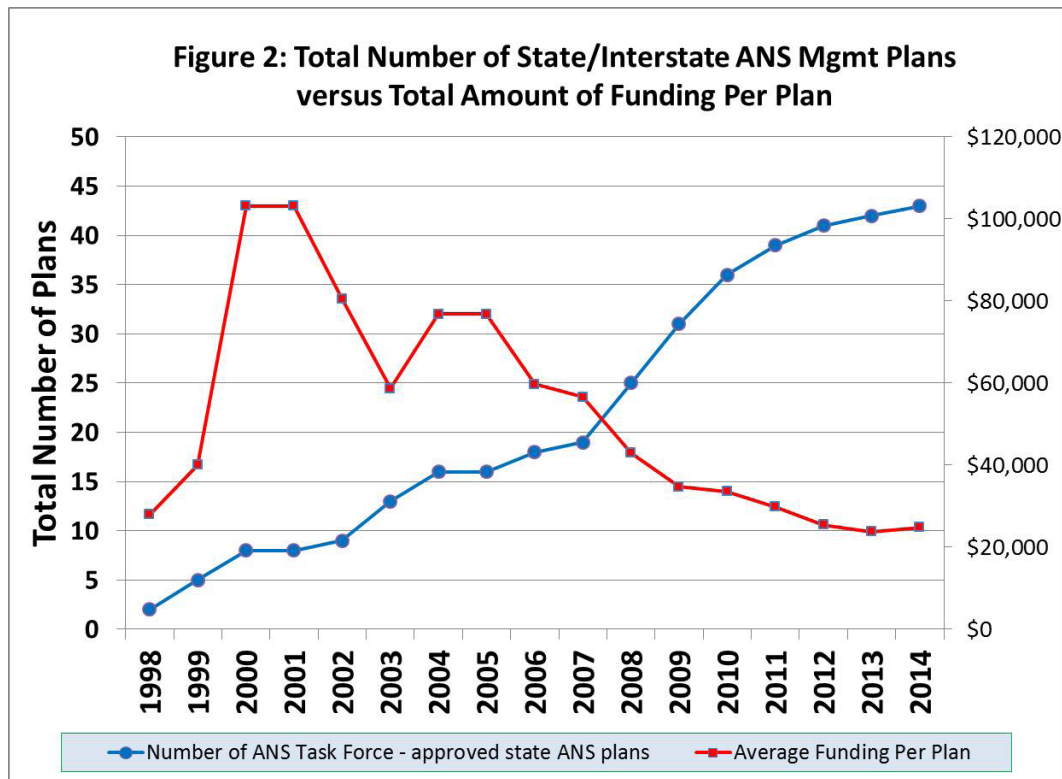
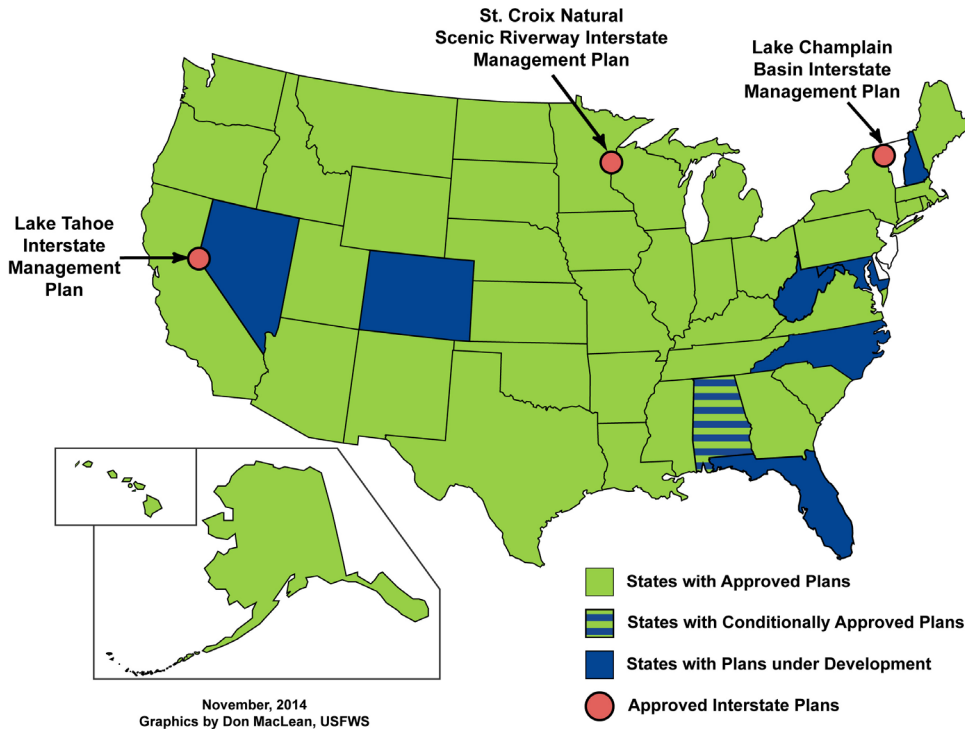
In addition to establishing the ANS Task Force and the framework for a comprehensive ANS Program, NANPCA (1990) provides the Director of the USFWS with the authorization to make grants available to states, tribes, and interstate organizations for the implementation of approved [State and Interstate ANS Management Plans](#). These plans help state resource agencies secure the necessary support from within their state to establish formal ANS programs. State ANS management plans identify technical, enforcement, or financial assistance for activities needed to eliminate or reduce the environmental, public health, and safety risks associated with ANS. They focus on identifying feasible, cost-effective management practices and measures that will be undertaken by state agencies, local programs, cooperating federal agencies, and others to prevent and control ANS infestations in an environmentally sound manner. Through their ANS Plans, state efforts weave together the framework of the national ANS program by supporting prevention, early detection, rapid response, containment, and control efforts. Since the passage of NANPCA in 1990, 42 plans (39 state and three interstate) have been approved by the ANS Task Force. The ANS Task Force, through USFWS, has been provided with approximately \$1 million annually, which is distributed equally among the states that apply for funding, unless a lesser amount is requested for individual ANS Management plans. Funding has not increased as additional plans have been approved. As such, fewer funds are now available for implementation of each individual plan.

State ANS Management Plans, Examples of Accomplishments

- Operating roadside inspection and watercraft decontamination stations.
- Monitoring waterbodies and detecting new invasions across the nation.
- Developing risk assessments and rapid response plans.
- Conducting small-scale containment and control projects.
- Supporting research projects, including research on ANS pathways, general ecological studies, control tools, invasive species impacts, and risk assessment projects.
- Conveying ANS prevention messages to millions of people across the country through a wide variety of outreach methods, venues, media, and materials.
- Conducting training courses in watercraft inspection training, ANS identification, monitoring, and other ANS topics.

Status of State ANS Management Plans

(42 Approved Plans - 39 State, and 3 Interstate)



The ANS Task Force receives approximately \$1 million annually to assist implementation of the State ANS management Plans, which is divided evenly between each approved plan. Consequently, as additional plans are approved, the funds available to each individual plans are reduced.

National ANS Management and Control Plans

NANPCA (as amended by NISA, 1996) specifies that the ANS Task Force may develop cooperative efforts to control established ANS and minimize the risk of harm to the environment and public health and welfare. Each plan focuses on essential tasks designed to minimize the impact to areas where ANS have already invaded and prevent their spread into additional habitats. The plans are developed through a cooperative process, with committee members from federal and state agencies, non-governmental organizations, industry representatives, subject matter experts, and others. The plans also undergo review by the ANS Task Force members and Regional Panels with opportunities for public review under the Federal Advisory Committee Act (FACA) guidelines and NANPCA. Successful implementation of these plans requires the participation of federal, state, and regional entities.

There are currently nine [National ANS Management and Control Plans](#) as well as one Action Plan^{xvi} approved by the ANS Task Force:

- Brown tree snake (*Boiga irregularis*), approved June 1996.
- Eurasian ruffe (*Gymnocephalus cernuus*), approved November 1996.
- European green crab (*Carcinus maenas*), approved November 2002.
- Mitten crabs (Genus *Eriocheir*), approved November 2003.
- *Caulerpa* species (an invasive algae), approved October 2005.
- Snakehead (Family *Channidae*), approved November 2006, revision approved May 2015.
- New Zealand mudsnail (*Potamopyrgus antipodarum*), approved May 2007.
- Asian carp (black carp (*Mylopharyngodon piceus*), bighead carp (*Hypophthalmichthys nobilis*), grass carp (*Ctenopharyngodon idella*), and silver carp (*H. molitrix*)), approved November 2007.
- Zebra mussel (*Dreissena polymorpha*) and quagga mussel (*D. rostriformis bugensis*), approved February 2010 as an Action Plan for Western United States waters.
- Lionfish (*Pterois volitans* and *P. miles*), approved May 2015.

ANS Management and Control Plans, Examples of Accomplishments

- Watercraft inspection and decontamination training is provided for concessionaires and National Park Service employees, state employees receive training on legal issues and the impact of quagga mussels, and new public wash stations were installed to prevent the spread of mussels.
- Technical assistance is provided, such as environmental DNA (eDNA) monitoring and new tools development to prevent the spread of Asian carp into the Great Lakes and other river basins.
- Monitoring in Oregon and Washington provided critical data on the abundance and population structure of the European green crab.
- Materials and lesson plans developed by several ANS Task Force members and Regional Panels have introduced ANS issues to students. Schools in as many as 38 states and 19 countries outside the United States had access to these resources.
- Research on New Zealand mudsnails and removals from fish hatchery water sources significantly reduced the risk of future invasions.
- Watercraft inspections and monitoring programs have been expanded to western water jurisdictions to prevent the further spread of zebra and quagga mussels.

Aquatic Nuisance Species Management at a Glance....

Coordination

The scope and complexity of ANS management requires the collective strength of multiple government agencies and private organizations in complementary ways. Coordination and cooperation between federal, state, and local entities are necessary to exchange information and lessons learned; address possible gaps, weaknesses, and inconsistencies in ANS management; increase efficiency in the use of resources; and facilitate greater harmonization of ANS management. A primary objective of the ANS Task Force is to facilitate cooperation and coordinate federal government efforts relating to ANS with those of the private sector and other North American interests.

Prevention

Prevention is the first line of defense and the most cost-effective means in combating ANS. Prevention ensures that new ANS do not become introduced into or further spread within the United States. Without prevention, ANS may infect our nation's aquatic ecosystems by establishing incipient populations that cause severe economic and ecological damage, which is often permanent and irreparable.

Early Detection and Rapid Response

Early Detection and Rapid Response (EDRR) efforts allow detection of new ANS before populations can establish or spread widely, thereby increasing the feasibility of eradication or containment. Actions include monitoring habitats to allow for the discovery of new species soon after introduction, reporting sightings of previously unknown species, and working quickly to prevent newly-discovered species from becoming established and spreading.

Containment and Control

After a species becomes established, management options include containment, control, and, if possible, eradication. Containment efforts are used to prevent further spread of the targeted ANS, while control efforts are used to suppress ANS populations so that other resource management objectives can be achieved.

Research

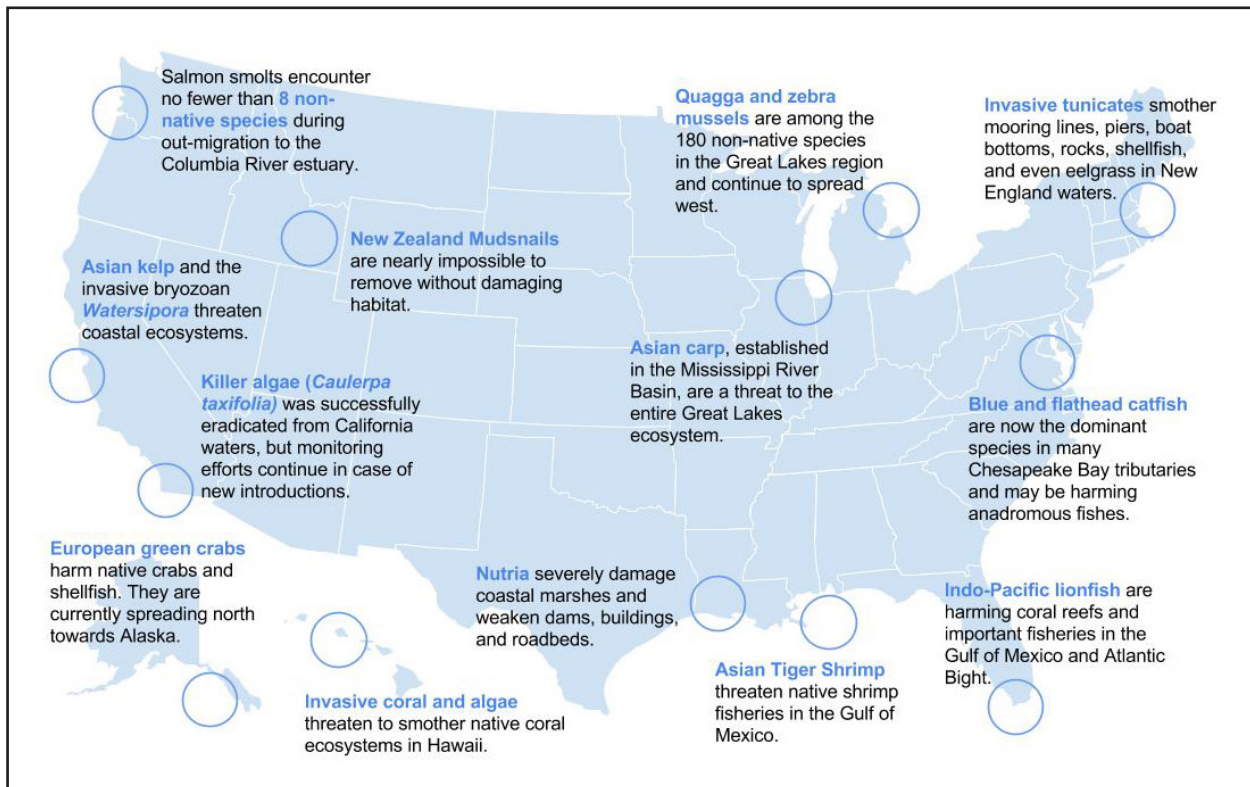
Research is necessary to deliver the components of an effective and comprehensive ANS program and can lead to a better understanding of the biology and impacts of ANS. This understanding results in improved risk and threat assessments, the development of a greater array of management tools, and support for effective management options. Research needs continue to arise as new ANS are discovered and new issues emerge.

Education and Outreach

To prevent the spread of ANS, it is critical that the public and private sectors understand 1) why ANS are detrimental, 2) why government oversight is needed, and 3) what actions can be taken to help prevent the introduction and spread of ANS. Robust public and industry awareness and outreach programs increase understanding of the impacts associated with ANS and allow public and private entities to become partners in solving the problem.

National Efforts

The ANS Task Force has accomplished much since its inception. The following is a summary of significant accomplishments of the ANS Task Force since its [2004 Report to Congress](#). It should be noted that this summary is meant to be illustrative of the wide range, but is by no means a comprehensive summary of the ANS efforts that are ongoing throughout the Nation. This section, as well as the regional sections that follow, are divided into six categories: coordination, prevention, early detection and rapid response (EDRR), containment and control, research, and education and outreach. Collectively, these categories make up the central mission of the ANS Task Force.



The map illustrates some of the key ANS issues within the United States. Numerous species have either invaded or threaten to invade the nation; therefore, the examples represented on the map should not be viewed as the only, or highest priority, ANS that threaten U.S. waters.

Coordination

The ANS Task Force has developed several tools to serve agencies, organizations, and the general public.

The ANS Task Force's [website](#) serves as a clearinghouse for ANS information, providing general information on ANS biology, impacts, and legislation as well as more detailed information in areas such as prevention, monitoring, and control. The website is also used to archive ANS Task Force meeting minutes, agendas, and presentations as well as plans and documents produced by ANS Task Force members and Regional Panels. Other tools produced by the ANS Task Force include the [ANS Experts Database](#), a nationwide list of ANS researchers and managers. This database has been an important resource to many as it provides a straightforward way to identify species, describe their biology and potential impacts, and form ANS response teams and management plans.

In 1998, a Memorandum of Understanding (MOU) between the USFWS and United States Geological Survey (USGS) established a national ANS Hotline (1-877-STOP-ANS) as a means for the public to report possible ANS sightings to the proper authority. The hotline was staffed 24 hours a day, with reports directed immediately to personnel in the USFWS's ANS program. A recent evaluation of the ANS Hotline supported phasing-out the hotline in 2015 in favor

of increased promotion of the reporting and alert system housed within [the USGS Nonindigenous Aquatic Species \(NAS\) Database](#). The NAS Database serves as a central repository for spatially referenced accounts of ANS. It provides scientific reports, online queries, distributional maps, and general information. The data are made available for use by biologists, interagency groups, and the general public. The database also allows users to report ANS sightings online and to receive e-mail alerts about specific ANS.

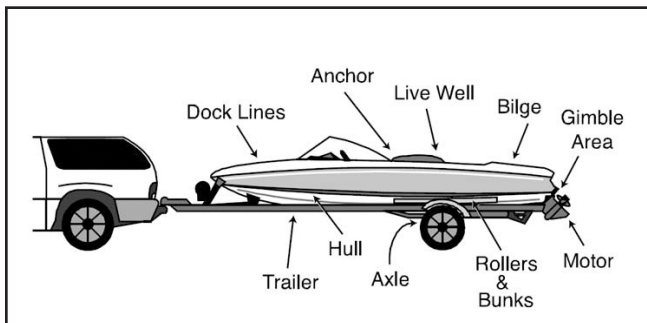


National Invasive Species Council

The annual National Invasive Species Awareness Week (NISA W) is a week dedicated to raise awareness and identify solutions to invasive species issues at local, state, tribal, regional, and national scales.

In response to concerns from Western states about the movement of AIS onto and off of federally managed lands, the ANS Task Force worked alongside NISC to draft guidance and policy recommendations that strengthen national efforts to prevent or contain the spread of both aquatic and terrestrial invasive species. The ANS Task Force has also been an active participant and organizer in several conferences, including the National Council for Science and the Environment's National Conferences on Science, Policy and the Environment; the International Conference on Aquatic Invasive Species; and the International Conference on Marine Bioinvasions. The ANS Task Force has also been involved in planning and executing the annual National Invasive Species Awareness Week, which allows participants to join events across the nation that raise awareness and identify solutions to invasive species issues at local, state, tribal, regional, and national scales.

Recognizing a need for improved communication and collaboration, several ANS Task Force member agencies have developed internal policies to improve ANS management. For example, the U.S. Forest Service (USFS) released a new National Policy for Invasive Species Management across the National Forest System. A USFS



USFWS

Example drawing from the ANS Task Force's Voluntary Guidelines for Preventing the Spread of ANS Associated with Recreational Activities. Organizations conducting ANS outreach are encouraged to promote and use these guidelines in their communication and outreach efforts.

Handbook is also under development to provide specific operational requirements and guidance for invasive species management operations. The U.S. Army Corps of Engineers (USACE) developed an Invasive Species Leadership Team that coordinates and collaborates with ANS Task Force members, regional invasive species councils, other federal and state agencies, and non-federal sponsors. The Team develops and implements cost-effective strategies to address ANS problems that affect USACE water resource management missions. The National Oceanic and Atmospheric Administration (NOAA) established an Aquatic Invasive Species Team as a means to facilitate internal and external information sharing and collaboration as well as better serve the Agency's role as co-chair to both the ANS Task Force and NISC.



USFWS

The Hazard Analysis and Critical Control Point (HACCP) planning process was developed to identify and control potential invasive species that may become a threat to native ecosystems.

Prevention

The ANS Task Force member agencies and organizations have several pathway management programs that support efforts to prevent introductions. These programs include public awareness campaigns, risk assessment and risk mitigation tools, and efforts to identify and prevent species introduction into the country or between states. Several guidance documents

have been developed by ANS Task Force members to minimize the risk of ANS introduction. The joint ANS Task Force/NISC Prevention Committee developed a [Guide for Pathway Definition, Risk Analysis, and Risk Prioritization](#). The guide is currently under revision to expand the guidelines and develop an online tool. The ANS Task Force also established several ad-hoc committees to develop consistent, practical guidelines to inform the public and prevent the spread of ANS. The resulting guidelines focus on [recreational activities](#), [water gardening](#), and the [use of animals and plants in school classrooms](#). Organizations conducting ANS outreach are encouraged to promote and use these guidelines in their communication and outreach efforts. At the federal level, the Bureau of Reclamation (BOR) developed the [Inspection and Cleaning Manual for Equipment and Vehicles to Prevent the Spread of Invasive Species](#). This manual includes protocols for inspection and cleaning various types of equipment and is applicable to many organizations.



Joe Myers/Maryland Department of Natural Resources

On October 4, 2002, the USFWS added the snakehead family of fishes (Channidae) to the list of injurious wildlife under the Lacey Act. This includes all currently recognized species, and any new species that may be described within that family in the future. By taking this action, snakehead fishes can no longer be imported into the U.S. or transported across state lines without a permit.

The USFWS and NOAA continue to improve upon the [Hazard Analysis and Critical Control Point \(HACCP\) planning](#) process and provide training to state and federal partners. HACCP is a management tool that provides a structured method to identify ANS risks and employ best management practices to prevent and remove potential invasive species from natural areas. The agencies also developed a HACCP “Train the Trainer” course to provide participants with tools to deliver a successful HACCP course and review submitted plans. Within the first year after inception, four “Train the Trainer” courses were offered around the nation, certifying more than 40 new HACCP instructors.

The Lacey Act, enacted in 1900 is the Nation’s first federal wildlife protection law and makes it unlawful to traffic in fish, wildlife, or plants taken, possessed, transported, or sold in violation of federal, state, foreign, or tribal conservation law, treaty, or regulation. More than 236 species are currently listed under title 18 of the Lacey Act as injurious wildlife. The Injurious Wildlife Listing program works closely with the ANS Task Force membership to

identify threats to U.S. ecosystems and prioritize species that should be evaluated. The USFWS focuses limited resources on responding to listing petitions and on species that are of a high risk of injuriousness, but are not yet present in the United States. The joint ANS Task Force / NISC prevention committee worked with the USFWS to develop a rapid screening tool that can be used to quickly evaluate the risks associated with species that are potentially harmful. The USFWS is also considering additional steps it can take to improve implementation of the injurious wildlife provisions of the Lacey Act.

Efforts to manage other ANS pathways include the Aquatic Animal Health Contact Project, led by the National Association of State Aquaculture Coordinators (NASAC). This project was a great success, as it has prevented accidental release of potential pathogens, thus minimizing harmful effects of ANS. In a separate effort, the Association of Fish and Wildlife Agencies (AFWA) cooperated with the DOI, USFWS, and Pet Industry Joint Advisory Committee (PIJAC) to develop a MOU establishing a general framework for collaborating on

Ian Davidson/Smithsonian Environmental Research Center



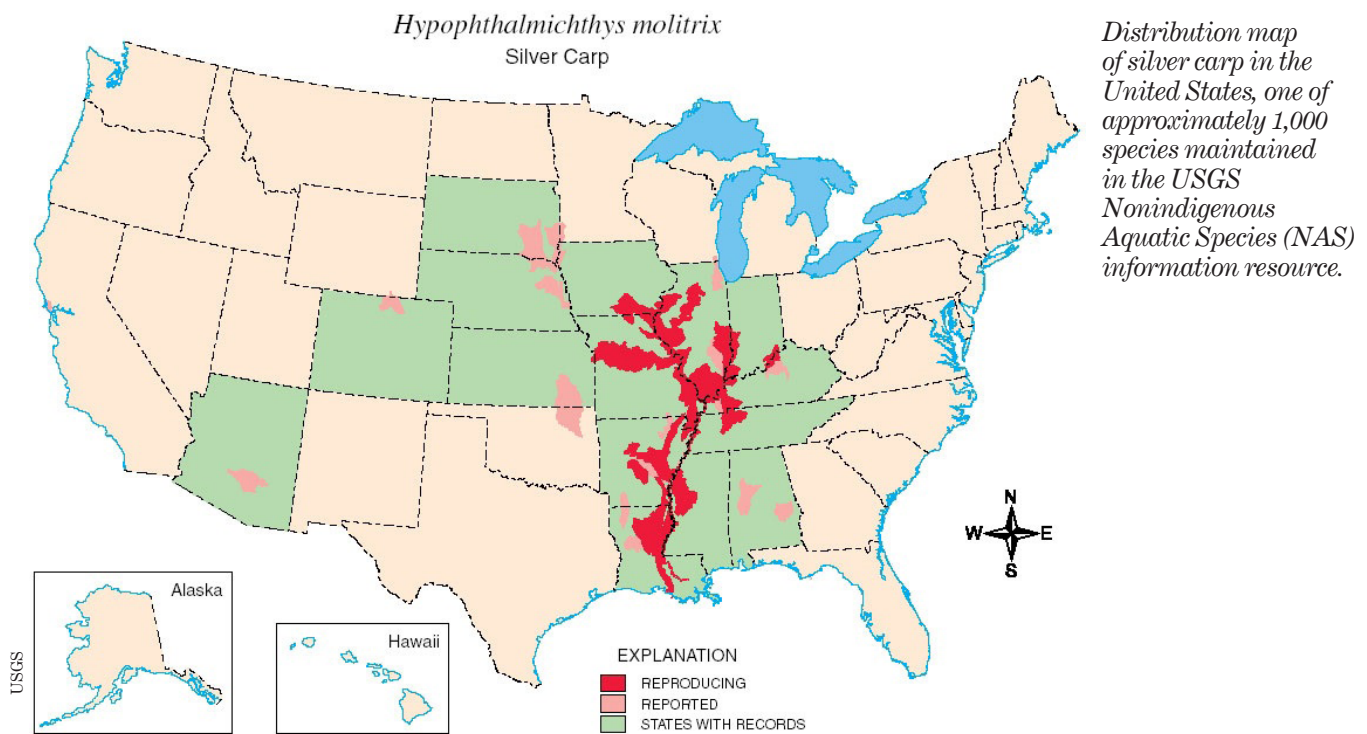
The accumulation of biofouling on ships, or biofouling, is an important vector for transferring invasive aquatic species which, if established in new ecosystems, may pose threats to the environment, human health, property and resources.

Above, a SCUBA diving researcher samples the hull of a heavily fouled recreational boat in California.

non-regulatory approaches to reduce the risk of ANS introduced into the United States through trade. Ongoing implementation of the MOU includes efforts by AFWA to evaluate which species should be evaluated for invasiveness and develop recommendations to limit or prevent trade of high-risk species.

Ballast water discharged from ships is one of the largest pathways for the introduction and spread of ANS to coastal and Great Lakes areas. The U.S. Coast Guard (USCG) has regulatory jurisdiction for ballast water management and other vessel operations to ensure that ANS are not discharged into U.S. waters to the maximum extent practicable. Since the passage of NANPCA in 1990, the USCG has developed, implemented, and enforced numerous ballast water regulations and policies for vessels operating in U.S. waters. In 2012, the USCG updated its regulations to establish a numeric ballast water discharge standard for the allowable concentration of living organisms in ships' ballast water. The USCG also amended its regulations for engineering equipment by establishing an approval process for ballast water management systems. This process promotes development of innovative ballast water management technologies, facilitates enforcement of regulations, and assists in evaluating the effectiveness of the ANS Program.

The USCG and Environmental Protection Agency (EPA) work closely together in the development of ballast water discharge standards and to harmonize requirements, to the extent feasible and appropriate, under their respective statutory mandates. The EPA completed the Issuance of the 2013 Vessel General Permit (VGP), a revision of the original VGP issued in 2008. The VGP requires vessel operators to use best management practices to reduce risks of transferring ANS via ballast water and hull fouling, requires treatment of ballast water for some vessels, and mandates self-monitoring of that treated ballast water to ensure systems are being operated appropriately. As effective ballast water management systems are installed onboard vessels, the EPA expects the risk of new shipborne invasions to U.S. waters to decrease.



The National Ballast Information Clearinghouse ([NBIC](#)) is a joint program of the Smithsonian Environmental Research Center (SERC) and the USCG. The principle aims of NBIC are to quantify the amounts and origins of ballast water discharged in U.S. coastal systems and to determine the degree to which such water has undergone open-ocean exchange or alternative treatments designed to reduce the likelihood of ballast-mediated ANS invasions.

The U.S. government's inter-agency delegation, which includes many Federal ANS Task Force members, advocate for a global approach to ANS at the International Maritime Organization (IMO), a specialized agency of the United Nations. The USCG and its partners are continuing to work collaboratively with IMO on guidelines and procedures for implementing the International Convention for the Control and Management of Ships' Ballast Water and Sediments, which was adopted in 2004 by the IMO but has not yet received the minimum ratification required to enter into force. The Convention will be executed 12 months after it has been ratified by 30 member states, representing at least 35 percent of the world's merchant shipping tonnage. As of June , 2016, it has been ratified by 51 IMO member states representing 34.87 % percent of the world's tonnage.^{xvii}

As part of the U.S. delegation, federal agencies—including the USCG, U.S. Department of Transportation (DOT), EPA, and NOAA—also participated in an IMO work group that developed draft guidance to address the threat of introducing ANS from biofouling (or the accumulation of organisms on surfaces) on ships. In July 2011, the IMO adopted the Guidelines for the Control and Management of Ships' Biofouling to Minimize the Transfer of Invasive Aquatic Species and requested that IMO Member States take urgent action in applying these Guidelines. The Guidelines are being disseminated to the shipping industry and other interested parties to help minimize the risk of introducing ANS via biofouling.

Other important tools to prevent the introduction of ANS include risk screening tools. The USFWS has developed a series of tools to help manage invasive species risks from the live animal trade. The tools include an Ecological Risk Screening Summary (ERSS) process, which helps to predict the invasiveness of imported, nonnative species; a Bayesian Network analysis, which helps assess the risk of species determined to be uncertain through ERSS; and a Risk Assessment Mapping Program (RAMP), a model that matches known species climate requirements with predicted climate regimes across North America. These tools evaluate the likelihood of a non-native species colonizing the United States and its potential harm to the environment, economy, or human health. To date, approximately [2,000 species](#) have been screened for potential ecological risk.

Early Detection and Rapid Response

Federal agencies have advanced tools at a national level that have assisted with localized efforts. For example, the USFWS is partnering with the USGS and other ANS Task Force members to lead the development of tools and protocols that identify eDNA samples from ANS. eDNA markers have been developed for Asian carp and for zebra and quagga mussels, and they are under development for African jewelfish, armored catfish, Asian swamp eel, Burmese python, lionfish, snakehead, and others. The USGS will deploy commercial, off-the-shelf technology for rapid detection of Asian carp DNA in 2016. Initially the tool will be used for Bighead and Silver Carp; however, USGS intends to expand its use to other species including Black and Grass Carp as well as invasive mussels and sea lamprey. In addition, the DOI (BOR, USGS, USFWS) has developed, refined and utilized polymerase chain reaction (PCR) protocols that rapidly detect zebra and quagga mussel DNA in water samples. For coastal efforts, NOAA has developed EDRR models that are currently being used to guide efforts to address marine ANS.

The USGS established the [Nonindigenous Aquatic Species \(NAS\) information resource](#) as a central repository for accurate and spatially referenced accounts of ANS across the Nation. The program monitors, analyzes, and records sightings of nonindigenous aquatic species throughout the nation to managers and other interested parties about introduction pathways, geographic distribution, ecology, and impacts of ANS. The NAS database notifies users of early detections by means of its [Alert System](#). Since 2008 there have been more than 1500 new detections (a species in a new state, county, or watershed). Limited resources required USGS to remove aquatic plants from the database in 2013, prompting the ANS Task Force and other groups to advocate for the need and support for the NAS Database in its full capacity. These efforts were successful as funding was added in 2015 to allow the USGS to record sightings of aquatic plants. Currently the database includes more than 308,000 records of approximately 1,200 aquatic species occurring outside their range. This information is used widely for a variety of purposes, including developing current distribution maps, conducting risk assessments, improving sampling design for monitoring of ANS, and predictive modeling of potential ranges and future invasions. The USGS also published several biological synopses and environmental risk assessments for ANS, including one for [Asian carp](#) (bighead and silver carp) as well as [black carp](#) and [snakeheads](#) (the Family Channidae); and an [identification](#)

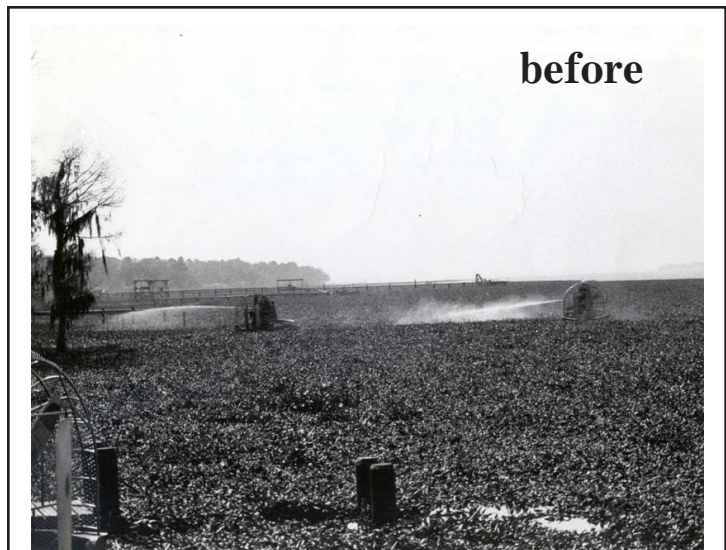
[guide for foreign and nonnative minnows](#) in the United States as information to help inform early detection and rapid response.

The National Exotic Marine and Estuarine Species Information System ([NEMESIS](#)), maintained by SERC is a resource for information on non-native, or exotic, species that occur in coastal marine waters of the United States. [NEMESIS](#) compiles detailed information on approximately 500 different non-native species of plants, fish, invertebrates, protists, and algae that have invaded our coastal waters. The database identifies which species have been reported, their current population status (i.e., whether established or not), as well as when, where, and how they invaded; it also summarizes key information on the biology, ecology, and known impacts of each invader. *NISbase*, a portal developed at the Marine Invasions Research Lab in collaboration with the USGS Nonindigenous Aquatic Species Database, allowed users to query multiple aquatic invasive species databases at one time with the convenience of a single search form. *NISbase* served as the prototype and paved the way for a new system called the [Global Invasive Species Information Network](#) (GISIN). GISIN has continued to grow and has added many data providers from around the world. It includes both aquatic and terrestrial. After the creation of GISIN, data from *NISbase* was moved to GISIN and *NISbase* has been disbanded.

Containment and Control

Several ANS Task Force national management and control plans guide containment and control programs across the Nation. Plans such as the "[National Asian Carp Management and Control Plan](#)," and the "[Quagga-Zebra Mussel Action Plan](#)" (which was submitted to Congress as DOI's

roadmap for addressing the western spread of zebra and quagga mussels) have limited the spread of high-impact ANS. Similar to ERDD, most ANS control efforts are on-the-ground and species-specific, yet federal agencies are developing comprehensive programs or strategies that encompass multiple regions. For example, the USFS finalized the Forest Service Manual 2900 (Invasive Species Management Policy) to direct management of all aquatic and terrestrial invasive species across the 193-million-acre National Forest System. The USACE conducts control and management operations of ANS in collaboration with many federal agencies and state organizations on its diverse portfolio of water resource facilities in all 50 states. The USACE is also conducting or participating in 10 large-scale ecosystem restoration activities, many involving ANS issues. To assist coastal restoration, the NOAA Restoration Center funds numerous projects nationwide in which ANS management is often a large component. NOAA also provides training and support to regional staff to ensure resource management activities do not promote further spread of ANS.



U.S. Army Corps of Engineers (USACE) is the steward of 12 million acres of public lands and waters at hundreds of water resources projects nationwide, which includes the responsibility to prevent or reduce unacceptable levels of ANS and their damage by the most economical means, and with the least possible hazard to people, property and the environment. The images above show the St. Johns River, Riverdale, Florida before (1973) and after (2003) USACE action.

USACE

USACE

Research

A principle role of the ANS Task Force is to provide guidance on ANS research, monitoring, and risk analysis as well as to provide feedback to researchers on the effectiveness of the management tools they develop. The ANS Task Force Research Committee drafted a [Research Risk Analysis Protocol](#) to evaluate proposed research for its potential to introduce or spread ANS and, where appropriate, outline the process of developing risk management plans. The ANS Task Force Ballast Water committee held a workshop that produced a report with recommendations to advance a cohesive binational research strategy that addresses information gaps inhibiting the development and validation of ballast water technologies. The EPA and USCG have further supported research efforts to better understand risk associated with ballast water discharge and the potential of ballast water treatment technologies by commissioning reports on those topics by the National Research Council and EPA's Scientific Advisory Board.

Research is ongoing to improve ballast water treatment technologies. For example, NOAA saw the completion of 3 grants supporting full-scale ballast water testing facilities and an additional 3 grants to test new technologies.

The USGS researched gas mixtures to treat ballast water and partnered with the National Park Service (NPS) to refine an emergency ballast water treatment system. The DOT, Maritime Administration (MARAD) established three domestic ballast water technology testing facilities and began researching hull fouling survey methods. The NPS worked with researchers and private companies to develop ballast water treatment technologies that could be installed on vessels for ongoing ANS management as well as emergency response technology and operations for vessel groundings. The USCG, with its research and development partners at the EPA, MARAD, U.S. Navy, and SERC, continues to develop and refine new procedures for testing the efficacy of ballast water treatment systems and further the understanding of ballast water management technologies and their impact on vessel operation and design.



Kim Holzer/Smithsonian Environmental Research Center

Researchers sample ballast water on board a ship docked in Baltimore Harbor.

The USGS continues to conduct research on high-priority and emerging ANS across the country as part of its Invasive Species Program. This research provides information on early detection and assessment of newly established invaders; aids monitoring efforts; improves understanding of the ecology of invaders and factors in resistance of habitats to invasion; develops and tests prevention and control alternatives; and works alongside partners to develop and assess approaches for restoring disturbed habitats after administering control actions.

Additional ANS research is conducted at SERC's Marine Invasions Research Lab, a national and international center for research on biological invasions in coastal marine ecosystems. The primary goal of the Lab's research is to understand biological invasion patterns and processes in marine ecosystems. Scientists seek to characterize patterns of marine invasion across space, time, and taxonomic groups; develop a mechanistic understanding of those factors that are driving observed patterns; and advance predictive capability about the establishment, spread, and impacts of ANS in marine ecosystems.

The USACE conducts ANS research through two direct-funded programs: the Aquatic Nuisance Species Research Program (ANSRP) and the Aquatic Plant Control Research Program (APCRP). The ANSRP addresses all ANS that are problematic to our Nations' waterways, infrastructure, and associated resources by investigating innovative technologies regarding risk assessment, prevention, species biology, and environmentally sound options to manage ANS. The APCRP is the only federally authorized research program directed to develop technologies for the management of invasive aquatic plants. The program provides effective, economical, and

environmentally compatible methods for assessing and managing problem aquatic vegetation that interfere with the valued uses of U.S. waterways. Past research projects have investigated biological control agents, chemical control strategies, biology of invasive aquatic plant species, and integrated weed management methods. Finally, the USFS supported a risk assessment that analyzed potential environmental impacts of quaternary ammonium products (i.e., Sparquat and many variations). This assessment is expected to result in amended EPA labels approving the use of these chemicals to decontaminate fire and field gear and protect against the spread of ANS.

Education and Outreach

ANS Task Force members have created a wide variety of public education materials for distribution across the country. In addition, national awareness programs educate and inform the public about ANS issues, inviting them to become a partner in solving the problem. [Stop Aquatic Hitchhikers!](#) (SAH!), developed by the ANS Task Force in 2000, is the internationally recognized public awareness campaign that empowers recreational users to become part of the solution in stopping the transport and spread of these harmful hitchhikers. Outreach methods used by a number of state, regional and local groups include: television and print advertisements, billboards, dioramas, and social media. In 2012, the USFWS signed an MOU with Wildlife Forever, transferring the operational lead of the SAH! conservation messaging brand. Wildlife Forever encouraged state and federal fish and game agencies, tribal organizations, and numerous non-government organizations (NGO) to support ANS awareness through consistent messaging and outreach. In 2014, insufficient funding by both parties led to the termination of the MOU with Wildlife Forever and the USFWS resumed the operational lead for the SAH! campaign.



Stop Aquatic Hitchhikers is a public awareness campaign that targets anglers, boaters, hunters and other outdoor recreational users to identify and stop the spread of ANS.



Habitattitude™ is an action-oriented public awareness campaign that strives to modify people's habits so pets are not released into the environment, inform people's attitudes so pets are thoughtfully chosen and well-cared-for, and protect habitats from the effects of unwanted pets. Collectively, these objectives are known as getting a habitattitude.

In 2004, the PIJAC, USFWS, and NOAA-Sea Grant unveiled Habitattitude™ to inspire and educate people to be both responsible pet owners and environmental stewards, thereby minimizing the impact of invasive species on the environment, economy, and human health. In 2009 PIJAC and DOI established an MOU as a general framework for cooperation between the signatories to collaborate on mutually beneficial education and public awareness initiatives with the goal of influencing human behavior. A secondary intent was to unify public and private-sector organizations around this issue, provide a platform to educate pet owners about the potential impacts of releasing unwanted companion animals, and empower the public to adopt proactive prevention practices to protect and conserve the environment. The DOI and PIJAC have recently recommitted to their efforts under the MOU. The 2014 work plan focuses on rebranding with new messaging and guidelines; a re-launch of Habitattitude™ is anticipated in 2016.

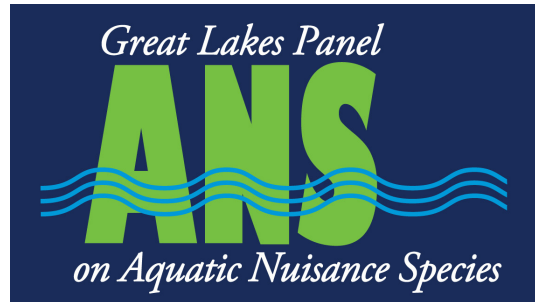
Other national education efforts include a USACE webinar series that educates individuals on ANS problems, management technologies, and ongoing research. The NPS provides on-site ANS information with park-based signage and visitor interpretation programs.

Great Lakes Region

Illinois, Indiana, Michigan, Minnesota, New York, Pennsylvania, Ohio, Wisconsin

Great Lakes Panel on Aquatic Nuisance Species

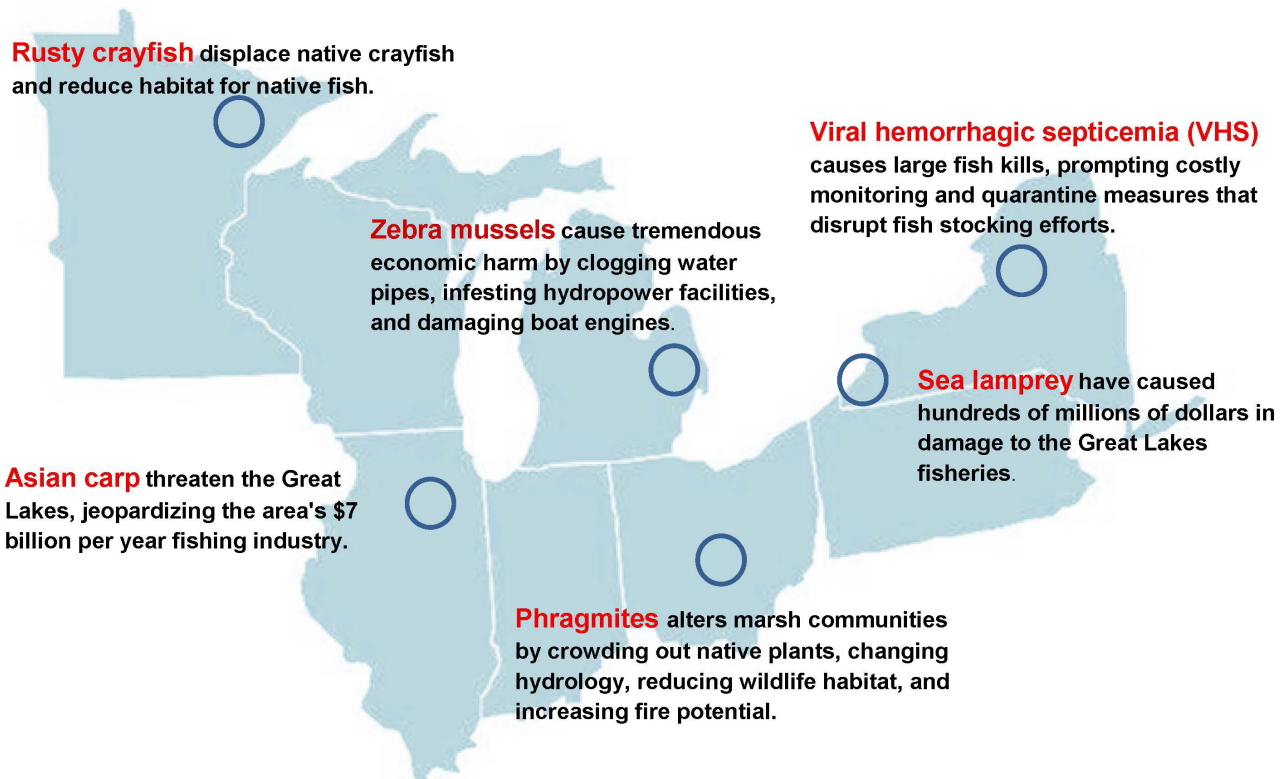
Convened in 1991, the Great Lakes Panel (GLP) was the first Regional Panel to be federally authorized by the ANS Task Force. The mission of the Panel is to coordinate the development of education, research, and policy to prevent new ANS from entering the Great Lakes Basin and to control and mitigate those ANS populations already established. The Panel carries out this mission by working to:



- Identify ANS priorities for the Great Lakes.
- Develop regional position statements on ANS priorities.
- Assist the ANS Task Force in coordinating federal ANS program activities.
- Provide advice concerning ANS prevention and control.
- Coordinate ANS program activities in the Great Lakes.
- Provide a forum for interagency/organizational communication.
- Serve as a vehicle for regional dialogue and discussion on ANS issues.

The GLP has been a leader nationally. Products produced over the past more than 20 years have provided guidance for its members as well as other regional panels in helping to address ANS challenges. The GLP also fosters binational collaboration and coordination on ANS research, education, and policy through the active participation of members representing Canadian federal, provincial, and nongovernment agencies. It creates a forum that allows information sharing, collaboration, and coordination to provide opportunities for leadership, the genesis of new ideas and approaches, and efficient operations that avoid duplication of efforts and use of resources. It leverages expertise and knowledge for “lessons learned,” providing insights into what resources are available and what efforts work. The networking and relationship-building opportunities provided through GLP meetings and activities provide links for collaborative campaigns, projects, and products, which leverages resources from the private, public, and non-profit sectors.

Website: <http://glc.org/projects/invasive>



The map illustrates the states included in the Great Lakes Panel on Aquatic Nuisance Species. Also highlighted are some of the key issues within the region. Numerous species have either invaded or threaten to invade the region; therefore, the examples represented on the map should not be viewed as the only, or highest priority, ANS within the region.

The following is a snapshot of significant accomplishments of the Great Lakes Panel on Aquatic Nuisance Species (GLP) and ANS Task Force member agencies in the Great Lakes region. This summary is meant to illustrate the wide range, but is by no means a comprehensive summary, of the ANS coordination, prevention, EDRR, research, and education and outreach that have been done and are ongoing in the Great Lakes region.

Coordination

The Great Lakes Panel (GLP) advances coordination on ANS prevention and control activities in the region through several mechanisms, including hosting [semi-annual meetings](#) and the activities of three standing committees that include Information and Education, Research Coordination, and Policy Coordination. GLP committees play a lead role in identifying priorities and progress on AIS prevention and control, as recorded in [committee priority documents](#). These documents are also designed to guide funding from local, state, provincial, and federal agencies and private foundations toward high priority needs as well as provide incentive for grant seekers to develop and seek funding for high priority projects. The documents are regularly updated by the committees to reflect progress in addressing priorities, emerging priorities, and other new information. In addition, the committee forums provide an opportunity for members to enhance coordination and consistency in research programs, outreach messages, and policy initiatives. For example, the GLP [compiled a comprehensive list](#) of all aquatic species for which certain activities related to commercial trade are restricted or prohibited, at either state, provincial, or federal levels. In compiling this list, the GLP has helped to elevate the issue of inconsistent policies and helped to drive greater coordination among these Great Lakes jurisdictions. In addition, this list serves as a useful resource for user groups, commercial interests, and other stakeholders within the region by increasing awareness of the regulations.

A great deal of coordination is ongoing around the issue of regional ballast water management and regulation. For example, the U.S. Saint Lawrence Seaway Development Corporation and International Joint Commission, both members of the GLP, initiated the formation of the Great Lakes Ballast Water Collaborative. One of the primary goals of the Collaborative is to share relevant, useful, and accurate information and foster better communication and collaboration among the key stakeholders engaged in the effort to reduce the risk of introduction and spread of ANS. A particular emphasis of the Collaborative has been to bring federal and state representatives together with marine industry representatives and respected scientists to find workable and effective solutions to the ANS challenge as they relate to the Great Lakes St. Lawrence Seaway System.

The GLP has also undertaken efforts to facilitate coordination and information-sharing related to the development of state ANS management plans. In 2007, the GLP organized a one-day session focused on state ANS management plans that was held as part of a joint meeting between the ANS Task Force and the GLP. This session provided a forum for the states to exchange ideas and lessons learned from working on their management plans. It was also an opportunity for members of the ANS Task Force to receive a briefing on the status of state management plan programs across the region and to actively engage with state representatives to develop recommendations for facilitating state ANS management planning. Discussions during this session generated strategies that could be used to overcome certain obstacles states were experiencing, and resulted in a set of recommendations for improving the development and implementation of state management plans.



ANS pathways of introduction and spread include maritime commerce, canals and waterways, organisms in trade, recreational activities, and public and private aquaculture. Each of these pathways requires specific strategies to reduce the risk of ANS introduction and spread into the Great Lakes.



The Great Lakes and Mississippi River Interbasin Study (GLMRIS) Report was submitted to Congress, Jan. 6, 2014, and contains eight potential plans, each with concept-level design and cost information, and evaluates the potential of these alternatives to control the spread of ANS. The Plans include non-structural controls, technologies and physical barriers. The Army Corp of Engineers held a public comment period and public meetings for the report in spring 2014.

Prevention

The GLP frequently supports and advances prevention efforts through the development of recommendations to address pathways of concern and highest risk to the Great Lakes region. These statements represent the consensus views of GLP members and help to advance action on pathways, regionally and nationally. Examples include recommendations related to preventing the introduction of ANS via ballast water and organisms in trade. Most recently, and in response to recent research, the GLP became engaged in efforts to prevent the establishment and spread of grass carp in the Great Lakes region.

Federally led prevention efforts in the Great Lakes region include the Great Lakes and Mississippi River Interbasin Study (GLMRIS) conducted by the USACE in consultation with other federal agencies, Native American tribes, state agencies, local governments and non-governmental organizations. The multi-year study resulted in the [GLMRIS Report](#) that presents the range of options and technologies available to prevent

ANS movement between the Great Lakes and Mississippi River basins. GLMRIS identified canals and waterways between the Great Lakes and Mississippi River basins that could function as a conduit for ANS movement between the two basins. As a result, state and federal agencies have mobilized to reduce the risk of interbasin transfers of ANS through these waterways. The long-term management of ANS control sites is still evolving, and each year new management practices and control methods are discovered.

The Great Lakes Commission (GLC), host organization of the GLP and *ex-officio* member of the ANS Task Force, is also involved in efforts to prevent the transfer of ANS between the Great Lakes and Mississippi River basins. In 2010, the GLC, in partnership with the Great Lakes and St. Lawrence Cities Initiative, conducted a large-scale study that developed options and identified associated costs, impacts, and benefits for separating the Mississippi River and Great Lakes watersheds in the Chicago Area Waterway System. The project resulted in a detailed report from contractors, a series of technical sub-reports, and a clear and concise summary report.

The GLC is also working to support prevention efforts by developing software to assess the availability of ANS via internet sales. This project will provide management tools to decision-makers and regulators to better assess the risks associated with internet sales, and present options for additional actions to prevent ANS introductions.

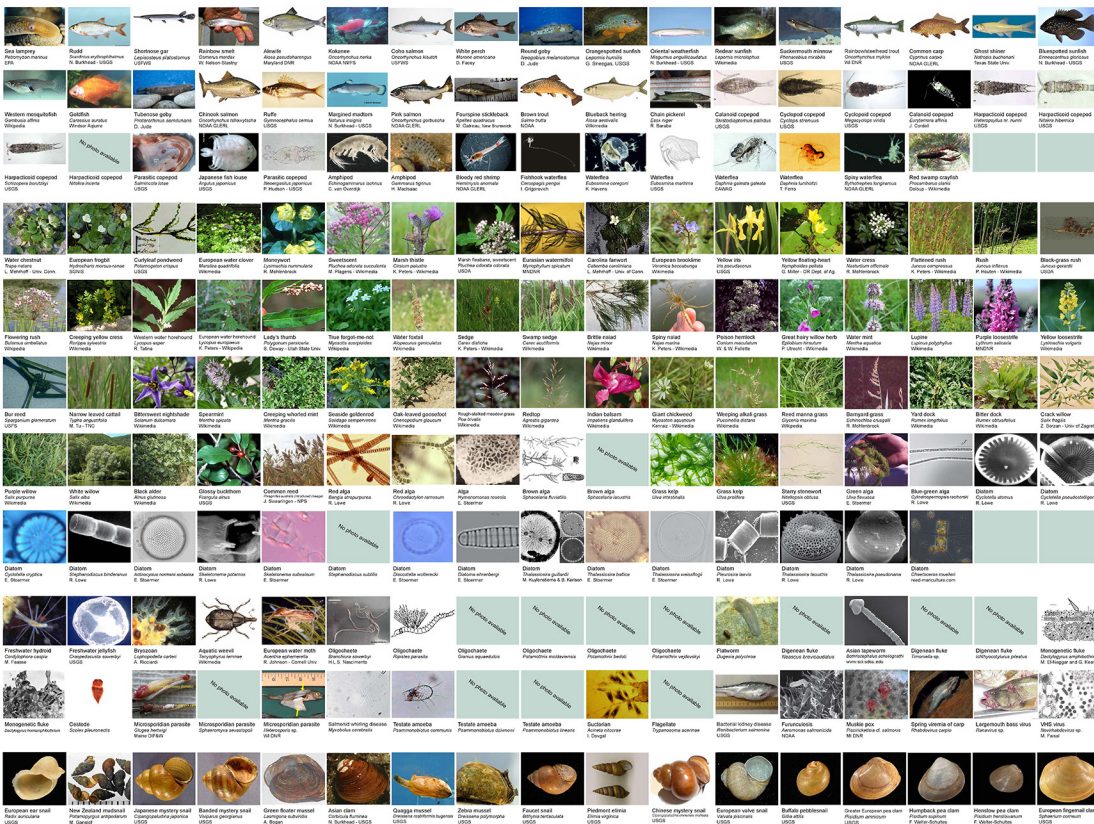


Great Lakes Aquatic Nonindigenous Species Information System

<http://www.glerl.noaa.gov/res/Programs/glansis/glansis.html>



Some of the 180 181 182 184 Non-Native Species Established in the Great Lakes



GLANSIS

A one-stop source for information about non-indigenous species in the Great Lakes region!

GLANSIS ENHANCEMENTS 2010-2011

The GLANSIS project has received funding under the Great Lakes Restoration Initiative (GLRI) for several improvements in support of early detection and rapid response.

- Addition of 'range expansion' species—those native to one portion of the Great Lakes but are considered invasive to other portions of the basin.
- Addition of high priority 'watchlist' species—those that have been identified in the literature as high risk for invading and becoming established in the Great Lakes.
- Updated and consistent 'impact' information allowing cross-taxa comparisons that are better able to support risk assessment and management.
- Addition of management information—regulations, best management practices, and control methodologies—for all the species in the database.
- Enhanced bibliographic information. (IL-IN Sea Grant)
- Addition of non-technical fact sheets for priority species of public interest. (IL-IN Sea Grant)

Great Lakes RESTORATION

GLANSIS NEEDS Your Verified Reports

Send reports to:
Dr. Rochelle Sturtevant
rochelle.sturtevant@noaa.gov
 NOAA Great Lakes Environmental Research Laboratory
 4840 South State Road
 Ann Arbor, MI 48108
 734-741-2235
www.glerl.noaa.gov

NOAA and USGS

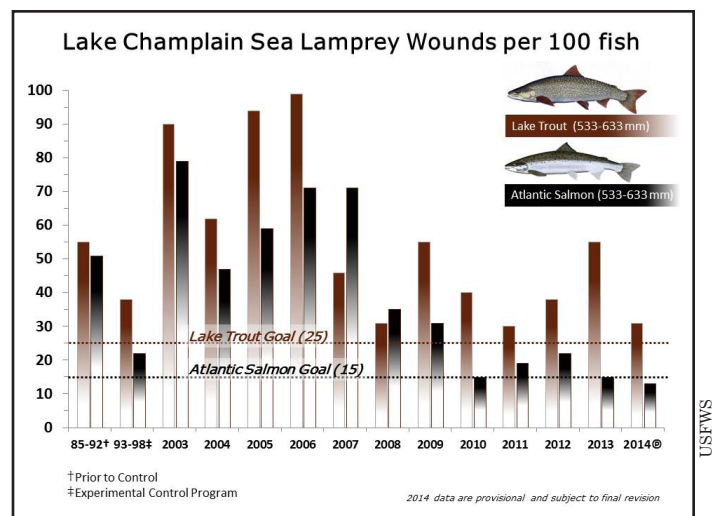
The Great Lakes have a long history of ANS introductions, currently over 180 nonindigenous species have been reported to have reproducing populations in the Great Lakes basin. The Great Lakes Aquatic Nonindigenous Species information System (GLANSIS) provides access to information on Great Lakes ANS in support of detection, management, and control efforts.

Early Detection and Rapid Response

The GLP continues to serve as a key forum for reporting on EDRR activities and providing feedback and input on the development and implementation of EDRR tools. Recent [meetings of the GLP](#) have included sessions on the next frontier of early detection tools, lessons learned from response activities, and plans for future work. The GLP also developed a [Position Statement on Professional Responsibility for Reporting of Aquatic Invasive Species](#) that urges researchers to report new discoveries of ANS in a timely manner to the appropriate state or federal natural resource agency.

Federal efforts to support ANS management within the Great Lakes region include NOAA's Great Lakes Aquatic Nonindigenous Species information System (GLANSIS), a regional node of the USGS national, online Nonindigenous Aquatic Species (NAS) database. The goal is to provide one-stop access to the best available information on Great Lakes ANS in support of detection, management, and control. NOAA is currently using the system to develop and apply tools to assess invasion probability as well as potential impacts of a list of "likely" invaders identified in the scientific literature.

The federally led and funded Great Lakes Restoration Initiative (GLRI) supports many EDRR efforts throughout the region. For example, EPA's Great Lakes National Program Office continues to develop a Great Lakes early detection network for ANS. Outcomes from this research will include refined and robust sampling strategies for potential non-indigenous species in different coastal systems across the Great Lakes and an evaluation of the capacity and efficiency to supplement morphological identification with DNA-based identification. The project will also extend and refine sampling strategies by evaluating challenges to early detection. Federal and state agencies in the region recently responded to several detections, including silver and bighead carps in the Chicago Area Waterway System, red swamp crayfish in Wisconsin, grass carp in Lake Erie, and hydrilla in New York. The GLRI is also supporting the development and implementation of an interstate EDRR plan for the Great Lakes region.



The cooperative operations and positive impacts on Great Lakes and Lake Champlain fisheries from the Sea Lamprey Control Program are highly visible and widely understood. The figure above shows the reduction in lamprey woundings of lake trout and Atlantic salmon in Lake Champlain since the program was implemented.

Containment and Control

Efforts to control Asian carp provide another example of ANS Task Force agencies, organizations, and Regional Panels working together to address serious environmental and economic threats. In 2007, the ANS Task Force approved The [Management and Control Plan for Bighead, Black, Grass, and Silver Carps](#) to address the threat of Asian carp in the United States. The nearly 20-year plan contains seven goals, 48 strategies, and 133 recommendations with a goal of eradicating all reproducing Asian carp populations in the wild. Should the plan be fully funded for implementation, the Asian Carp Working Group Implementation Team has prioritized the 133 actions in the Plan for immediate action.

In both the upper Mississippi River Basin and Ohio River Basin, state, federal, and non-governmental partnerships have been developing holistic strategies to address Asian carp and other AIS, building off the National Asian Carp Plan. The efforts being conducted in the respective basins leverage resources of each partner organization and are used to inform budgets and work plans focused on addressing the threat from Asian carps. For example, in response to growing concern over the spread of these invasive carp through the Mississippi River and Great



USFWS

Workers with the U.S. Fish and Wildlife Service electrofish for Asian carp.

Lakes Basins, the Minnesota Department of Natural Resources partnered with NPS staff to evaluate threats posed by Asian carp and actions needed to minimize their impact in waters of the upper Mississippi River. In 2011, these groups developed an action plan that led to early identification of Asian carp movement, habitat evaluations for potential establishment in the Saint Croix Riverway, and initiatives to prevent the spread of Asian carp in the Upper Mississippi River. The USFWS, acting as an agent through the Great Lakes Fishery Commission, implements a sea lamprey control program with U.S. and Canadian investments exceeding \$20 million annually. This program illustrates the level of effort that is sometimes needed to significantly reduce the population of an invasive species once it is established. The effectiveness of this program is largely due to the development of unique control technologies that are used within an

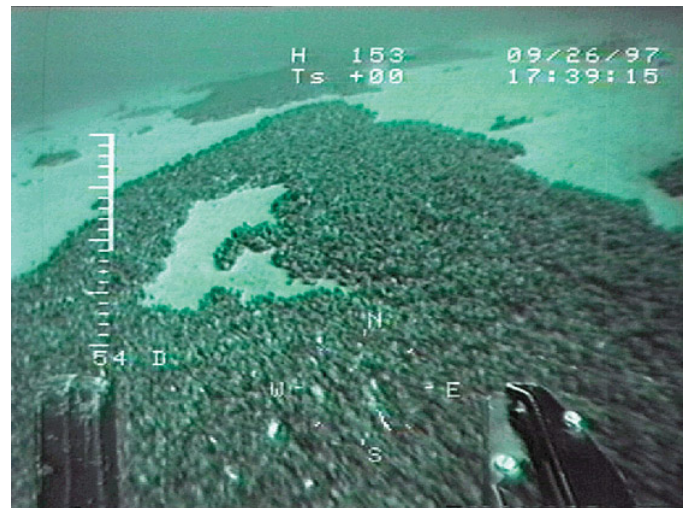
integrated pest management approach to target and suppress sea lamprey populations. Sea lamprey control has directly contributed to the reestablishment of Great Lakes and Lake Champlain sport and commercial fisheries, estimated to have an annual value in the billions of dollars.

Since 2010, the Great Lakes Restoration Initiative (GLRI) has advanced invasive species control in the Great Lakes basin. This initiative provides \$45-60 million dollars annually for the enhancement of invasive species activities by federal agencies and their state, tribal, and community partners. The GLRI has enabled federal agencies and Great Lakes states to make progress by working together on control plans and on-the-ground actions for some of the more than 180 ANS that exist in the Great Lakes. Over 300 invasive species projects have been funded to date, with the majority of these being control and containment activities. Many of the methods and approaches funded by GLRI are broadly transferable to other parts of the country.

Research

The GLP's Research Coordination Committee has played a significant role in driving an ANS research agenda for the Great Lakes region. A research priorities document was developed following the review of various state and regional research and management plans and conference proceedings. The Committee continues to work with GLP member agencies and other partners to advance research on the priorities outlined in the document and to update the document as new information and priorities emerge. Further, the committee recognized that certain ANS species might require focused research attention. Thus, a priority species list was developed to draw attention to those organisms with known and significant adverse impacts on the Great Lakes-St. Lawrence River ecosystem.

Researchers are developing control techniques that target Asian carp without harming other fish species. GLRI provided funds for the USFWS to increase their capacity to effectively support eDNA analysis. This



USGS

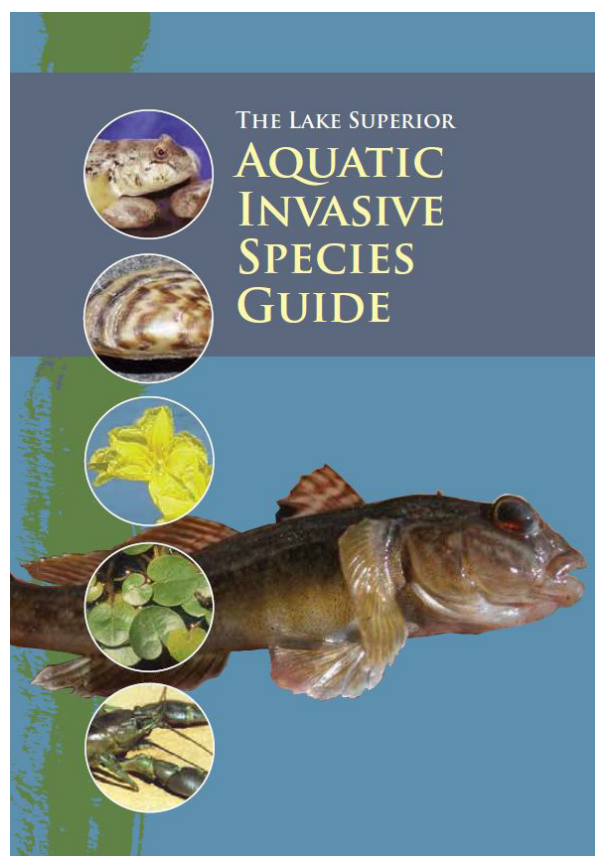
Zebra mussels are widely known for their conspicuous infestation of rocks and other hard substrates. USGS scientists, in collaboration with The Ohio State University and ODNR- Division of Geological Survey, discovered that zebra mussels are extensively colonizing sand and mud sediments in western and central Lake Erie. These beds of zebra mussels could affect the exchange of nutrients between the sediment and the overlying water and within the Lake Erie food web.

program is being implemented by USFWS to monitor the Great Lakes and the Chicago Area Waterway System (CAWS) for Asian carp. GLRI also provided funds to the USGS to develop new containment and control technologies for Asian carp and to transfer these new tools to managers for use in the field. USACE, Buffalo District, in cooperation with the U.S. Army Engineer Research and Development Center (ERDC), served as the lead agency on a demonstration project for the eradication of *Hydrilla verticillata*, an invasive, submersed aquatic weed found in the Erie Canal and Tonawanda Creek. The USACE also provided technical expertise on the development and review of hydrilla management plans for Cayuga Lake Inlet and the Croton River. Eradication is particularly important given the economic and ecological value of the waterway and risk of spread to multiple water bodies through New York and the Great Lakes. The demonstration project utilized aquatic herbicide treatments in 2014 and 2015 followed by intensive post-treatment monitoring to determine treatment success and future adaptive management strategies. This demonstration project is an example of successful collaborations and partnerships among many agencies including USACE, New York State Department of Environmental Conservation, USFWS, EPA, New York Canal Corporation, Niagara County Soil & Water, New York's Partnerships for Regional Invasive Species Management, and the Western New York Hydrilla Task Force to solve an expanding regional, invasive species issue.

NOAA's Great Lakes Environmental Research Laboratory (GLERL) developed food web models to predict ANS impacts on Lakes Michigan, Erie, and Huron ecosystems. The lab also configured models to forecast both ecological and economic impacts of current and future species invasions to the Great Lakes. The GLRI has also provided essential funds to USGS and other federal agencies to synthesize and field-test sea lamprey pheromones, with the hope that pheromones could be used to boost trapping and removal efficiency. GLRI funding also supports the [Great Lakes Phragmites Collaborative](#), led by the GLC and the USGS to facilitate communication among stakeholders across the region and serve as a resource center for information on Phragmites (common reed) biology, management, and research.

The USGS conducts a wide variety of research on ANS in the Great Lakes, particularly zebra and quagga mussels, sea lamprey, and Phragmites. Much of this research focuses on determining the effects of ANS on native species and the ecosystem and on developing and supporting ANS control efforts. For example, USGS research on zebra and quagga mussels included examining potential refugia for native mussels; documenting the extirpation of native mussels; and determining effects of zebra and quagga mussels on thiaminase (an enzyme that degrades vitamin B₁), benthic invertebrates, and fish communities in the Great Lakes. Recently USGS scientists have begun developing and testing control methods for zebra and quagga mussels and have published a volume on the biology, impacts, and control of zebra and quagga mussels. In addition, the USGS, in partnership with the GLC, Great Lakes Fisheries Commission, and NOAA, recently formed the [Invasive Mussel Collaborative](#) to provide a framework for communication and coordination and to advance scientifically sound technology for invasive mussel control to produce measurable ecological and economic benefits.

The Inter-Tribal Fisheries and Assessment Program and Chippewa Ottawa Resource Authority (CORA), a member agency of the GLP, have developed and tested specially modified nets that prevent unwanted bycatch. The modifications will help tribal commercial fishermen in the 1836 treaty area avoid fouling of nets by ANS and



Ontario Invading Species Program

Great Lakes Panel on Aquatic Nuisance Species routinely assists the production of ANS outreach and education materials. The Lake Superior Aquatic Invasive Species Guide provides one such example.

aid in the rehabilitation of native lake trout. CORA will continue to help tribal commercial fishermen adopt and use the new system and explore opportunities to promote their methods to assist fisheries research and other commercial fisheries.


Education and Outreach

The GLP Information and Education Committee routinely provides feedback and input on the development of outreach messages and products in the Great Lakes region; one recent example is the [Lake Superior Aquatic Invasive Species Guide](#). The GLP also developed recreational guidelines for ANS that were later “nationalized” by the ANS Task Force’s Recreational Activities Committee. In 2011, the GLP recommended that these guidelines be updated based on improved communication strategies developed through the Stop Aquatic Hitchhikers! campaign, newly detected ANS, and new recreational opportunities; as a result, the [Voluntary Guidelines to Prevent the Introduction and Spread of Aquatic Invasive Species: Recreational Activities](#) was recently approved and published by the ANS Task Force.

Another significant outreach accomplishment was the development of the 14-page full-color informational booklet entitled [Great Lakes Aquatic Invasions](#), a joint initiative of the GLP and GLC. The booklet provides a comprehensive overview of ANS problems in the Great Lakes, along with challenges and the approaches being taken to address them. Nearly 10,000 copies have been disseminated to local, state, and federal decision-makers, as well as other user groups from the recreational and commercial sector. The GLC also publishes an ANS Update newsletter that covers emerging ANS issues in the Great Lakes region, including an ANS feature article and state, provincial, and federal updates.

Western Region

Alaska, Arizona, California, Colorado, Guam, Hawaii, Idaho, Kansas, Montana, North Dakota, Nebraska, New Mexico, Nevada, Oklahoma, Oregon, South Dakota, Texas, Utah, Washington, Wyoming



The Western Regional Panel on Aquatic Nuisance Species

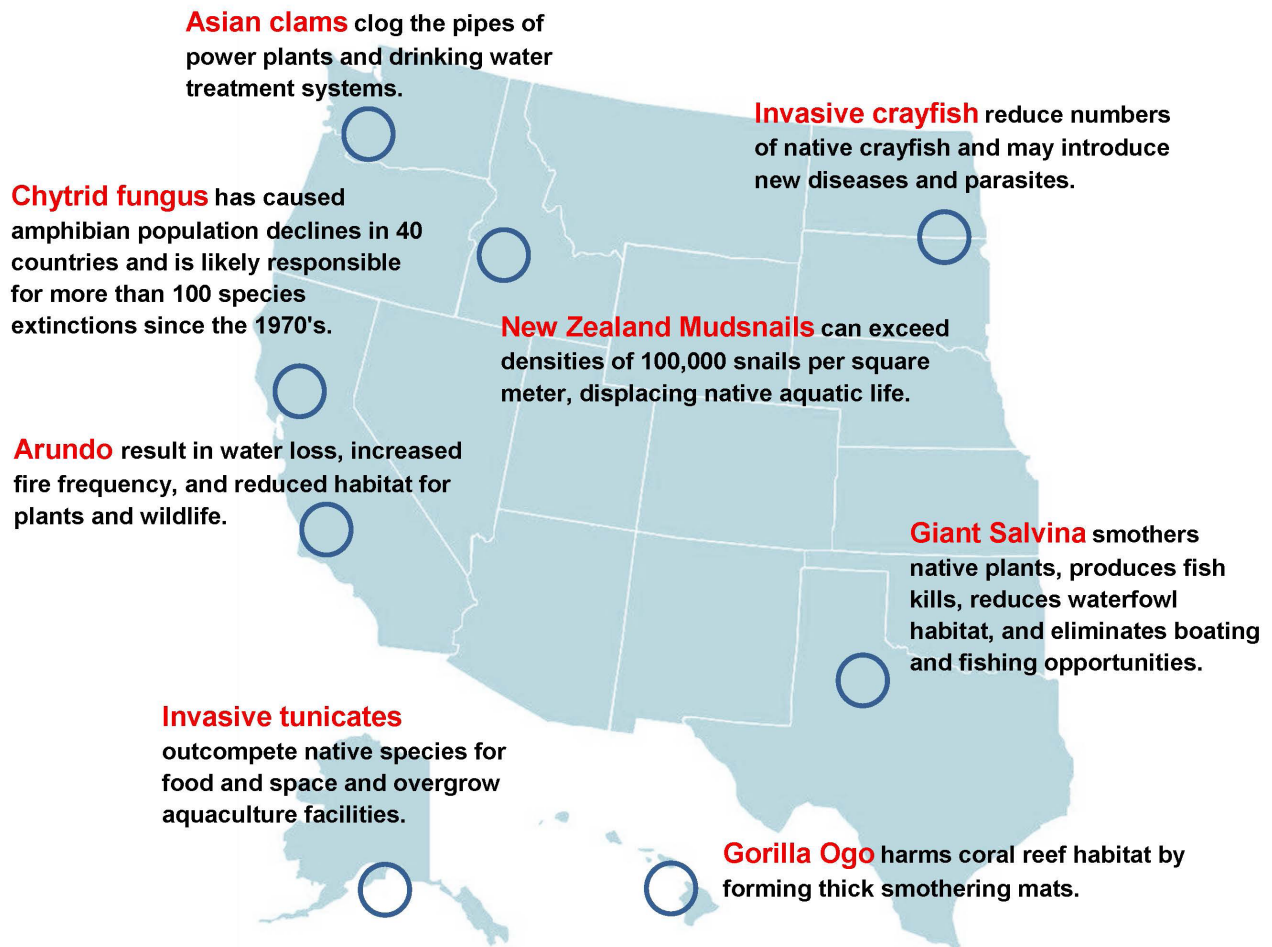
The Western Regional Panel (WRP) was formed in 1997 to protect western aquatic resource from ANS. Its mission is to prevent the introduction and spread of ANS into western marine, estuarine, and freshwater systems through the coordinated management and research activities of state, tribal, federal, commercial, environmental and research entities, industries, and other regional panels. The panel strives to achieve this mission by working to:



- Identify western region priorities for responding to ANS.
- Make recommendations to the ANS Task Force regarding an education, monitoring, prevention, and control program to prevent the spread of zebra and quagga mussels west of the 100th meridian.
- Coordinate, where possible, other ANS program activities in the West.
- Develop an emergency response strategy for federal, state, and local entities for stemming new invasions of ANS.
- Provide advice to public and private individuals and entities concerning methods of preventing and controlling ANS infestations.

WRP membership is representative of inland and coastal interests with members from state, federal, and Canadian agencies; tribal representatives; and members ranging from academia, industry, commissions, non-profit conservation organizations, recreational boating, and legal interests. The greatest focus of the WRP has been placed on ANS coordination, prevention, control, management, and education and outreach. Ensuring that member partners have a voice on ANS and sharing those concerns with the ANS Task Force has been a critical WRP role. The WRP provides a forum for sharing information on prevention, control, and management, and in many cases prioritizing the needs of the diverse interests represented within its large geographic area.

Website: <http://www.fws.gov/answest>



USFWS

The map illustrates the states included in the Western Regional Panel on Aquatic Nuisance Species. Also highlighted are some of the key issues within the region. Numerous species have either invaded or threaten to invade the region; therefore, the examples represented on the map should not be viewed as the only, or highest priority, ANS within the region.

The following is a snapshot of significant accomplishments of the Western Regional Panel on Aquatic Nuisance Species (WRP) and ANS Task Force member agencies in the western region. This summary is meant to illustrate the wide range, but is by no means a comprehensive summary, of the ANS coordination, prevention, EDRR, research, and education and outreach that have been done and are ongoing in the Western region.

Coordination

To address the spread of non-native mussels into the West, the WRP developed the [Quagga-Zebra Mussel Action Plan for Western U.S. Waters](#) (QZAP). QZAP was approved by the ANS Task Force as an action plan and adopted as DOI's roadmap for addressing the western spread of quagga and zebra mussels. The USFWS funds projects that support QZAP priorities such as developing effective watercraft and equipment inspection and decontamination protocols and establishing boat inspection and decontamination stations. To further advance the goals identified in QZAP, the WRP and other partners brought together leaders in ANS management, attorneys general, and state and federal law enforcement for the *2012 Legal and Regulatory Efforts to Minimize Expansion of Invasive Mussels through Watercraft Movements – a Co-Learning Workshop* to discuss and improve current boat inspection and decontamination programs in the West. This effort has cascaded into successful improvements in communication, relationships, protocols, and legislation.

To address invasive tunicate species (commonly called sea squirts) within the western region, the WRP hosted a workshop in Seattle, Washington in August 2014 that brought together coastal managers, scientific leaders, and other pertinent regional stakeholders. Items discussed at the workshop included known extent of existing tunicate populations, potential environmental and economic impacts, previous and planned management efforts, research and funding priorities, and control options. As an outcome of the workshop, a regional tunicate management plan is currently under development.

The 2011 Japan tsunami plagued the West Coast with marine debris, bringing the potential of ANS introductions. In response, the *Regional Preparedness Response Workshop to Address Biofouling and Aquatic Invasive Species* was held in Portland, Oregon in the Summer of 2012. Sponsors of the event included Portland State University, National Sea Grant, Oregon Sea Grant, Oregon State University, Oregon Department of Fish and Wildlife, USFWS, and NOAA. The workshop brought together marine debris and invasive species experts, managers, and communicators and resulted in the creation of [Response Protocols for Biofouled Debris and Invasive Species Generated by the 2011 Japan Tsunami](#), a coherent framework for risk assessments, management, outreach and engagement, policy, and research relative to introduction of ANS from marine debris. In 2014, a JTMD Summary Meeting was convened to capture lessons learned from the overall response to the marine debris caused by the Japan tsunami including gaps and needs to improve responses to future incidents.

Section 1209 of the NANPCA authorizes the ANS Task Force to undertake a comprehensive, environmentally-sound program in coordination with regional, territorial, state, and local entities to control the brown tree snake (*Boiga irregularis*) in Guam and other areas where the species is established outside its historic range. At the request of the DOI's Office of Insular Affairs, the USGS Rapid Response Team was established in 2002 to help prevent the spread of invasive brown tree snakes through screening, risk assessment, outreach, and training for field response efforts. The brown tree snake project partners include the DOI Office of Insular Affairs, U.S. Department of Agriculture (USDA), National Wildlife Research Center and Wildlife Services, USFWS, and state and island governments.



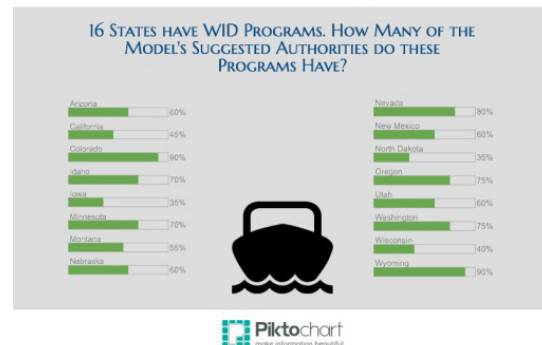
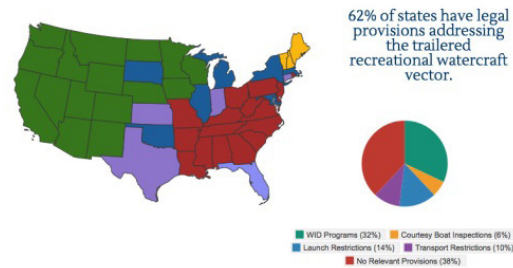
Oregon State University Hatfield Marine Science Center

In June 2012, for example, a large commercial fisheries dock washed ashore on Agate Beach, north of Newport, Oregon. The dock grounded on a sandy beach about 14.5 months after it was torn away from its moorings by the tsunami on March 11, 2011. A remarkable living assemblage of marine organisms were found on the dock including more than 90 Japanese species.

State Watercraft Inspection Programs

Quick Facts

Prepared by the National Sea Grant Law Center (October 2014)



National Sea Grant Law Center

A comparison among state Watercraft Inspection and Decontamination (WID) Programs.

Prevention

The WRP developed and approved [Guidance to Prevent the Spread of AIS through Field Gear and Uniform Minimum Protocols](#) as well as Standards for Watercraft Interception Programs for Dreissenid Mussels in the Western United States. The Panel also initiated the committee “[Building Consensus in the West](#),” which has focused on the development of a multi-state watercraft inspection and decontamination effort. This committee, along with the National Sea Grant Law Center, AFWA, and National Association of Attorneys General, developed [Preventing the Spread of Aquatic Invasive Species by Recreational Boats: Model Legislative Provisions & Guidance to Promote Reciprocity among State Watercraft Inspection and Decontamination Programs](#) to offer guidance on watercraft inspection and decontamination (WID) programs and create a foundation for multi-state reciprocity. Further, a comparison among state programs in the context of the model law has been examined in a National Sea Grant Law Center report, [From Theory to Practice: A comparison of state watercraft inspection and decontamination programs to model legislative provisions](#).

The WRP worked alongside several federal agencies- including the BLM, BOR, USFWS, USACE, USFS, and USGS- to carry out numerous activities related to zebra and quagga mussels. Efforts under the [100th Meridian Initiative, a cooperative effort between local, state, provincial, regional, and federal agencies to prevent the westward spread of zebra and quagga mussels and other ANS in North America](#), included assessments of high-use boat ramps for targeting prevention efforts, determining the efficacy of car washes for boat decontamination, investigating methods for decontamination of SCUBA gear, and the effectiveness of chemical treatments.

Early Detection and Rapid Response

The WRP- partnering with the USDA Agricultural Research Service’s Exotic and Invasive Weed Research Unit, University of California - Davis, and Portland State University- developed Preemptive Rapid Response Teams for Exotic Aquatic Weeds. The WRP also worked with the USFWS to monitor for existing ANS infestations in the Pacific Region including New Zealand mudsnails (*Potamopyrgus antipodarum*), nutria (*Myocaster coypus*), Amur goby (*Rhinogobius brunneus*) in the Lower Columbia River watersheds, Spartina in Willapa Bay National Wildlife Refuge in Washington State, brown tree snake in Guam, non-native fish in northwest states and Hawaii, amphibians, reptiles, aquatic and riparian weeds at many National Wildlife Refuges, and pathogens at USFWS Fish Health Centers. The NPS, upon detection of quagga mussels in Lake Mead, established an incident team and developed a quagga and zebra mussel infestation Prevention and Response Planning Guide. The NPS’s Lake Mead National Recreation Area also implemented containment procedures by developing a boat washing and public education



NOAA

Workers for the Maunahua Bay Reef Restoration Project restored the coral reefs through manual removal of invasive alga. The restored sand bottom and hard substrate habitat will enable seagrass expansion and coral recruitment.



USDA-Wildlife Services, Guam

Brown tree snake near a trap along a fence line on Guam. Trapping around ports and other cargo staging areas is central to an integrated pest management program designed to deter dispersal of the species.



Quagga mussels attached to a boat from infested waters.

program that has widely increased the understanding of invasive mussel management. Similarly, a USFWS dive team assisted the NPS when quagga mussels were discovered at Glen Canyon National Recreation Area's Lake Powell. The dive team conducted surveys around marinas to identify the presence or absence of quagga mussels. The WRP member agencies also responded with a variety of other efforts to contain the infestation and limit further spread.

Other federal efforts to facilitate early detection of potentially invasive species include a partnership between the USGS, Washington State University, and PSMFC to develop the [Columbia River Basin Aquatic Invasive Species Database](#), a regional node of the USGS' NAS database. This database provides biological and physical information for managers and researchers to develop new ways to eliminate or reduce impacts of ANS throughout the Columbia River Basin in a changing climate. Other efforts include the development and release of the [Atlas of Nonindigenous Marine and Estuarine Species in the North Pacific](#), a partnership with the EPA, USGS, and North Pacific Marine Science Organization (PICES). The atlas contains species profiles for 747 near-coastal nonindigenous species for countries represented by PICES with the intention of filling information gaps on distribution, invasion history, environmental tolerances, and life history to aid in designing effective management strategies to mitigate the economic, ecological, and human health threats associated with invasive marine species.

Davis Dam Penstock Gate Oct.07



RECLAMATION

The surface of a normally underwater part of the Davis Dam in Nevada, just downstream from the Hoover Dam on the Colorado River, covered with invasive quagga mussels.

Containment and Control

The Maunalua Bay Reef Restoration Project, an invasive algal removal project, was implemented in Hawaii by The Nature Conservancy with funding from NOAA through the American Recovery and Reinvestment Act. This project was completed earlier than expected and under budget; it also created or retained 75 jobs, engaged eight local businesses and five local farmers, and recycled 100 percent of the invasive algae into compost to be used on local farms. In addition, 3,000 community members and 12 schools got involved in the reef restoration by contributing a total of 7,000 hours of community service. According to The Nature Conservancy, the volunteer program will continue, as will scientific research in the Bay.



Scientists from the Smithsonian Environmental Research Center prepare to collect images and biological samples of biofouling from a fishing boat. Data are used to determine the effects of season, vessel type, speed, vessel husbandry, and route on the degree of hull fouling.

SERC's West Coast Laboratory has worked with more than 150 volunteers to remove *Undaria pinnatifida*, an Asian kelp, from marinas in San Francisco Bay. This effort continues to reduce the kelp population in local marinas, allows native species to recover, and benefits recreational and commercial interests that depend on the Bay.

The USDA Animal and Plant Health Inspection Service – Wildlife Services (USDA-WS) has improved brown tree snake prevention efforts in Guam with the establishment of cooperative agreements with 30 commercial packing and shipping warehouses. USDA-WS uses detector dogs to locate snakes and has also integrated the use of oral toxicants for brown tree snake interdiction. In 2012, USDA-WS reached 99.5 percent inspection rate of military and civilian cargo and flights.

Research

The WRP conducted research to gain a better understanding of the thermal tolerances, physiological conditions, and population genetics of zebra and quagga mussels. The panel also completed a [risk assessment of recreational boating](#) traffic to more effectively manage this pathway.

In an effort to develop a cost-effective method to decontaminate the ballast tanks of recreational watercraft, a prototype ballast water filtration system was developed by a private business and tested at Lake Mead by the University of Nevada, Reno. Support for the project was provided by the USFWS, California Department of Fish and Wildlife, Colorado Parks and Wildlife Department, Tahoe Regional Planning Agency, PSMFC, and Water Sports Industry Association. Test results showed the filtration unit will retain or damage Dreissenid veligers (planktonic larva of most bivalve mollusks) and zooplankton, suggesting its potential to prevent additional ANS introductions. This project highlights broad-reaching, successful collaboration across private, public, and academic sectors.

The USGS research on ANS in the Western Region has focused on evaluating ballast water treatment systems, developing and testing a method to control New Zealand mudsnails and other invasive mollusks. The agency has also demonstrated the utility of PCR microarrays to detect organisms in ballast water, developed a molecular technique to detect zebra and quagga mussels, and coordinated with partners to develop [zebra and quagga mussel monitoring protocols](#) and prioritize monitoring needs in the Columbia River Basin and surrounding areas. In addition, research funded by the USGS and conducted at Portland State University improved the understanding of the natural history of nutria in the Pacific Northwest. Research also resulted in an improved live trap design to better study and remove nutria.

The West Coast Laboratory of the SERC's Marine Invasion Research Laboratory, with support by federal and state agencies, studies patterns and processes of marine invasions over broad spatial scales. The lab works closely with its counterparts in Maryland and Oregon to compare the biological diversity and impacts of ANS in waters on the Atlantic and Pacific coasts. The lab also serves as a focal point for research being conducted in Alaska, Guam, and Panama. Ongoing projects include hull surveys of commercial ships and recreational vessels using remotely operated vehicles and video cameras to assess the extent of fouling. Further, settlement plates (plastic plates that become fouled by various organisms over time) have been deployed in San Francisco Bay on a quarterly or annual basis since 2000 as part of an international effort to understand and document patterns of invasion in marine coastal waters. Starting in 2010, the focus in San Francisco Bay has also included a robust system for detection and monitoring of marine invasions.

Sea Grant programs in Washington, Oregon, and California are undertaking a regional evaluative approach to predict the risks of ANS introduction and spread and to develop and test ANS education and management strategies. The project examines three primary pathways for invasions; the use of live organisms in



Deborah Mercy/Alaska Sea Grant, University of Alaska, Fairbanks

The Smithsonian Environment Research Center trains citizen scientists to search for invasive marine species. Such efforts engage and teach the public about detection of newly arriving species that may threaten coastal waters.

school classrooms, outdoor recreation activities, and water conveyance systems such as aqueducts. Using an innovative model developed by Oregon Sea Grant, the West Coast project is evaluating pathway risks and habitat suitability for predicting how vulnerable the region is to ANS.

The Brown Tree Snake Project, managed by USGS, conducts research on this snake species to predict its potential range in areas not yet invaded; develop and assess methods to detect, contain, and control brown tree snakes; learn about the snake's habitat, movements, prey selectivity, and prey density of different sizes to better target controls; and develop tools to protect species of conservation concern from further predation. USGS recently completed a major survey of brown tree snake populations across the entire island of Guam, based on collecting ecological and reproductive data from 1,800 hand-captured snakes. Results of this survey are being used to refine prescriptions for landscape-level snake suppression using snake toxicants. The USGS is also conducting research to understand and mitigate threats posed by brown tree snakes to the endangered Mariana swiftlet, a small cave-dwelling bird only found on Department of Defense (DOD) lands on Guam. Further, the USDA, Animal and Plant Health Inspection Service – National Wildlife Research Center has worked to develop various brown tree snake repellents and Automated Aerial Broadcast System (AABS) for the delivery of toxicants. The AABS has demonstrated brown tree snake population reduction on trial plots with aerial broadcast of toxicants.

Education and Outreach

The WRP updated and published the [Threats to the West](#), an eight page brochure that was distributed among all WRP regional partners and other interested individuals and groups. The panel also completed the [Guidance to Prevent the Spread of AIS through Field Gear](#) as well as a pilot project to explore outreach to boaters on permitted rivers conducted by the Invasive Species Action Network. The WRP also conducts several ANS prevention and educational programs, including "[Train the Trainer](#)" [programs with Master Gardeners](#) and [Watercraft Inspection Programs](#).

SERC's West Coast Laboratory is establishing a citizen science network to monitor for target non-native species in Alaska and California. Participants in the monitoring program include scientists from local state and federal agencies, concerned citizens, school groups, and native Alaskan groups. One such effort is the [Invasive Tunicate Network](#), which is comprised of teachers, students, outdoor enthusiasts, environmental groups, and state and federal biologists who monitor for non-native tunicates and other invasive species along the U.S. West Coast, with a primary focus on Alaska. The network seeks to engage citizen volunteers in the collection of critical background, to facilitate the early detection of ANS.

The West Coast Sea Grant [Watersheds & Invasive Species Education](#) (WISE) program works with teachers to develop curricula, learning activities, and other tools that bring ANS learning into the science curriculum. At the same time, WISE teaches teachers how to prevent their classroom science projects from becoming inadvertent pathways for releasing invaders into the wild. Among the educational tools is a growing [AIS Toolkit](#) of classroom-created projects and activities designed to bring home the "stop the invaders" message.

Gulf and South Atlantic Region

Alabama, Georgia, Florida, Louisiana, Mississippi, North Carolina, South Carolina, Texas

Gulf & South Atlantic Regional Panel on Aquatic Nuisance Species

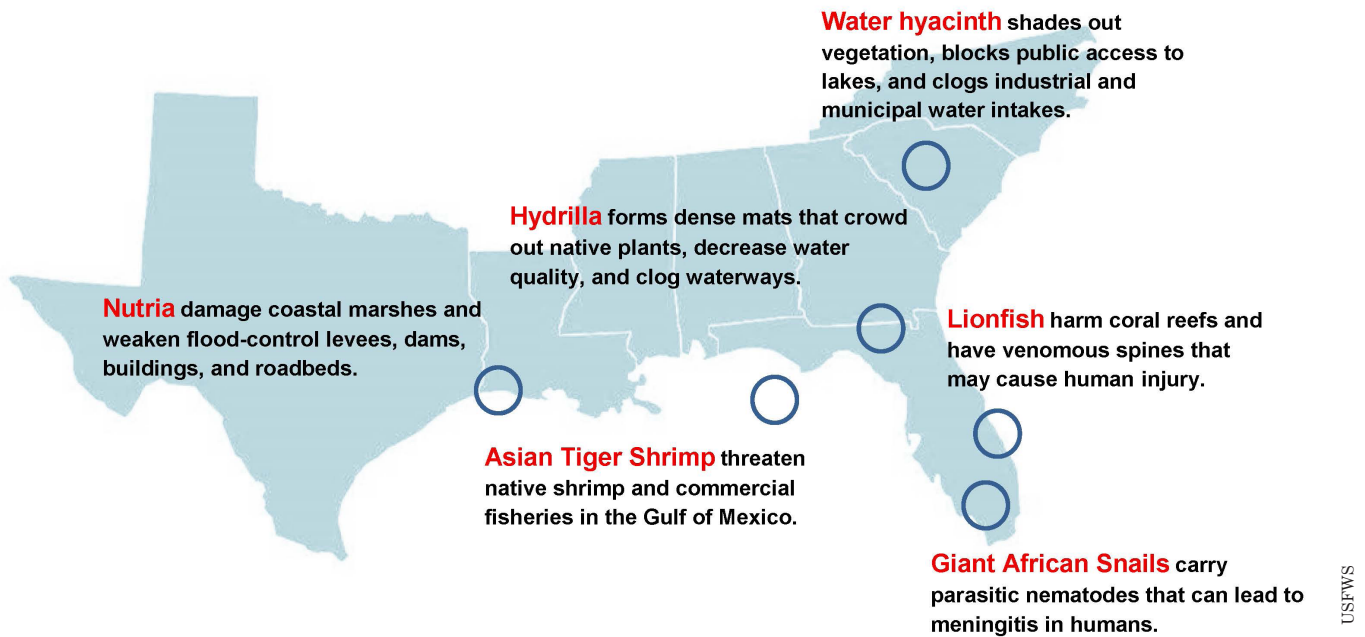
The Gulf and South Atlantic Regional Panel on Aquatic Invasive Species (GSARP) was established in 1999 under the Gulf of Mexico Program of the EPA. In 2002, the Gulf States Marine Fisheries Commission took over administration and coordination responsibilities. The mission of the GSARP is to provide for coordination of ANS control and management activities among its member states and other organizations in the region and to help all the members develop a working relationship with each other to facilitate communication and cooperation across the region. The panel works to:



- Identify ANS priorities for the Gulf and South Atlantic Region.
- Keep all members apprised of the most recent developments in ANS movements, education, and control activities.
- Coordinate ANS program activities in the Gulf and South Atlantic Region.
- Provide a forum for interagency/organizational communication.
- Make recommendations to the ANS Task Force regarding issues of concern to the region.
- Serve as a vehicle for regional dialogue and discussion on ANS issues.

GSARP members include representatives from state, federal, and international agencies, non-governmental organizations, industry, and private citizens with authorities over or interest in addressing ANS issues. The Panel has funded projects aimed at developing novel ways to control and eradicate ANS in the southeast region. They have also supported projects that developed and distributed outreach materials to educate the public about the impacts of ANS and the steps they can take to stop new introductions and the spread of existing populations.

Website: <http://www.gsarp.org>



The map illustrates the states included in the Gulf & South Atlantic Regional Panel on Aquatic Invasive Species. Also highlighted are some of the key issues within the region. Numerous species have either invaded or threaten to invade the region; therefore, the examples represented on the map should not be viewed as the only, or highest priority, ANS within the region.

The following is a snapshot of significant accomplishments of the Gulf & South Atlantic Regional Panel on Aquatic Invasive Species (GSARP) and ANS Task Force member agencies in the Gulf and South Atlantic region. This summary is meant to illustrate the wide range, but is by no means a comprehensive summary, of the ANS coordination, prevention, EDRR, research, and education and outreach that have been done and are ongoing in the Gulf and South Atlantic region.

Coordination

The GSARP organized a cooperative effort to obtain genetic samples and document the spread of Asian tiger shrimp within all eight states of the region. State and federal agencies reported captures to the USGS NAS Database and collected samples that were sent to the NOAA Southeast Fisheries Science Center's Beaufort Lab for analysis.

Prevention

The USGS NAS Program gives routine updates to the GSARP on the new introductions and range expansions of ANS within the region that have been entered into the NAS Database. This keeps the Panel's members aware of the greatest threats to their region and allows them to prioritize prevention and control efforts. To further facilitate prevention communication, the GSARP produces a newsletter "Water Watch" that summarizes the issues addressed at each of the Panel's meetings. In 2005, the GSARP worked together with the MRBP to host a training session for members of both panels to learn about different risk assessment methodologies. A number of state members have made use of this training by conducting risk assessments of their own in order to list problematic species and prevent them from importation.

In the early- to mid- 2000s, the USGS NAS Program worked with the GSARP states to perform a pathway analysis of the region. The states then used the results to guide their management efforts. Several of the states also use the pathway [information](#) provided by USGS in their ANS state management plans.

Early Detection and Rapid Response

The GSARP developed a Rapid Response Plan for the region and is working to incorporate the Incident Command System (ICS) as well as successful elements of other plans that have been used across the country into the plan.

Working with partners, the USGS and NOAA released products and tools to aid in early detection of ANS in the Gulf and South Atlantic Region. Examples of this work include producing a [Field Guide to the Nonindigenous Marine Fishes of Florida](#), predicting the potential range of Nile tilapia in the northern Gulf of Mexico, documenting increased observations and establishment of lionfish and Asian tiger shrimp in the Gulf of Mexico and Atlantic Coast. The USGS also completed many studies examining the physiological tolerances of many ANS, including Burmese pythons (*Python bivittatus*), Nile tilapia (*Oreochromis niloticus*), African jewelfish (*Hemichromis bimaculatus*), Asian swamp eels (*Monopterus albus*), Mayan cichlids (*Cichlasoma urophthalmus*), and goldfish (*Carassius auratus*) to inform early detection and monitoring activities. Information on physiological tolerances can be useful in predicting potential spread of these species. USGS, NOAA, and REEF collaborate on rapid response to new reports of introduced marine fish in Southeast Florida.

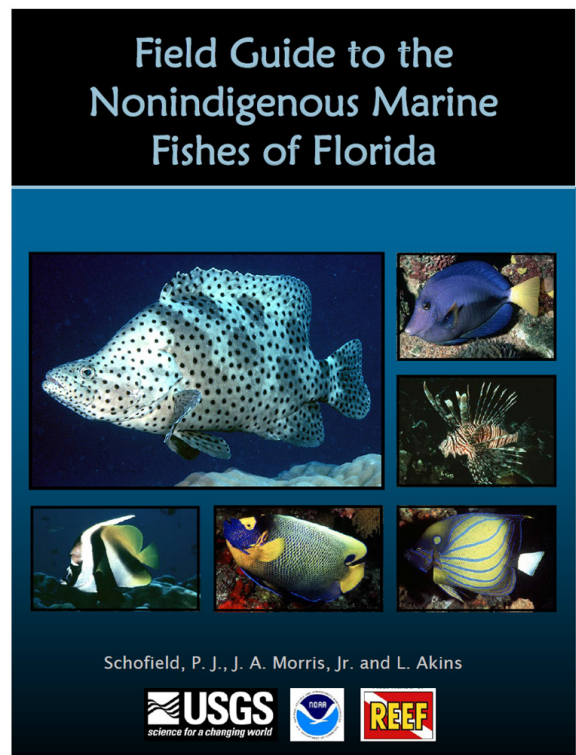
Containment and Control

Several agency-specific plans have been developed to complement the ANS Task Force's National Invasive Lionfish Prevention and Management Plan. For example, the NPS developed a lionfish response plan that has been used as a foundation for individual parks to develop local management plans and guide the agency and its partners in addressing the invasion of lionfish. NOAA's Office of National Marine Sanctuaries has prepared a Lionfish Response Plan that documents a variety of ongoing monitoring, control, research, and education and outreach activities at the 3 marine sanctuaries affected by the invasion.

After hurricanes Katrina and Rita hit the Gulf Coast in the summer of 2005, the USGS worked with the state of Mississippi to assess the distribution of Nile tilapia at and around an aquaculture facility destroyed by subsequent storm surge, aided the state in applying rotenone to prevent surviving Nile tilapia from escaping into surrounding waters, and sampled after the treatment to assess treatment success.

Research

Recognizing a need for species-specific tools that can be used to eradicate invasive fish populations without adversely affecting the native species, the GSARP and USGS supported a study of a "Trojan YY fish." This study consisted of a sex-reversed fish containing two Y chromosomes that can be introduced into a normal fish population. These YY fish result in the production of a disproportionate number of male fish in the population in subsequent generations. Mathematical modeling of the system following introduction of the YY fish reveals that female fish decline in numbers over time, leading to eventual extinction. Another GSARP-supported study investigated approaches to generate sterile snails in high yields. Aquarium dumping is a primary pathway for introduction, so new snail introductions



To help prevent the establishment of non-native fishes in Florida's marine waters, NOAA's National Centers for Coastal Ocean Science (NCCOS), the Reef Environmental and Education Foundation (REEF), and the U.S. Geological Survey (USGS) have formed a partnership to focus on early detection and rapid response of non-native marine fishes. The Field Guide to the Nonindigenous Marine Fishes of Florida provides species accounts for non-native fishes sighted in estuarine and marine waters of Florida, serving as a "watch list" of invaders that could potentially become established.

could be greatly reduced if aquarium snails were made available as a sterile product, unable to reproduce if introduced into the wild.

NOAA has researched lionfish biology and ecological impacts since they were first observed by a NOAA researcher on a shipwreck off the coast of North Carolina in 2000. The agency issued its first ecological forecast of their spread and predicted Atlantic range in 2003 and is now applying the research findings to develop control and management options for coastal managers. Florida Sea Grant- along with NOAA Sea Grant programs in Georgia, South Carolina, North Carolina, and Puerto Rico- has funded three research projects that will test methods to control lionfish in the Atlantic and Caribbean. The largest of these research projects focused on identifying efficient and cost-effective methods to “fish down” lionfish numbers so native fish populations can recover and stabilize. The second project evaluated the effectiveness of using fishing derbies to reduce lionfish numbers. The third project compared removal techniques (e.g., derbies, traps) on coral reefs in selected locations in South Florida and the U.S. Virgin Islands. The USGS has conducted research documenting the effects of ANS on native species, communities, or habitats in the Gulf and South Atlantic Region. These studies have included the effects of African jewelfish on simulated Everglades aquatic communities, effects of Rio Grande cichlid on native bluegill, and effects of Lorarciid catfishes on bank stability. The agency has also previously investigated the effect of hurricanes Katrina and Rita on the distribution of giant salvinia and assessed the toxicity of rotenone to Asian swamp eels. In addition, USGS has ongoing work modeling nutria population dynamics and impacts on marsh loss in coastal marshes of Louisiana.

NASAC, in conjunction with Florida Department of Agriculture and Consumer Services, conducted a survey of the Atlantic coastal states to summarize and compare their laws, policies, and programs pertaining to ANS and the use of sovereign submerged lands for shellfish culture. The project



USFWS, Columbia River Fisheries Program Office

As shown in this campaign poster, aquarium dumping is a primary pathway for introduction.



GSARP

The Gulf & South Atlantic Regional Panel on Aquatic Invasive Species created an invasive species traveling trunk, a self-contained outreach and educational tool that can be used to educate a wide variety of people about the impacts associated with ANS and the steps they can take to stop new introductions and the spread of existing populations.



While visually stunning, invasive lionfish threaten native fish habitats, biodiversity and recovery of coral reefs.

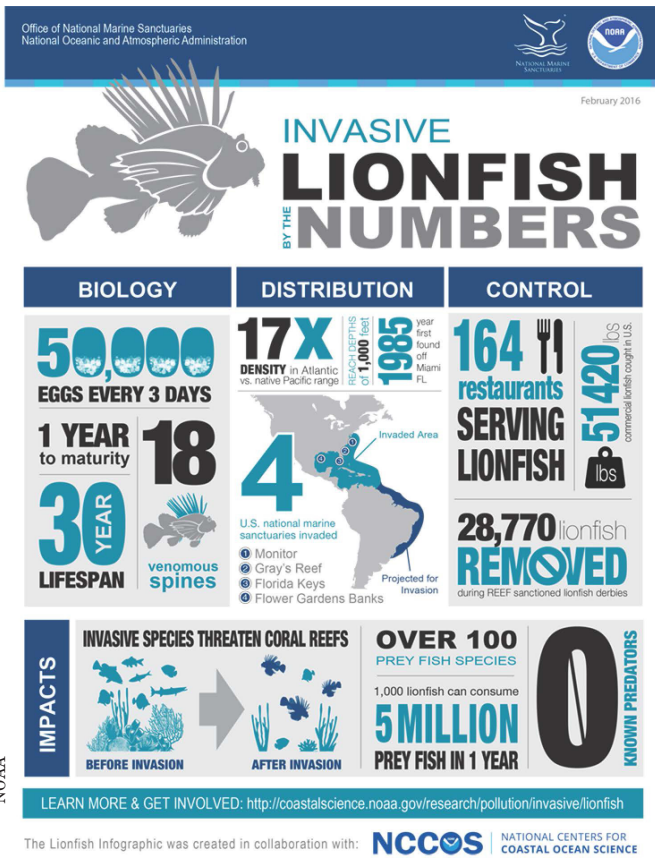
examined the culture of non-native shellfish in state marine waters and potential impacts to native shellfish. The resulting analysis has been shared with the Atlantic states, NOAA's Aquaculture Program, and shellfish producers via the East Coast Shellfish Growers Association.

Education and Outreach

In 2009, the GSARP developed and distributed 80,000 Stop Aquatic Hitchhiker brochures showing regional examples of aquatic invasive species. Each GSARP state received 10,000 brochures with state specific contact information on the back panel. The GSARP developed and produced several [Trunks of Invasive Species Information](#), which are available by request to the public at no charge.

The goal of the material is to inform school-aged children about the impacts of invasive species on the natural environment, to encourage positive behavior changes with regard to non-native species throughout children's lives, and to prevent new introductions. Since their development in 2012, the trunks have been used by more than 35 organizations—ranging from federal and state agencies to universities, schools, and NGOs—to present the material to thousands of people across the United States.

NOAA responded to the public demand for information on lionfish through media campaigns, workshops, social media campaigns, podcasts, annual symposia, and direct briefings to fishery managers. In collaboration with Reef Environmental Education Foundation (REEF), NOAA has trained more than 250 divers and snorkelers on how to identify and safely capture lionfish. Together, these organizations coordinate lionfish derbies that have brought public attention to the lionfish invasion, removed lionfish from localized areas, and highlighted the procedures for safe preparation and consumption of lionfish. At a broader scale, lionfish reporting efforts across the entire invaded range have been facilitated by the USGS, USFWS, and other stakeholder groups that manage lionfish reporting hotlines and websites.



Northeast Region

Connecticut, Massachusetts, Maine, New Hampshire, New York, Rhode Island, Vermont

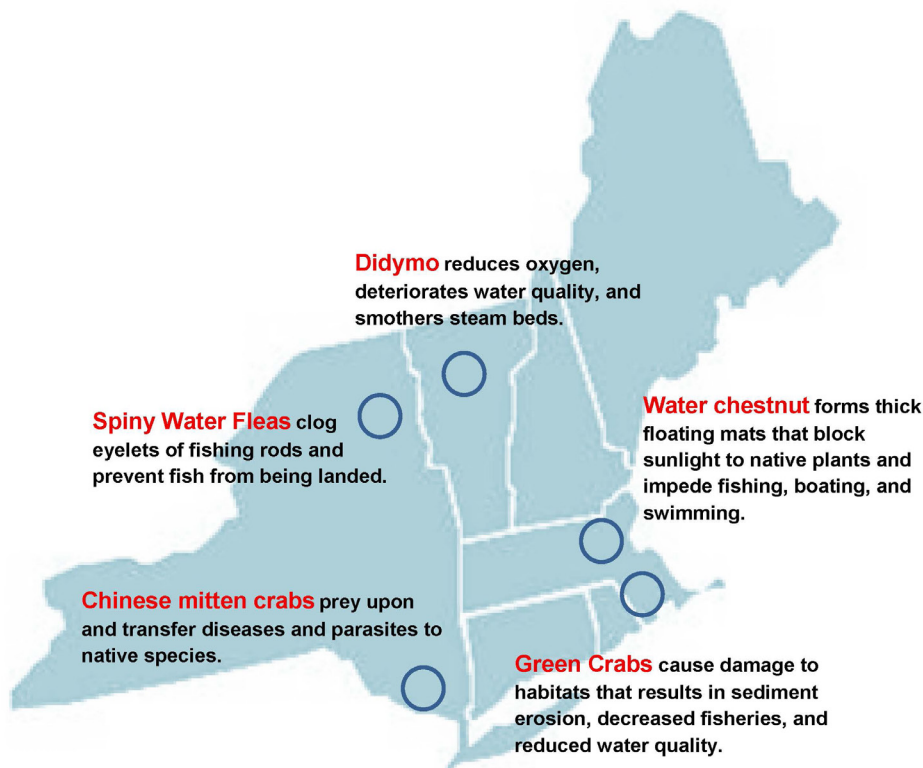
Northeast Aquatic Nuisance Species Panel

The Northeast Aquatic Nuisance Species (NEANS) Panel was established in 2001, the fourth Regional Panel established under the auspices of the ANS Task Force. The NEANS Panel's mission is to protect the marine and freshwater resources of the Northeast from ANS through commitment and cohesive coordinated action. The Panel works with states within the regions as well as neighboring Canadian Provinces.



The Panel's members represent state, provincial, and federal governments; tribes; academia; environmental organizations; lake associations, recreational fishing and boating interests, and industries including commercial shipping and fishing, power and water utilities, bait, aquaculture, nursery and aquarium trades. The NEANS Panel's activities focus on promoting member communication, coordination, and collaboration through meetings, workshops, training opportunities, and the production and distribution of outreach and education products.

Website: <http://www.northeastans.org>



The map illustrates the states included in the Northeast Aquatic Nuisance Species Panel. Also highlighted are some of the key issues within the region. Numerous species have either invaded or threaten to invade the region; therefore, the examples represented on the map should not be viewed as the only, or highest priority, ANS within the region.

USFWS

The following is a snapshot of significant accomplishments of the Northeast Aquatic Nuisance Species (NEANS) Panel and ANS Task Force member agencies in the Northeast region. This summary is meant to illustrate the wide range, but is by no means a comprehensive summary, of the ANS coordination, prevention, EDRR, research and education, and outreach that have been done and are ongoing in the Northeast region.

Coordination

The NEANS Panel’s biannual meetings often include working with partners on a variety of workshops and events to provide information on emerging species, management issues, training, and field demonstrations of technologies. For example, the NEANS Panel conducted a joint meeting with the GLP in May 2012 with a special session on species-in-trade. A workshop on Hydrilla, an aquatic weed that threatens several states and provinces within the region, was convened as an adjunct to the meeting and resulted in the USACE’s Engineer Research and Development Center’s Aquatic Plant Control Research Program organizing a symposium in September 2012 to identify research and management needs for the monoecious biotype of Hydrilla. The NEANS Panel also co-hosted the International Didymo Conference in 2013 with the Invasive Species Action Network, which brought together experts and other leaders in the field. In addition, the NEANS Panel has produced regional matrices detailing the federal, state, provincial, and local regulatory environments to provide participants and the public with the information necessary to analyze and manage laws, rules, and policies pertaining to ANS.

Prevention

The NEANS Panel states have developed and expanded boat steward programs including those in the Great Lakes headwaters in New York, which are funded under federal GLRI funds. In response, several states have enacted legislation and regulations aimed at stopping the spread of ANS through recreational boating and commerce.

The Lake Champlain Basin Program (LCBP) ANS Management funds have been used to help develop the [Lake Champlain Cooperative Boat Wash Initiative](#) to provide car wash facilities that are equipped to service trailered vessels around Lake Champlain in New York and Vermont. Funds from USFWS help support the Lake Champlain Boat Launch Steward Program, which provides courtesy boat inspections to prevent the spread of ANS. During the 2013 field season the boat launch stewards interfaced with more than 12,800 vessels launching or retrieving from Lake Champlain. Stewards spoke to more than 27,000 visitors and found aquatic organisms on 7.4 percent of the boats they inspected. Overall 2.5 percent of boats inspected were carrying ANS. Stewards also collected 826 samples of aquatic organisms off boats, trailers, and other equipment that contained 1,338 different species; over 59 percent of samples were reviewed and positively identified for quality assurance.

Early Detection and Rapid Response

The NEANS Panel and its participants have embraced the effectiveness of the EDRR approach on a variety of levels. The Panel convened two workshops to learn more about other strategies, including inviting other industries’ and agencies’ approaches. As a result of the workshops, the Panel created an EDRR approach that has since been used to respond to invasions of hydrilla and the Chinese mitten crab. NEANS Panel member agencies are also involved in a variety of efforts to mobilize citizens and experts for early detection of ANS in freshwater and marine systems



Originally brought into the United States as an aquarium plant, today Hydrilla verticillata is established in all Gulf states and has been recently detected in several Atlantic and Pacific Coast States. Control of Hydrilla can cost states millions of dollars each year.

before they become established and impair fishing wharves, boat launch areas, harvests and catches, and the aesthetics important to tourism economies. Such efforts include the citizen science program [Marine Invader Monitoring and Information Collaborative \(MIMIC\)](#), [rapid assessment surveys to monitor marine areas](#), and development of an [Early Detection and Rapid Response Plan for the Invasive Chinese Mitten Crab](#). The NEANS Panel also provided financial support to the Connecticut River Watershed Council in their water chestnut control efforts.

The LCBP monitors existing infestations, including zebra mussels, water chestnut, and Eurasian water milfoil. Rapid response and control of water chestnut was a priority in the Missisquoi National Wildlife Refuge during the summer of 2013. LCBP funds were allocated in partnership with the Friends of Missisquoi National Wildlife Refuge and the USFWS Missisquoi National Wildlife Refuge to survey 1,072 acres of wetland in areas previously known to have water chestnut. This effort resulted in a total of 536 man-hours spent pulling 4,857 water chestnut rosettes. LCBP funds also supported Asian clam (*Corbicula fluminea*) rapid response efforts in Lake George, New York. The Asian clam rapid response program tested and monitored the effectiveness of different benthic barrier mats at suffocating Asian clams. The results of the pilot project directly informed consequent treatments.

NOAA Sea Grant programs in New Hampshire, Maine, and Massachusetts Institute of Technology have developed a regional early detection network. The network focuses on protecting the riverine, estuarine, intertidal, and near shore marine ecosystems of the Gulf of Maine from the identified threats posed by Chinese mitten crabs (*Eriocheir sinensis*).

Containment and Control

Control efforts to combat recent Hydrilla infestations have been implemented in Cayuga Lake, one of New York's Finger Lakes, and the Erie Canal near Buffalo, New York. Control in these areas is essential to prevent spread into Lake Erie and the St. Lawrence River. A coordinator was hired to lead the Cayuga Lake control, while a cooperative agreement was reached to control the Erie Canal infestation under joint federal (USACE and USEPA) and New York State funding. The NEANS Panel also worked with federal, state, provincial, and other agencies to draft [Best Recommendations for Decontamination of Outdoor Equipment For the Prevention of Spread of the Invasive Alga, *Didymosphenia geminata* \("Didymo"\)](#).

Participating Car Washes

- 1 Hands On Car Wash**
119 First Street,
Swanton, VT
(802) 527-0514
Bay Dimensions: 15'h x 16' w x 30'l
- 2 Hands On Car Wash Main Street**
291 N Main Street,
St. Albans, VT
(802) 527-0514
Bay Dimensions: 15'h x 16' w x 30'l
Water Temperature: 100-110°F
Water Pressure: 1200 PSI
Timed Wash Length: 4.4 mins
- 3 Hands On Car Wash Lake Street**
10 Beaulieu Drive,
St Albans, VT
(802) 527-0514
Bay Dimensions: 15' h x 16' w x 30'l
- 4 Washland Car Wash**
310 Margaret Street,
Plattsburgh, NY
(518) 563-9274
Water Temperature: <100°F
Water Pressure: 1300 PSI
Timed Wash Length: 3.5 mins
- 5 No Way Car Wash**
269 Margaret Street,
Plattsburgh, NY
(518) 563-1850
- 6 Eco Car Wash**
530 Route 7 South,
Hilton, VT
(802) 893-3534
Bay Dimensions: 10'h x 10' w
Water Pressure: 1300 PSI
Timed Wash Length: 3.5 mins
- 7 Checkerbar Car Wash**
38 Boomer Highway,
Colchester, VT
(802) 655-0077
Bay Dimensions: 14'h x 19' w x 42'l
Water Temperature: 77-130°F
Water Pressure: 1300 PSI
Timed Wash Length: 6 mins
- 8 Champ Car Wash Essex**
124 Pearl Street,
Essex Junction, VT
(802) 878-0941
Bay Height: 10'4"
Water Temperature: 120°F
Water Pressure: 1200 PSI
Timed Wash Length: 3.5 mins
- 9 Seaway Car Wash**
1341 Shelburne Road,
South Burlington, VT
(802) 951-9274
Bay Dimensions: 8'7" h x 11' w x 24'l
Water Temperature: 110-135°F
Water Pressure: 1000 PSI
Timed Wash Length: 4 mins
- 10 Champ Car Wash South Burlington**
1801 Shelburne Road,
South Burlington, VT
(802) 864-0403
Bay Height: 13'6"
Water Temperature: 120°F
Water Pressure: 1200 PSI
Timed Wash Length: 3.5 mins
- 11 Crown Point Car Wash**
2738 Main Street,
Crown Point, NY
(518) 597-4224
Bay Dimensions: 12'h x 15' w x 24'l
Water Pressure: 1100 PSI
Timed Wash Length: 4 mins
- 12 Treadway Car Wash**
1202 NYS Route 9N,
Ticonderoga, NY
(518) 585-2103
Water Temperature: 70-80°F
Water Pressure: 1200 PSI
Timed Wash Length: 4 mins

Lake Champlain Cooperative Boat Wash Program

Map showing participating car washes (1-12) and boat launch locations (A-Z) across the Lake Champlain Basin, including New York, Vermont, and Quebec.

1 Participating Car Wash
A Boat Launch*
■ Lake Champlain Basin

* NY Dept. of Environmental Conservation and VT Dept. of Fish and Wildlife boat launches

Asian clams have raised concentric ridges unlike any native to the region.

Please collect and report sightings to VT DEC at 802-490-6120. More information on AIS can be found at www.lcbp.org

The Lake Champlain Basin Program and its partners have organized the Lake Champlain Cooperative Boat Wash Program to help boaters find local car wash stations that are suitable for pressure washing boats, trailers, and other equipment. The program also provides boaters with the equipment necessary to properly clean their vessels and rid them of aquatic hitchhikers.

LCBP funds have been used to support mechanical and hand harvest control of water chestnut in the southern end of Lake Champlain. Management efforts represent a partnership with numerous government and nongovernment entities, including The Nature Conservancy, New York State Department of Environmental Conservation, New York town of Dresden, LCBP, USFWS, and USACE. These efforts have mechanically harvested hundreds of acres of water chestnut, greatly reducing the range of this aquatic weed.

Research

The NEANS Panel initiated and funded a literature review of hydrilla. The review included information about how the species behaves during seasonal and climatic changes. Federal efforts within the Northeast region include work from the USGS that modeled the potential U.S. distribution of the freshwater diatom, *Didymosphenia geminata*. The USGS also continues to determine non-target effects of lampricides to native species of concern to ensure the safety of lampricide applications to control sea lamprey in Lake Champlain and Lake Ontario.


Education and Outreach

The NEANS Panel created the [Online Guide to Aquatic Invasive Species in Northeastern North America](#), which allows users to create a customized, printable ANS guide for freshwater and marine habitats which can be taken into the field or used for training purposes. The NEANS Panel also identified priority ANS and produced a variety of educational products to help the public identify these species and locate resources for additional information. These products, including Hydrilla and [Asian Clam "WATCH" Cards](#), and floating key chains, each contain Protect Your Waters and Stop Aquatic Hitchhikers! branding, and incorporates a quick response (QR) code that leads mobile device users to a website that provides further information. The NEANS Panel has also conducted a variety of workshops that provided training on social marketing, working with the media, volunteer management, and understanding the legislative process.



Lake George Asian Clam Eradication Project

The Asian clam, Corbicula fluminea, was found in Lake George, New York in 2010. Over 600 mats were installed to smother non-native clams and minimize the threat posed to the lake's environment.



NEANS
NORTHEAST AQUATIC
NUISANCE SPECIES PANEL

Sea Squirt
Didemnum vexillum

Characteristics

- * Cream white, tan, or yellow
- * Dense colonies of microscopic, individual animals (zooids)
- * Colonies grow up to 12-18 in (30-46 cm) long
- * In slow-moving waters, may form long, ropey, or beard-like colonies that commonly hang from hard substrates such as docks, lines, and ship hulls
- * In faster-moving waters, may form low, undulating mats that encrust and drape rocky seabeds (pebbles, cobbles, boulders, and rock outcrops)

Habitat


- * Hard surfaces such as docks, pilings, moorings, ship hulls, rocks, and seafloor
- * Primarily below the low-tide line to continental shelf depths of 210 ft (65m)

Known Distribution


- * Northeastern U.S. (New Jersey, New York, Connecticut, Rhode Island, Massachusetts, New Hampshire, Maine)
- * Covers much of Georges Bank and Gulf of Maine

Impacts


- * Alters marine habitats and threatens to interfere with fishing, aquaculture, and other coastal and offshore activities
- * Grows over organisms such as tunicates, sponges, seaweeds, hydroids, anemones, bryozoans, scallops, mussels, and oysters
- * Covers siphons of shellfish living in the seabed
- * Blocks bottom-feeding fish from reaching their prey



Sea squirt (*Didemnum vexillum*)
Credit: A. Pappal



Sea squirt (*Didemnum vexillum*)
Credit: L. Stefaniak, UConn



Sea squirt (*Didemnum vexillum*)
Credit: L. Stefaniak, UConn

Northeast Aquatic Nuisance Species Panel

Example page generated from the Online Guide to Aquatic Invasive Species in Northeastern North America. The tool allows creation of customized field guides that can be used to detect and prevent ANS.

Mississippi River Basin Region

Alabama, Arizona, Colorado, Iowa, Illinois, Indiana, Kansas, Kentucky, Louisiana, Mississippi, Minnesota, Missouri, Montana, North Carolina, North Dakota, Nebraska, Ohio, Oklahoma, Pennsylvania, South Dakota, Tennessee, Texas, Virginia, Wisconsin, West Virginia, Wyoming

Mississippi River Basin Panel on Aquatic Nuisance Species

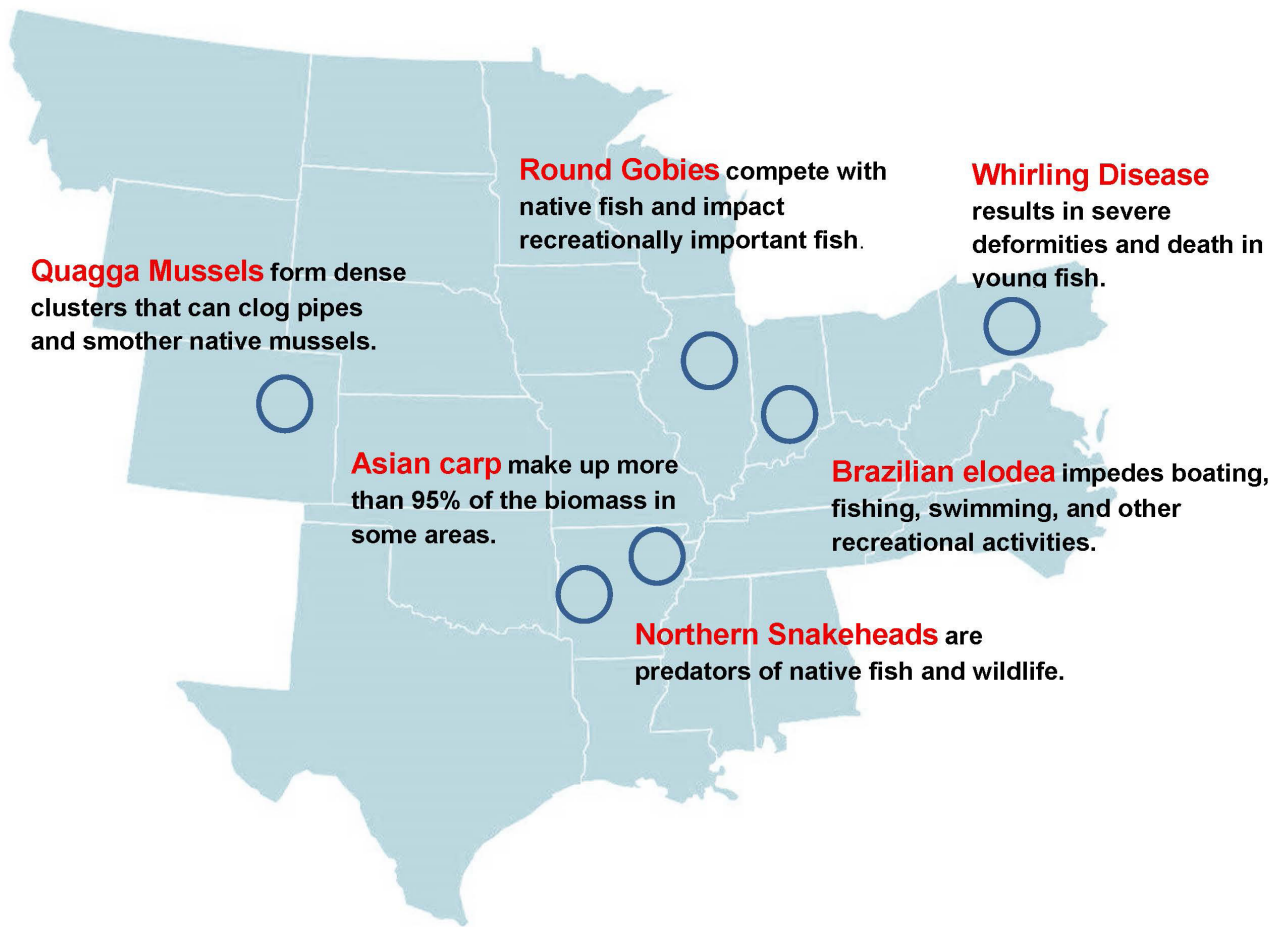
The Mississippi River Basin Panel (MRBP) was formed in 2002 and has been hosted by the Mississippi Interstate Cooperative Resource Association (MICRA) since 2003. The MRBP project area includes the entire Mississippi River Basin, the largest watershed in the nation, covering 1.25 million square miles, and draining 41 percent of the continental United States. In accordance with the six responsibilities for regional ANS panels established by statute, the MRBP's current priorities are:



- Interagency and interbasin coordination and information exchange among management agencies and stakeholders.
- Identification and evaluation of ANS pathways.
- Training and familiarization with the Incident Command and National Incident Management Systems for implementing rapid response actions.
- Implementation of the national Asian Carp Management and Control Plan.
- Development and accessibility of ANS material.
- Evaluation of the effectiveness of education and outreach actions to increase awareness and foster behavior change.

The MRBP membership includes representatives from academia, private environmental and commercial interests, and state and federal agencies. The MRBP has three standing committees to address the panel's responsibilities, to identify current priorities, and to assist in implementation of the ANS Task Force Strategic Plan. The panel facilitates coordination and implementation of regional ANS programs and projects, identifies priorities and emerging issues, and develops recommendations for the ANS Task Force. Efforts are also directed to the creation of regional ANS outreach products and implementation of projects to address priority ANS issues within the basin.

Website: <http://www.mrbp.org>



USFWS

The map illustrates the states included in the Mississippi River Basin Panel on Aquatic Nuisance Species. Also highlighted are some of the key issues within the region. Numerous species have either invaded or threaten to invade the region; therefore, the examples represented on the map should not be viewed as the only, or highest priority, ANS within the region.

The following is a snapshot of significant accomplishments of the Mississippi River Basin Panel on Aquatic Nuisance Species (MRBP) and ANS Task Force member agencies in the Mississippi River Basin region. This summary is meant to illustrate the wide range, but is by no means a comprehensive summary, of the ANS coordination, prevention, EDRR, research, and education and outreach that have been done and are ongoing in the Mississippi River Basin region.

Coordination

The Mississippi Interstate Cooperative Resource Association (MICRA), with input from the MRBP and others, developed an action plan to guide coordinated efforts in the Mississippi River Basin to prevent additional species invasion and control priority ANS. The action plan has two primary goals: 1) reduce and ultimately prevent all new introductions of ANS; and 2) stop the spread of ANS within the Basin, extirpate harmful ANS, or, if extirpation is not possible, control ANS populations to ensure sustainable aquatic ecosystems and the social, economic, and cultural uses they support.

In response to the Asian carp invasion within the Mississippi River, MICRA hosted a workshop and webinar to provide a forum for natural resource managers in the Mississippi River Basin to have an in-depth discussion on the potential for commercial harvest to be an effective tool to reduce Asian carp populations. Participants identified several issues

related to the commercial harvest of Asian carp and requested that MICRA take a lead role in coordinating basin-wide resolution, which led MIRCA to draft a [position statement](#) on the commercial harvest of Asian carps.

Prevention

The MRBP developed and refined a [Rapid Risk Screening Process and a Model Risk Assessment and Risk Management Process](#) for state natural resource management agencies. The project resulted in a process that natural resource management agencies can use to evaluate ANS risks and determine which species warrant a full risk assessment prior to being imported into the United States. The process allows for low-risk organisms in trade to not be unnecessarily held up for a full risk assessment and protects native ecosystems by identifying the highest-priority species in trade that warrant further risk assessment. The tool was later updated to include decision support tools and a climate change component. The MRBP also worked with the USCG to complete a risk assessment of barge traffic as vectors for ANS transport and dispersal, including a study on bilge water and external transport of materials on barges within the Mississippi River Basin.



Gary Chancey/USFWS

U.S. Fish and Wildlife Service Wilmington Substation employees electrofish for small Asian carp in Marseilles pool of the Illinois Waterway.

Early Detection and Rapid Response

The MRBP developed a [Model Rapid Response Plan for Aquatic Invasive Species](#) in the Mississippi River Basin and will develop addendums with protocols for fish, plants, and invertebrates as separate documents. The MRBP hosted an ICS-based mock rapid response exercise for member agencies and partners. An After Action Report was developed that identified additional steps to improve rapid response preparedness.

Containment and Control

MICRA recently completed a national analysis to evaluate and identify sources and pathways of grass carp introductions. Information provided through this analysis will provide the USFWS and states with an understanding of the extent and magnitude of legal grass carp sales, shipping, and stockings, and will result in recommendations, where necessary, for reasonable actions to reduce the risk of illegal and accidental introductions of diploid grass carp. The information will also assist with the implementation of the recommendations and strategies identified in the [Management and Control Plan for Bighead, Black, Grass, and Silver Carps in the United States](#).

Research

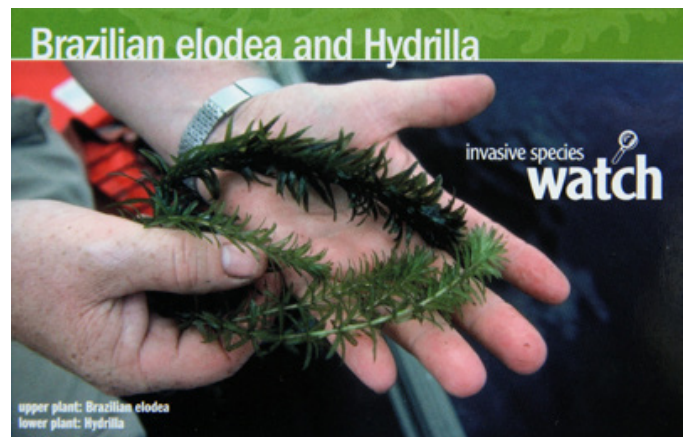
The MRBP assisted member states in conducting ANS surveys that determined how much boaters and anglers know about ANS and determined where they get their information. The purpose of these surveys was to use the results to direct future public information campaigns for greatest effectiveness. The results of these surveys are also used by the MRBP Outreach and Education Committee to develop regional recommendations, priorities, and projects.



University of Wisconsin Sea Grant

Wisconsin Sea Grant Watercraft Inspector talks with a sailboater about measures he can take to prevent spreading aquatic invasive species.

The USGS increased the understanding of zebra mussel impacts in the Upper Mississippi River by studying ecosystem and population-level effects (e.g., examining the effect of zebra mussels on denitrification rates and the health, growth, and survival of native mussels); the physiology of individual zebra mussels (e.g., comparing filtration rates and diet selectivity of zebra mussels with that of native species); and the efficacy and selectivity of commercial products for controlling zebra mussels. The USGS is also working to develop control tools intended to primarily impact dreissenid mussels.



South Carolina Department of Natural Resources

The USGS has been conducting research on bighead and silver carps since they became abundant in the Mississippi, Missouri, and Illinois rivers. USGS researchers identified the best models to use for Asian carp age assessments and detected habitat use and spawning areas (e.g., [Fluvial Egg Drift Simulator](#) (FluEgg)). The agency also characterized many aspects of Asian carp life history, improved sampling and fishing gear for Asian carp, enhanced eDNA and molecular detection methods, and is working to develop several tools for containment and control. This research has led to a better understanding of the invasion as it occurred, assisted predictions about future spread, and provided managers with information to better manage Asian carp. Further, the USACE is developing population models to estimate survival, recruitment, movement, and population growth of Asian carp species as well as conducting studies to assess the ecological risk of Asian carps to native fish and plankton communities. USACE scientists are also evaluating functional thresholds and behavioral responses (e.g. swimming performance) of Asian carps; these data are used to improve the development, design and operation of barrier technologies.

Education and Outreach

The MRBP hosted an international symposium on invasive Asian carp in North America. Following the symposium, the MRBP worked with the American Fisheries Society and other partners to publish [Invasive Asian Carps in North America](#). The book provides researchers and resource managers with a comprehensive resource containing the most current information available on four species of Asian carp in North America. Moreover, U.S. Representatives Mike Kelly (R-Pennsylvania) and Betty McCollum (D-Minnesota) sponsored an “Asian Carp Awareness Symposium” hosted by MICRA in the United States Capitol Visitor’s Center during [National Invasive Species Awareness Week](#) and [Great Lakes Days](#). Speakers from MICRA discussed the extent and magnitude of the Asian carp invasion. The symposium brought needed attention to the extent and magnitude of the Asian carp problem in the Mississippi River Basin and the need to implement the national [Management and Control Plan for Bighead, Black, Grass and Silver Carps in the U.S.](#)

To assist with public education efforts, the MRBP worked with the Illinois-Indiana Sea Grant Program to produce and distribute Hydrilla and Brazilian elodea (*Egeria densa*) [WATCH cards](#). The MRBP distributed the WATCH cards to aid detection and public awareness efforts. The North Central Regional Aquaculture Center (NCRAC) supplied funding to develop educational materials and biosecurity plans and to hold six workshops to address concerns of fish farmers that the exotic disease pathogen Viral Hemorrhagic Septicemia (VHS) and ANS such as zebra mussels, rusty crayfish, and Asian Carp could be a threat to their operations. NASAC assisted NCRAC and collaborative agencies to develop best management practices and biosecurity plans for culture methods used in the North Central region. To date, VHS has not been found in or transferred to any fish farm in the United States.

Mid-Atlantic Region

*Delaware, District of Columbia, Maryland, North Carolina,
New Jersey, New York, Pennsylvania, Virginia, West Virginia*

Mid-Atlantic Panel on Aquatic Nuisance Species

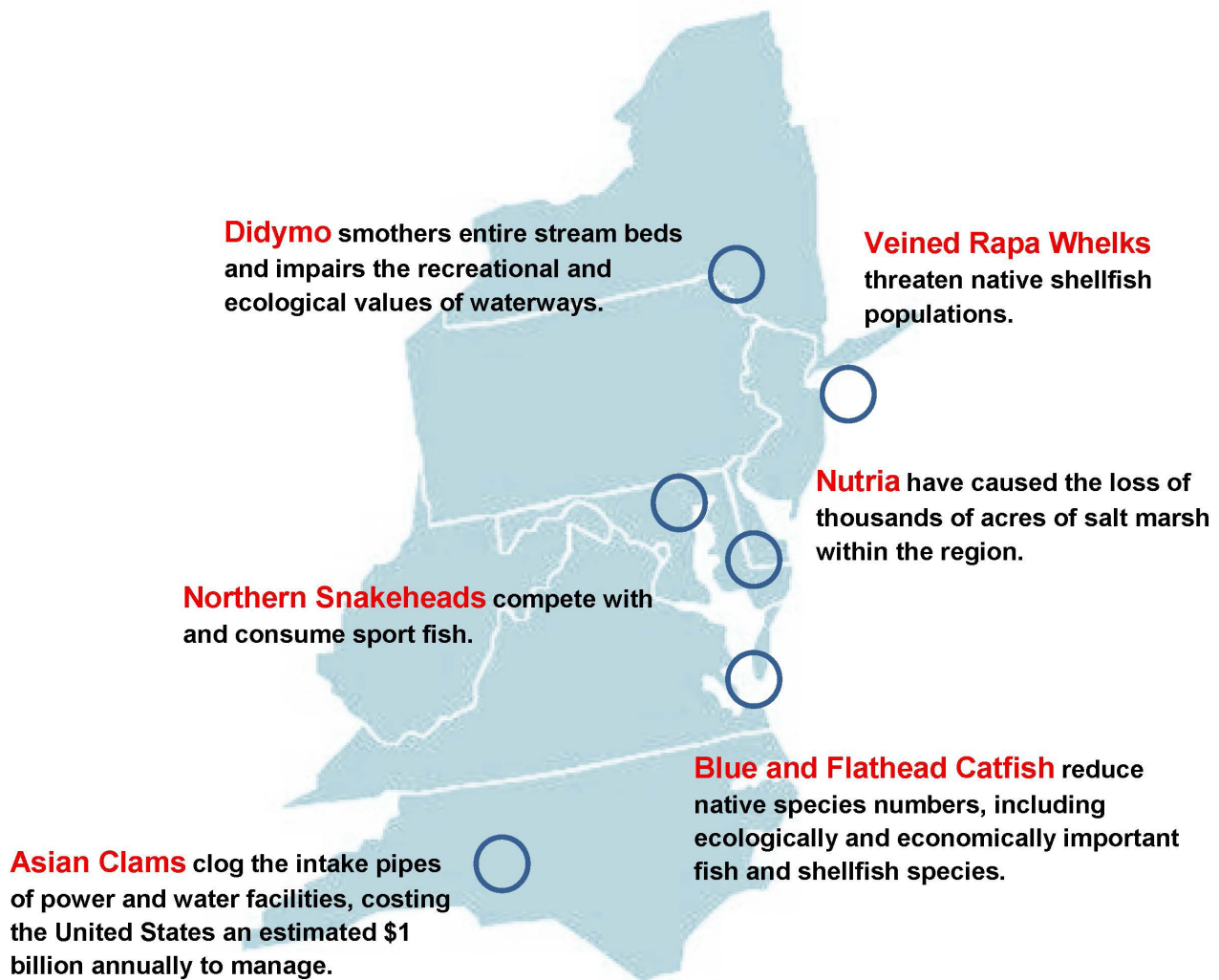
The Mid-Atlantic Panel on Aquatic Invasive Species (MAP) was formed in 2003 through efforts of the Chesapeake Bay Program's Invasive Species Workgroup and others to address the numerous ANS threats in the Chesapeake Bay watershed and the Mid-Atlantic region. The MAP has a diverse membership representing state and federal agencies, academic institutions, environmental organizations, commercial interests, and regional entities.



The mission of the MAP is to assist state and federal agencies and other stakeholders in developing and implementing strategic, coordinated, and action-oriented approaches to prevent and control ANS in the Mid-Atlantic region. The driving force behind the mission is to strengthen cooperation, coordination, and communication on ANS issues within the region and beyond. The Panel helps state, federal, and local agencies, non-profits, and private landowners tackle ANS issues by:

- Identifying and prioritizing regional issues.
- Coordinating local ANS programs.
- Operating a Small Grants Competition.
- Assisting the ANS Task Force in coordinating federal programs that promote effective methods of preventing and managing ANS introductions.
- Development and accessibility of ANS material.
- Evaluation of the effectiveness of education and outreach actions to increase awareness and foster behavior change.

Website: <http://www.midatlanticpanel.org>



USFWS

The map illustrates the states included in the Mid-Atlantic Panel on Aquatic Invasive Species. Also highlighted are some of the key issues within the region. Numerous species have either invaded or threaten to invade the region; therefore, the examples represented on the map should not be viewed as the only, or highest priority, ANS within the region.

The following is a snapshot of significant accomplishments of the Mid-Atlantic Panel on Aquatic Invasive Species (MAP) and ANS Task Force member agencies in the Mid-Atlantic region. This summary is meant to illustrate the wide range, but is by no means a comprehensive summary, of the ANS coordination, prevention, EDRR, research, and education and outreach that have been done and are ongoing in the Mid-Atlantic region.

Coordination

The MAP provides opportunities for coordination across participating states, agencies, and organizations by holding semi-annual meetings throughout the region and occasional topic-specific workshops. The MAP hosted an integrated program of [ANS Prevention through Vector Management](#) in 2009 aimed at closing the door as tightly as possible to harmful ANS and offering the best prospects for preventing potential new invasions. The workshop brought together distinguished scientists and policy leaders from across the country to discuss the research, management, education, and public engagement challenges and opportunities for developing an action-based vector management framework to prevent new ANS introductions. Workshop participants identified significant knowledge gaps and actions required to support a vector management approach to prevent new bioinvasions. One impact from this workshop was the proposal led by Maryland Sea Grant, with subsequent funding by NOAA,

to study the [live bait vector](#) using both ecological and social science research to comprehensively understand the biology as well as the human dimensions of this pathway.

To help foster communication, coordination, and collaboration across the region, the MAP assembled a list of aquatic species they determined to be “of interest.” This list is intended to help researchers and managers analyze the prevention and management of species tracked outside their known range. The MAP also supported the 2013 International Didymo (*Didymosphenia geminata*, an invasive diatom) Conference, bringing together research experts and resource managers from across the country to discuss the latest understanding about the species and how to most effectively manage this invasion.

Prevention

With seed funding from the MAP, the Maryland Department of Natural Resources, SERC, USFWS, and NOAA established a Chinese Mitten Crab Watch program to investigate the status of this invasive species and prevent its spread.

Early Detection and Rapid Response

To foster an effective response to ANS introductions, Maryland Sea Grant, MAP, and its members developed the [Rapid Response Planning for Aquatic Invasive Species document](#). The rapid response plan employs the ICS to provide a common language and help various agencies and jurisdictions work together as a well-coordinated unit. A template was also made available to encourage states in the Mid-Atlantic and beyond to adapt the plan to their specific needs while maintaining the value of a common framework across the region. A number of states have used this plan as a template for their own rapid response planning.

Containment and Control

The [Invasive Catfish Task Force](#), chaired by NOAA’s Chesapeake Bay Office, is responsible for coordinating the best available science and developing precautionary management approaches to mitigate the spread and minimize the impacts of invasive catfish species on the Chesapeake Bay ecosystem. The role of the Invasive Catfish Task Force is to incorporate information on blue and flathead catfish and develop a management strategy to handle these invasive species across all jurisdictions.

“Combat invasive species” was one of five priority habitat recovery actions identified in Chesapeake Bay Executive Order 13508. In support of this action, the USFWS and NOAA developed a rapid response team in each state to detect and control invasive species and seek full implementation of the Nutria Management Plan. With support from the MAP and in partnership



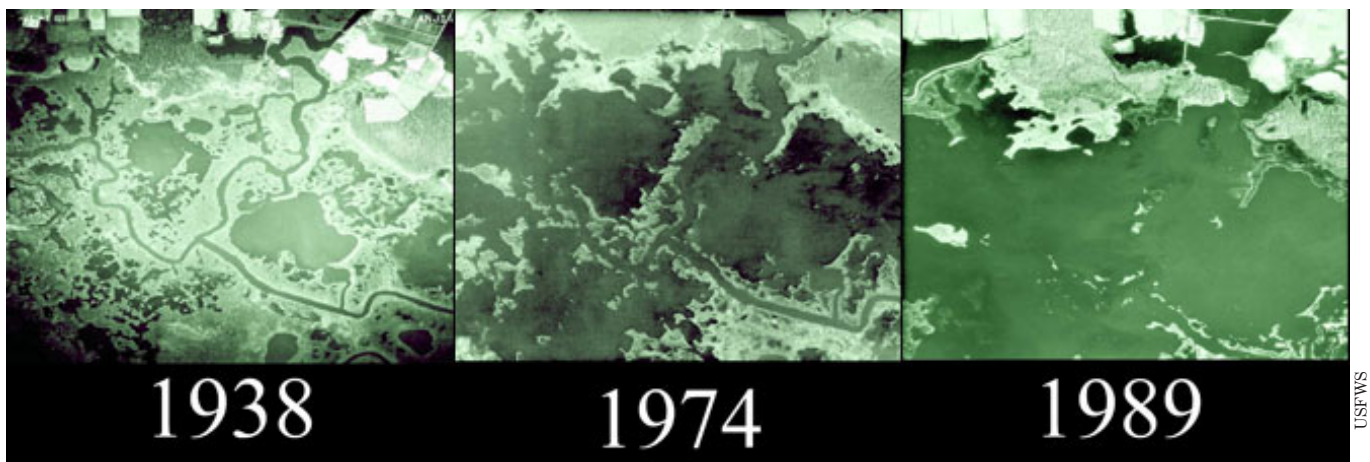
Maryland Sea Grant

Anglers in the Mid-Atlantic often use live baitworms packed in seaweed. But this poses a threat to the environment – the seaweed can carry invasive species that don’t belong here. A study led by Maryland Sea Grant provides a detailed analysis of the potential ANS that may live in this seaweed and identifies solutions to the risk posed by this vector.



USFWS

Blue and flathead catfish have rapidly expanded into nearly every major tributary in the Chesapeake Bay watershed and are negatively affecting native species and the Chesapeake Bay ecosystem. The role of the Invasive Catfish Task Force will be to incorporate all available information on blue and flathead catfish to develop a management strategy for handling these invasive species across all jurisdictions.



A series of three photos from 1938, 1974, and 1989 that show the degradation of wetland in the Blackwater National Wildlife Refuge, Maryland. Much of the damage can be attributed to nutria feeding activities. Significant efforts have been taken to locate and remove nutria populations from the Delmarva Peninsula.

with federal agencies, private landowners, states, universities, the Nutria Partnership, and non-governmental organizations, lead agencies continue to prevent infestations of ANS before they become established and more costly to control. The USGS continued to assist the USFWS and USDA WS to determine the presence of nutria in eastern Maryland wetlands after an extensive eradication effort when few nutria remain. Detection at low population levels is vital to successful eradication.

Research

Since 2007, the MAP has devoted most of its federal funding toward [annual grant competitions](#) that direct funds to ANS issues in the Mid-Atlantic States. To date, the MAP has funded 34 projects totaling \$318,000. These federal dollars brought an additional \$516,000 in matching funds to support ANS work. Projects may include aspects of ANS research, prevention, early detection, control, and /or outreach and education. Some examples of funded projects include:

- Detection and control of Phragmites in Virginia.
- Development of ANS prevention signage for boat ramps in Pennsylvania.
- Eradication of invasive carp from New Jersey waters.
- Mapping nutria populations in Virginia and development of a strategic plan for nutria control in Virginia and North Carolina.
- Development of ANS outreach materials for educators in Pennsylvania, Maryland, and New York.
- Research on eDNA monitoring for Didymo in Maryland.

In addition to MAP funded projects, SERC researchers in the region have been studying the prevalence of the parasitic barnacle, *Loxothylacus panopaei*, in populations of the white-fingered mud crab (*Rhithropanopeus harrisi*) since the 1990s in hopes of understanding how this introduced parasite affects the mud crab population. Public volunteers are invited to join in the collection of the mud crabs as a way to engage participants in the scientific process and provide valuable information about ANS. In addition, the USGS assessed habitat use, movements, home ranges, diet, growth, reproduction, and nesting behavior of northern snakeheads in the Potomac River Basin to aid resource managers and also discovered that northern snakeheads can carry Largemouth Bass Virus, a disease that impacts several fish species but only appears to cause death in some largemouth bass.

Education and Outreach

The MAP funded a Pennsylvania Sea Grant project to produce the [Pennsylvania Aquatic Invasive Species \(AIS\) Field Guide](#). Printed on waterproof paper, this handbook is a consistent and clear resource for identifying, collecting, and reporting on ANS in Pennsylvania. The MAP has funded a project to expand this guide to cover all of the Mid-Atlantic States. In addition, the MAP provided funds to develop a graduate-level professional development course on ANS in the Hudson River. The innovative project is a hybrid online and field-based course that enhances educators' knowledge of ANS and ability to effectively use their schoolyards as ANS teaching classrooms. Twenty-four educators, representing 16 school districts from New York City to Albany, have participated to date. The course materials have also been integrated into other professional development courses offered by the Cary Institute of Ecosystem Studies. Penn State Extension also used MAP funding to develop outreach and training materials for preventing the spread of ANS through water gardening.



Pennsylvania Sea Grant

A wide variety of tools and materials have been developed to educate the public and inform them of measures they can take to prevent the introduction and spread of ANS.

Current Status of the ANS Task Force

The ANS Task Force provides coordination and collaboration to prevent ANS introduction and spread; monitor, control, and research such species; and disseminate related information.

The ANS Task Force is funded through the USFWS to conduct semi-annual meetings and provides support to achieve goals identified by the Regional Panels and ANS Task Force-approved management plans and to implement programs that reflect the goals within the ANS Task Force Strategic Plan.

State and Interstate ANS Management Plans

State and Interstate ANS Management Plans are a useful tool for identifying activities needed to eliminate or reduce the environmental, public health, and safety risks associated with ANS.

In 1990, the NANPCA recognized that states are integral partners in the battle against ANS and authorized the State and Interstate Aquatic Nuisance Species Management Plan (SIANSMP) grant program. To more strategically combat ANS and ensure funds are spent in a targeted way, states may develop plans that focus on feasible, cost-effective management practices and measures to be undertaken by the states and cooperating entities to prevent and control ANS infestations in an environmentally sound manner. The ANS Task Force provides written guidance to facilitate and streamline management plan development along with the review and approval process. The ANS Task Force must approve a state's plan for it to be eligible for SIANSMP funding. Since 1998, the ANS Task Force has approved 42 plans (39 state plans and 3 interstate). To support implementation of those plans, funding from the grant program is distributed equally among the states that apply, unless a lesser amount is requested for individual plans. Many states use their funds to support a State ANS Coordinator position who collaborates with partners in the state and serves as an expert resource for partners and communities on ANS related issues. Other states choose to leverage funding from the grant program with other funds to conduct collaborative projects that address plan priorities. In some cases the funding from the USFWS represents the only funding the states spend on ANS, while in other cases the annual allocation represents only a small portion of a state's total ANS budget.

National ANS Management and Control Plans

Species-specific ANS Management and Control Plans help identify priority actions and needs, but additional effort is needed to implement them effectively.

The ANS Task Force or any other entity may recommend the development of a species-specific management and control plan. Development of a plan can proceed if approved by the ANS Task Force and if an entity or ad-hoc committee steps forward to lead the drafting process. These plans identify activities to minimize the impact to areas where ANS have already invaded and prevent their spread into additional habitats. Once a plan is drafted and approved by the ANS Task Force, however, additional work is needed to facilitate Federal, state, tribal, local, and non-governmental partners to work together to identify available resources and how to move forward with implementation.

Benefits of the ANS Task Force

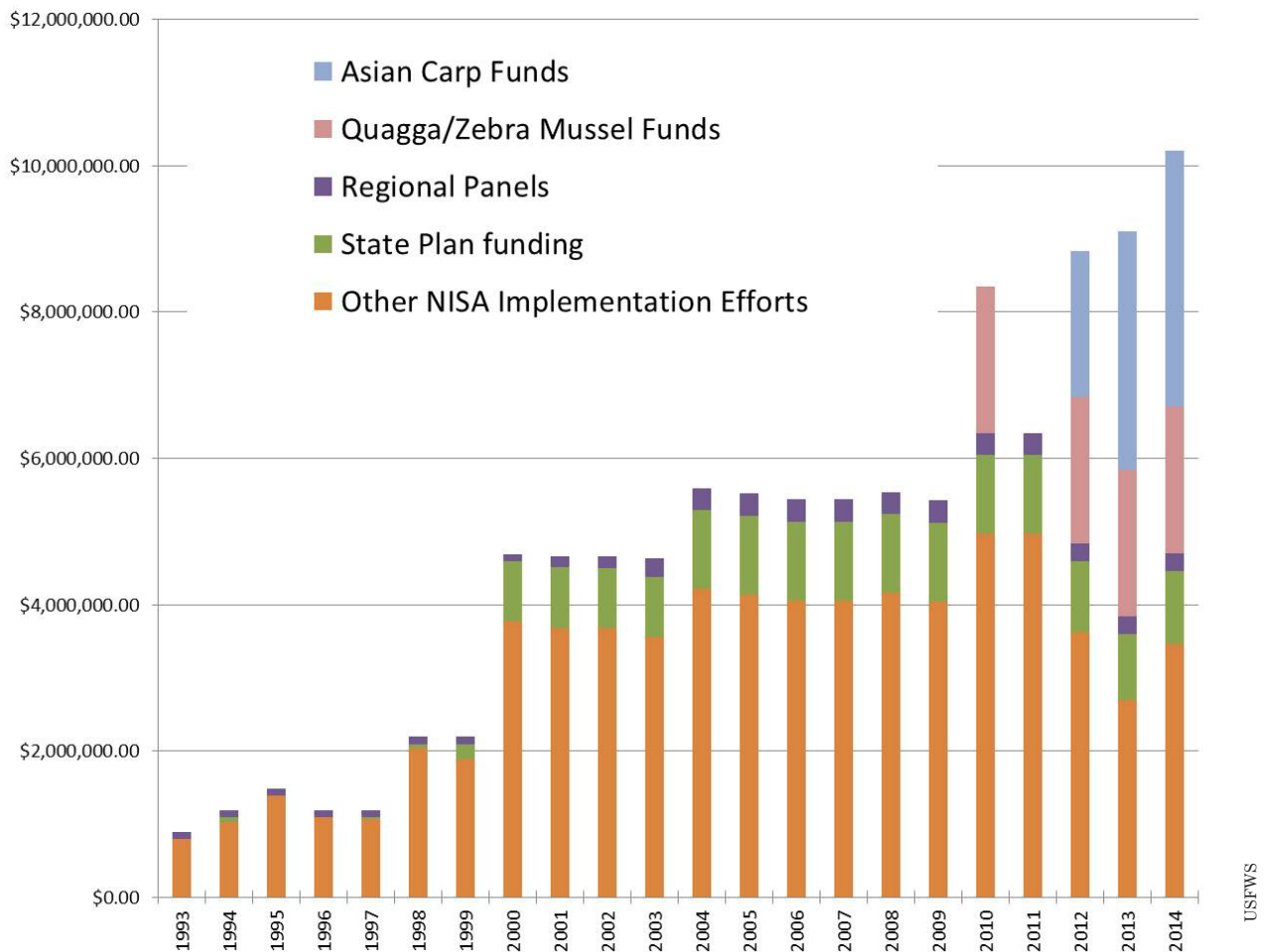
- Facilitates the exchange of ideas through participant networks and collaborative activities.
- Leverages resources across agencies and organizations.
- Minimizes duplication of efforts.
- Provides an established mechanism for interaction with states and regions.
- Improves the likelihood of successful ANS prevention and management.

Regional Panels

Regional Panels play an important role in regional ANS efforts, but additional emphasis on their role is needed.

The six Regional Panels provide a host of services and products that foster communication, cooperation, and collaboration and, as such, help ensure that the ANS Task Force meets its legislative mandates. The unique position of the Panels allows them to coordinate, provide advice, and identify priorities on a broad range of complex regional ANS issues while collaborating across a broad spectrum of parties. Annual funding from the USFWS to support operation of the Regional Panels remained level with an annual allocation of \$300,000 until 2013, when funding for the Regional Panels was reduced by 20 percent (\$60,000) as a result of budget sequestration. The FY 2016 President's budget included an increase of \$42,000 for Regional Panel support. This amount aimed to restore, in part, the annual allocations received by the Regional Panels prior to 2013 and augment their ability to coordinate program activities and advise public and private interests on ANS efforts within their region. The FY 2016 President's budget increase was approved by the Senate, but not approved by the House.

ANS Program Funding History, 1993-2014



Looking Ahead...

ANS are a global problem; increased world trade, climate change, and other factors may increase invasion rates and create additional pathways for introduction.

ANS have a profound effect on aquatic ecosystems, resulting in the displacement of native species, reduced biodiversity, and the alteration of community structure and food webs. As a result, biological invasions significantly contribute to species endangerment, habitat degradation, and global biodiversity loss. ANS also inflict enormous economic burdens; the cost to manage ANS is estimated at billions of dollars each year. ANS are a global problem; as the world trade network continues to grow, invasion rates increase and pathways for introduction become more numerous and complex. Additional challenges to ANS management may result from changes in the Earth's climate that will likely continue, or even accelerate, over the next century.

Despite the challenges, the ANS Task Force remains optimistic.

The ANS Task Force's purpose is defined by statute under Section 1202 of the NANPCA of 1990, as amended by the NISA (Public Law 104-332 (Oct 26, 1996)) (collectively the Act). In general, it is charged with developing and implementing a program for U.S. waters to prevent introduction and dispersal of aquatic invasive species; to monitor, control, and study such species; and to disseminate related information. Authorities and appropriation levels are outlined in Sections 1201 – 1209 and Section 1301 of the Act.

Since its establishment, the ANS Task Force has witnessed considerable success in the prevention and control of ANS, along with increased emphasis on the restoration of ecosystems that have been adversely affected. Enhanced research and information exchange, new detection and eradication techniques, innovative control methodologies, and collaborative models are increasing our capacity to manage ANS. Awareness of the problems caused by ANS has also dramatically improved, as evidenced by increased ANS prevention, monitoring, and control activity at federal, state, and local levels. The ANS Task Force is encouraged by these accomplishments and is committed to working collaboratively to put its strategic goals and objectives into action, but requires additional resources to address ongoing and emerging challenges.

The ANS Task Force has identified four areas for future consideration:

1. Revise and Reauthorize the National Invasive Species Act

Since the Act was reauthorized in 1996 a number of new federal and non-federal participants have joined the ANS Task Force and major advances have been achieved with respect to scientific knowledge associated with the introduction, management, and impact of ANS across the Nation. Reauthorizing the Act would provide the opportunity to act on the most recent scientific knowledge, incorporate the broad spectrum of current approaches to prevent, control and manage ANS, and reinvigorate federal agencies in their involvement on the ANS Task Force to meet the objectives of the Act.

- A more effective Prevention Program focused on high-risk pathways for invasive species not yet established in the United States. This would include risk assessments on the vectors and pathways of non-native species and the development of risk management practices to reduce the movement and establishment of ANS. While it is important to address existing detrimental species, such as Asian carp and quagga mussels, these efforts should not surpass or diminish measures to sustain and implement a comprehensive national prevention program.
- A comprehensive National ANS Monitoring Program to support early detection and documentation of the establishment and spread of ANS in marine, estuarine, and freshwater ecosystems nationwide.

- A National Early Detection and Rapid Response Program, as directed in the White House Priority [Agenda on Climate Resilience and Natural Resources](#) to be coordinated by the ANS Task Force, in collaboration with the National Invasive Species Council, to control or eradicate high-risk and newly detected ANS invasions. The emergency response fund called for in the Agenda on Climate Resilience and Natural Resources report would be used to establish ANS prevention and containment capabilities nationwide to protect uninvaded waterbodies.
- An enhanced National ANS Outreach, Education, and Awareness Program to coordinate and implement the work of ANS Task Force members to engage the public and provide increased support for citizen-science activities to help prevent, monitor, manage and control ANS.
- Expanded Cooperative ANS Research Activities to provide additional ANS research grant funding opportunities and facilitate partnerships to address high priority prevention and management needs. Increased knowledge of ANS biology, potential pathways of introduction and impacts, and associated prevention and control methods, as well as socioeconomic impacts, interaction with climate change, and other major drivers of change will increase the effectiveness of ANS management.

2. State ANS Management Plan Implementation

Working with the Administration, Congress, states, and other key stakeholders, the ANS Task Force will develop recommendations to more effectively implement the State and Interstate ANS Management Plans. This should include the development of guidelines, procedures, and reporting mechanisms for an annual State/Interstate ANS Management Plan competitive grant program targeting the consistent implementation of management actions across jurisdictional boundaries. The number of State ANS management Plans approved by the ANS Task Force has more than doubled over the last decade; accordingly, efforts to engage Federal, state, tribal and regional authorities and other stakeholders must be increased to address the problems and concerns identified in each plan.

3. ANS Task Force Regional Panel Support

The ANS Task Force will work with relevant stakeholders to develop recommendations to better support each ANS Task Force Regional Panel in their efforts to identify regional ANS priorities, coordinate regional ANS program activities, and provide advice concerning ANS prevention and control.

4. Control and Management of ANS

The ANS Task Force will continue to lead the development of a coordinated strategy by federal member agencies and *ex-officio* member organizations to control and manage high-priority ANS. Control and management commitments should consider resource responsibilities, whether actions will complement the work of other ANSTF members, and if the proposed actions will produce measurable results. Control and management is a cost-intensive management option when compared to prevention, and is most cost-effective when action is taken immediately upon first detection, when populations are still localized and can be contained or eradicated. Funding, public awareness, and management expertise are critical to success, particularly because ANS can span geographic and jurisdictional boundaries and do not recognize political boundaries or agency jurisdictions. Therefore, the ANS Task Force should coordinate an ecosystem-level approach to control and manage ANS.

ANS Task Force Federal Members – Roles in ANS Management

U.S. Fish and Wildlife Service (USFWS)

The mission of the U.S. Fish and Wildlife Service (USFWS) working with others to conserve, protect, and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people. The Service meets its conservation mission by enforcing federal wildlife laws, protecting endangered species, managing migratory birds, restoring nationally significant fisheries, conserving and restoring wildlife habitat, helping foreign governments with their international conservation efforts, and distributing hundreds of millions of dollars to State fish and wildlife agencies. Within the ANS management arena, the USFWS serve as co-chair of the ANS Task Force and oversees multiple programs that manage invasive species across the United States. The USFWS oversees the injurious species provisions of the Lacey Act (Title 18), which are paramount to preventing the introduction and spread of invasive species into the United States. The Office of Law Enforcement directs the inspection of wildlife shipments at 37 ports, and enforces wildlife laws against trafficking in interstate and foreign commerce of injurious and invasive species. In addition to managing invasive species on its 150 million acre National Wildlife Refuge System, The USFWS has several other programs that address invasive species threats to trust resources, including migratory birds, threatened and endangered species, and fisheries.

National Oceanic and Atmospheric Administration (NOAA)

The National Oceanic Atmospheric Administration (NOAA) is responsible for the stewardship of the nation's ocean resources and their habitat. NOAA provides vital services for the nation: productive and sustainable fisheries, safe sources of seafood, the recovery and conservation of protected resources, and healthy ecosystems—all backed by sound science and an ecosystem-based approach to management. The NOAA has responsibility for prevention, monitoring, control, education, and research to prevent future introductions and the spread of ANS. The NOAA provides staff support for engagement and activities related to its leadership role as the co-chair of both the National Invasive Species Council (representing the Department of Commerce) and the ANS Task Force—two interagency organizations that coordinate and ensure complementary, cost-efficient, and effective federal activities regarding invasive species. In addition, NOAA's Sea Grant program and program offices have been actively involved in research and outreach regarding ANS, as well as restoration of habitat that benefits native species by removal of invasive organisms.

Bureau of Land Management (BLM)

The Bureau of Land Management (BLM), the United States' largest federal landowner, manages approximately 245 million acres of land, including 132,190 miles of fish-bearing streams and rivers, nearly 3 million acres of lakes and reservoirs, and countless wetlands, primarily in 11 western states. The BLM biologists work to prevent the spread of ANS within isolated desert springs that harbor populations of rare and unique fishes as well as large river systems that support salmon and resident fishes of exceptional regional and national value. The BLM-managed waters provide recreational opportunities for the growing human population throughout the Western United States and help sustain culturally important subsistence fisheries for Native Americans and economically important commercial fisheries. As a key member of the ANS Task Force, its Western Regional Panel, and the Federal Interagency Committee for the Management of Noxious and Exotic Weeds (FICMNEW), BLM also works on controlling invasive plants and has implemented an action plan—Partners Against Weeds— to prevent and control the spread of noxious weeds on public lands.

Bureau of Reclamation (BOR)

The Bureau of Reclamation (BOR) is responsible for programs that control invasive species infesting BOR-managed water systems, including reservoirs, rivers, and distribution canals. The BOR manages invasive species through its Integrated Pest Management Program under its basic operation and management authority and various reclamation-enabling statutes and directives.

Department of State (DOS)

The Bureau of Oceans and International Environmental and Scientific Affairs, Office of Conservation and Water (OES/ECW), is the main point of contact in the Department of State (DOS) for invasive species issues. OES is responsible for international marine and coastal invasive species as well as terrestrial species in a variety of contexts, and advocates for policies and approaches consistent with those of the United States at international forums (e.g., multilateral environmental agreements) and regional initiatives (e.g., the Convention on Biological Diversity and the Arctic Council). The DOS works closely with other federal agencies to develop U.S. policies on invasive species and collaborates with other agencies in international matters related to invasive species.

Environmental Protection Agency (EPA)

The U.S. Environmental Protection Agency's (EPA) mission to protect human health and the environment overlaps with multiple goals of the ANS Task Force strategic plan. Since 2008 the EPA has adopted a primary role in ANS prevention by defining, under the authority of the Clean Water Act and in coordination with the USCG, regulatory structures aimed at reducing the risk of ballast waterborne aquatic invasions. The EPA also plays a major coordination and funding role in the Great Lakes region as signatory to the bi-national Great Lakes Water Quality Agreement, by coordinating federal policy and activities on the Asian Carp Regional Coordinating Committee and, more broadly, by leading the Great Lakes Restoration Initiative as the chair of the initiative's Interagency Task Force and Regional Working Group. The EPA's Office of Research and Development also directly supports prevention and early detection goals through its ongoing research efforts.

National Park Service (NPS)

The National Park Service (NPS) manages over 400 units covering more than 83 million acres in the 48 coterminous states, Alaska, Hawaii, the Pacific Islands, and the Caribbean. The areas managed by the NPS are diverse, including large natural parks and wilderness areas, recreation areas, seashore and lakeshore monuments, and historic sites. The NPS regulations prohibit the introduction of non-native plants and animals to the aquatic systems it manages, and parks nationwide are engaged in the prevention and management of ANS. The NPS is committed to working with other federal agencies and state partners to stop the spread of ANS, including high-profile species such as zebra and quagga mussels and Asian carp. Beginning in fiscal year 2014, the NPS committed \$2 million to invasive mussel prevention, containment, and management in nine western parks. In the upper Mississippi, the NPS is working with other federal agencies and state partners to prevent the spread of Asian carp. Smaller-scale efforts to control or eradicate non-native aquatic species are underway in many parks.

U.S. Army Corps of Engineers (USACE)

The U.S. Army Corps of Engineers (USACE) has a number of control programs for invasive species, and is authorized (although unfunded since 1996) to implement a 50/50 federal/local cost-sharing arrangement with state and local governments for managing nuisance aquatic plants in waterways not under the control of the USACE or other federal agencies. The Removal of Aquatic Growths (RAG) program authorizes the USACE to remove/control aquatic vegetation obstructing navigation on federal projects in Gulf Coast States. The USACE also has two direct-funded research programs that focus on invasive species; the Aquatic Plant Control Research Program and the Aquatic Nuisance Species Research Program. The USACE also maintains and operates electric dispersal barriers located in the Chicago Sanitary and Ship Canal to prevent movement of Asian carp from the Mississippi River Basin to the Great Lakes.

U.S. Coast Guard (USCG)

Section 1101 of the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990, as reauthorized and amended by the National Invasive Species Act of 1996, provides authority to the U.S. Coast Guard (USCG) for ballast water management (BWM) and other vessel operations, and directed it to ensure to the maximum extent practicable that ANS are not discharged into U.S. waters. Since 1990, the USCG has developed a series of regulations and policies and enforced their compliance for vessels operating in U.S. waters. (USCG jurisdiction under NISA applies to the U.S. territorial sea, or 12 nautical miles). In 2012, the USCG published its latest regulations that established a numeric ballast water discharge standard (BWDS) for the allowable concentration of living organisms in ships' ballast water discharged in waters of the United States. It also amended its regulations for engineering equipment by establishing an approval process for ballast water management systems (BWMS). Setting a BWDS promotes development of innovative BWM technologies, facilitates enforcement of BWM regulations, and assists in evaluating the effectiveness of the ANS Program. As part of the BWMS approval process, the USCG requires the use of Independent Laboratories to perform testing and evaluate data. The USCG and EPA work closely together in the development of ballast water discharge standards and to harmonize requirements, to the extent feasible and appropriate, under their respective statutory mandates. The USCG also leads the U.S. government's inter-agency delegation to advocate U.S. interests at the International Maritime Organization of the United Nations.

U.S. Department of Agriculture, Animal and Plant Health Inspection Service (USDA-APHIS)

The Animal and Plant Health Inspection Service (APHIS) within the U.S. Department of Agriculture (USDA) is the primary agency charged with preventing invasive species from entering the United States. The APHIS authority arises from laws such as the Plant Protection Act and a number of statutes collectively referred to as the animal quarantine laws. The APHIS can prohibit, inspect, treat, quarantine, or require mitigation measures prior to allowing entry of plant species, plant pests, biological control organisms, animals, animal products and by-products, or their host commodities or conveyances. The APHIS is also authorized to prevent the introduction and dissemination of diseases and pests of livestock and poultry. The APHIS has emergency authority to deal with incipient invasions and works in cooperation with academia, non-governmental organizations, and other federal, state, regional, and local agencies.

U.S. Department of Transportation (DOT), Maritime Administration (MARAD)

The Department of Transportation (DOT) oversees federal highway, air, railroad, maritime, and other transportation administration functions that have a role in ANS management; these components include the Federal Highway Administration (FHWA), Federal Railroad Administration (FRA), Maritime Administration (MARAD), and Saint Lawrence Seaway Development Corporation (SLSDC). The FHWA has an oversight role in federally funded highway projects that include both interstate and state highways. The FHWA's Vegetation Management Program guides states' departments of transportation on invasive species issues. The FRA promotes safe and environmentally sound rail transportation and supports invasive species control efforts on rail corridors. The MARAD promotes development and maintenance of an adequate, well-balanced U.S. Merchant Marine and supports the control of ANS. The SLSDC is responsible for the safe and efficient movement of marine traffic through the U.S.-owned and operated facilities of the Saint Lawrence Seaway and performs ballast water examinations and participates in collaborations to reduce introduction and spread of ANS through vessels entering the St. Lawrence Seaway.

U.S. Forest Service (USFS)

As a major federal landowner in the nation, the U.S. Forest Service (USFS) works extensively with public and private stakeholders and other partners to conduct management activities against a wide range of aquatic and terrestrial invasive species across the 193-million-acre National Forest System extending from Alaska to the Caribbean. Across the National Forest System, the USFS manages thousands of freshwater streams, rivers, lakes, vernal pools, wetlands, and other freshwater areas, as well as marine estuaries and related habitats. The USFS is recognized as a leader in invasive species ecology, management, and research in the United States and internationally. The USFS also plays an important role in each of the national federal interagency coordinating groups addressing invasive species, including the ANS Task Force, the Federal Interagency Committee for the Management of Noxious and Exotic Weeds (FICMNEW), and the Federal Interagency Committee for Invasive Terrestrial Animals and Pathogens (ITAP).

U.S. Geological Survey (USGS)

The U.S. Geological Survey (USGS) Invasive Species Program in the Ecosystems Mission Area conducts research on terrestrial, aquatic, and marine ecosystems, including invasive plants, vertebrates, invertebrates, and fish and wildlife disease organisms. The USGS assists resource managers by providing reliable information on invasive species biology and distribution, developing methods and tools to better prevent and control invasions, quantifying effects of invasive species, and developing management alternatives for restoration. Emphasis is given to areas administered by the DOI and regions that are particularly threatened by invasive species, such as Hawaii, western rangelands, wetlands, the southeast, and the Great Lakes, but the goal is to be able to tailor and apply methods, tools and strategies to other locations. The USGS hosts a prominent [national database](#) as a central repository for spatially referenced biogeographic accounts of introduced aquatic species in the United States. The database provides scientific reports, real-time queries, spatial data sets, species distribution maps, and general species information. The data is available for use by biologists, interagency groups, and the general public.

List of Acronyms

AFWA	Association of Fish & Wildlife Agencies
AIS	Aquatic Invasive Species
ANS	Aquatic Nuisance Species
APHIS	Animal and Plant Health Inspection Service
ARRA	American Recovery and Reinvestment Act
BLM	Bureau of Land Management
BOR	Bureau of Reclamation
DOI	Department of the Interior
DOS	Department of State
DOT	Department of Transportation
EDRR	Early Detection and Rapid Response
EPA	Environmental Protection Agency
FACA	Federal Advisory Committee Act
FICMNEW	Federal Interagency Committee for the Management of Noxious and Exotic Weeds
GLC	Great Lakes Commission
GLP	Great Lakes Panel
GLRI	Great Lakes Restoration Initiative
GSARP	Gulf and South Atlantic Regional Panel
HACCP	Hazard Analysis and Critical Control Point
LCBP	Lake Champlain Basin Program
MARAD	Maritime Administration
MICRA	Mississippi Interstate Cooperative Resource Association
MAP	Mid-Atlantic Panel
MRBP	Mississippi River Basin Panel
NANPCA	Nonindigenous Aquatic Nuisance Prevention and Control Act
NASAC	National Association of State Aquaculture Coordinators
NCRAC	North Central Regional Aquaculture Center
NEANS	Northeast Aquatic Nuisance Species Panel
NISA	National Invasive Species Act
NISC	National Invasive Species Council
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
PIJAC	Pet Industry Joint Advisory Committee
QZAP	Quagga-Zebra Mussel Action Plan
REEF	Reef Environmental Education Foundation
SAH	Stop Aquatic Hitchhikers
SERC	Smithsonian Environmental Research Center
USACE	United States Army Corps of Engineers
USCG	United States Coast Guard
USDA	United States Department of Agriculture
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WRP	Western Regional Panel

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Endnotes

- ⁱ Wilson, E O. (1999). *The diversity of life*. WW Norton & Company
- ⁱⁱ Wilcove DS, Rothstein D, Dubow J, Phillips A, Losos E. (1998). Quantifying threats to imperiled species in the United States. *BioScience* 48:607-615
- ⁱⁱⁱ Cucherousset, J. and J.D. Olden. (2011). Ecological Impacts of Nonnative Freshwater Fishes. *Fisheries* 36(5), 215 — 230.
- ^{iv} Pimentel D, Zuniga R, Morrison D. (2005). Update on the environmental and economic costs associated with alien-invasive species in the United States. *Ecological Economics*. 52: 273-288.
- ^v Use of the term “vector” varies among agencies and organizations and is commonly confused with “pathway.” The ANS Task Force defines a vector as the physical means or agent causing a species to translocate or spread (e.g., ship, car, waders). Pathway is defined as an activity or process through which a species may be transferred to a new location (e.g., shipping, animal trade, recreational activities).
- ^{vi} Wilson, E.O. (1999). *The diversity of life*. WW Norton & Company.
- ^{vii} Wilcove DS, Rothstein D, Dubow J, Phillips A, Losos E. (1998). Quantifying threats to imperiled species in the United States. *BioScience* 48:607-615
- ^{viii} Cucherousset, J. and J.D. Olden. (2011). Ecological Impacts of Nonnative Freshwater Fishes. *Fisheries* 36(5), 215 — 230.
- ^{ix} Cusack, C., Harte, M.J., and Chan, S.S. (2009). *The economics of invasive species*. Oregon State University, Sea Grant College Program
- ^x Pimentel D, Zuniga R, Morrison D. (2005). Update on the environmental and economic costs associated with alien-invasive species in the United States. *Ecological Economics*. 52: 273-288.
- ^{xi} Simpson A. (2004). The Global Invasive Species Information Network: What’s in it for you? *BioScience* 54: 613-614.
- ^{xii} Center TD, Frank JH, Dray FA. (1997). Biological control. In: Simberloff D, Schmitz DC, Brown TC. (Eds.), *Strangers in Paradise*. Island Press, Washington, DC, pp. 245– 266.
- ^{xiii} Asian Carp Regional Coordinating Committee: 2016 Asian Carp Action Plan Congressional Briefing. April 26, 2016. This statement refers to funding spent FY 10 to FY 16; although the timeframe of Activities within this Report is 2004 to 2015.
- ^{xiv} Leung, B., Lodge, D. M., Finnoff, D., Shogren, J. F., Lewis, M. A., & Lamberti, G. (2002). An ounce of prevention or a pound of cure: bioeconomic risk analysis of invasive species. *Proceedings of the Royal Society of London B: Biological Sciences*, 269(1508), 2407-2413.
- ^{xv} Two members co-represent the Native American Fish and Wildlife Society
- ^{xvi} The “[Quagga-Zebra Mussel Action Plan for Western U.S. Waters](#)” is not an official ANS Task Force National Management and Control Plan. The goal of this document is to summarize current strategies to address the invasion of zebra and quagga mussels in the West, and to identify and prioritize the specific actions that are needed to comprehensively manage these species.
- ^{xvii} The timeframe of this Report is 2004 to 2015; however in June 2016 the number of IMO member states that ratified the International Convention for the Control and Management of Ships’ Ballast Water and Sediments increased to 51, representing 34.87 % percent of the world’s tonnage.
- ^{xviii} The ANS Task Force Membership Contact List is continuously updated, Please refer to the ANS Task Force website (<http://www.anstaskforce.gov>) for the latest version.
- ^{xix} Tahoe Regional Planning Agency was approved as an ex-officio member in May, 2015. As this addition followed completion of the report, accomplishments of the Tahoe Regional Planning Agency are not included in this Report.

ANS Task Force

For additional information on the ANS Task Force:

ANS Task Force website: <http://anstaskforce.gov>

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