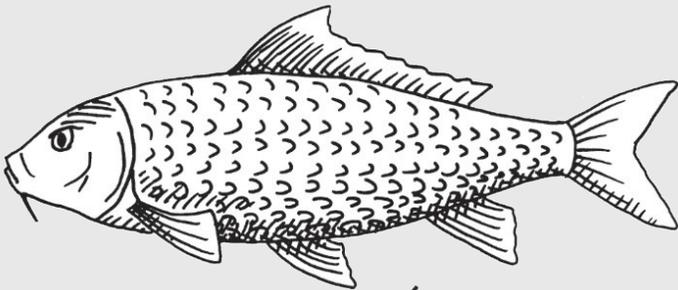


Aquatic Nuisance Species Task Force

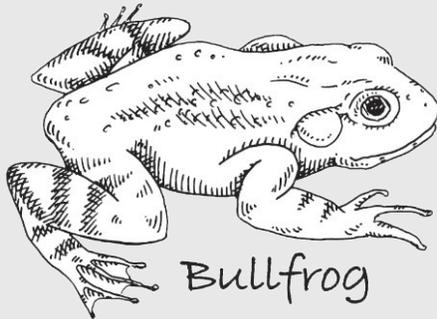
2016 - 2017 Report to Congress



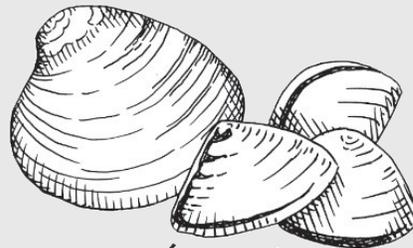
Carp Species



European
Green Crab



Bullfrog



Invasive Clams
and Mussels



Hydrilla



New
Zealand
Mudsnaail

Purple
Loosestrife



ANS Task
Force

Dedicated to the prevention and control of aquatic nuisance species

Introduction

Aquatic nuisance species (ANS) are nonindigenous species that threaten the diversity and abundance of native species, the ecological stability of infested waters, and water dependent commercial, agricultural, aquacultural, and recreational activities. To combat this threat, Congress established the ANS Task Force with the passage of the Nonindigenous Aquatic Nuisance Prevention and Control Act (NANPCA) in 1990 and reauthorized NANPCA with the passage of the National Invasive Species Act (NISA) in 1996 (collectively, the Act).

The Act charges the ANS Task Force with developing and executing a program 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.

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. In response to this requirement, this report highlights work conducted by the Federal and ex-officio members of the ANS Task Force and its regional panels during Fiscal Years (FY) 2016 and 2017.¹ It serves to demonstrate the continuing progress of the ANS Task Force in the development and implementation of a comprehensive program for the United States to combat ANS. Accounting for each individual ANS endeavor would be a daunting task as efforts under the ANS Task Force are conducted at national, regional, and State levels and involve numerous Federal and State agencies, universities, conservation groups, industry leaders, and other stakeholders. As such, this report is not a comprehensive summary of ANS efforts throughout the Nation, but instead illustrates the wide range of efforts occurring under the auspices of the ANS Task Force. Accomplishments in this report are divided into six ANS management goals: coordination, prevention, early detection and rapid response (EDRR), containment and control, research, and education and outreach. Collectively, these goals make up the central mission of the ANS Task Force.

The ANS Task Force is guided by its [Strategic Plan for 2013–2017](#), which serves 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, control and public understanding of ANS, yet also calls attention to habitat restoration and research. Future strategic planning efforts of the ANS Task Force will build upon its accomplishments and continue to progress its long-standing goals, while also addressing emerging ANS challenges.

ANS Task Force Members

The ANS Task Force consists of 13 Federal agency representatives and 15 ex-officio, non-Federal members. The 15 ex-officio non-Federal members provide insights that strengthen the effectiveness of the ANS Task Force. 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 members 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

¹ In April 2017, the Department of Interior (DOI) began a review of its Federal advisory boards. As the ANS Task Force acts in accordance with the provisions of the Federal Advisory Committee Act, the DOI review required the immediate postponement of all ANS Task Force meetings and operations. Accordingly, there are no activities to report for FY2017 after April 2017. A new charter for the ANS Task Force was signed on January 10, 2018, which permitted the ANS Task Force to resume its operations.

Ex-officio members of the ANS Task Force²:

- Great Lakes Commission
- Lake Champlain Basin Program
- Chesapeake Bay Program
- San Francisco Estuary Partnership
- 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
- National Aquaculture Association
- National Marine Manufacturers Association
- Smithsonian Environmental Research Center
- Tahoe Regional Planning Agency

Coordination

ANS issues are significant in their breadth and scope as their threats emanate from numerous taxa, and in turn, endanger aquatic resources around the globe. A variety of pathways are capable of transporting ANS into new environments including ballast water and hulls of ships, recreational watercraft and fishing equipment, importation of non-native species for food, pets, and other purposes, and the long distance transport of marine debris. To effectively manage ANS, multiple efforts and strategies are required. ANS management includes actions taken to prevent the introduction, establishment, and spread of ANS as well as to provide for eradication and control to minimize adverse impacts, such as impacts to the environment, human health, cultural resources, and the economy.

The great extent of work needed to manage ANS and their impacts demonstrates that one agency or work group cannot tackle it alone. The ANS Task Force was created by Congress to coordinate efforts between Federal, State, tribes, and local agencies, the private sector, and other North American interests. Collaboration facilitated by the ANS Task Force provides an opportunity for its members to identify priorities and establish a unified, well-coordinated approach to ANS management. Working with other agencies and organizations also allows the ANS Task Force to identify gaps in statutory authority, emerging policy issues, and better define future ANS Task Force roles and responsibilities for managing ANS.

The ANS Task Force strives to create opportunities and synergies among members and participants by sharing resources, expertise, and ideas across agency and organizational lines. To achieve this goal, the ANS Task Force also works in conjunction with six regional ANS Panels and issue-specific committees to provide a national and regional infrastructure, which continuously coordinates on important ANS issues at Federal, State, and local levels. In addition, the ANS Task Force has approved nine Species Management and Control Plans, a Quagga-Zebra Mussel Action Plan for Western U.S. Waters, and 44³ State or Interstate ANS Management Plans. Each of these coordination components are described in detail below.

² Two members co-represent the Native American Fish and Wildlife Society

³ In FY2016 and 2017, there were 43 approved State or Interstate ANS Management Plans. The ANS Task Force approved the Nevada ANS Management Plan in June 2018, bringing the total at 44 approved plans by the publication date of the RTC.

Coordination Spotlight

States play a critical role in ANS management and have numerous programs related to the wide variety of ANS found within their borders. The Act recognized that states are integral partners in the battle against ANS and, accordingly authorized the Director of the U.S. Fish and Wildlife Service (USFWS) to make grants available to States, tribes, and interstate organizations that have State or Interstate ANS Management Plans approved by the ANS Task Force. To facilitate this process, the ANS Task Force provides written guidance to streamline management plan development along with the review and approval process. Once approved, the plans are a valuable and effective tool for identifying and addressing ANS problems and concerns across numerous jurisdictions with many interested and affected organizations. State and Interstate ANS Management Plans identify technical, enforcement, and other resources 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 implement the broad framework of a national ANS program and support the ANS Task Force mission and its strategic goals. In 2016, the ANS Task Force reviewed and approved a revision to the New York State ANS Management Plan. It also approved the Maryland ANS Management Plan, bringing the total number of approved plans in FY 2017 to 43 (40 State and three interstate).

In 2016 and 2017, the USFWS continued to provide funds to support plan implementation through its State and Interstate Aquatic Nuisance Species Management Plan (SIANSMP) grant program. Since 2004, funding for this program remained consistent at approximately \$1M, with funds equally distributed 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. In 2016, funding for the program was doubled to \$2 million, or approximately \$46,500 for each plan. The increase was maintained for 2017, testament to the return on investment and the value that States receive from having an ANS management plan reviewed and approved by the ANS Task Force.

ANS Task Force and Member Coordination Efforts

The ANS Task Force has developed several tools to serve agencies, organizations, and the general public. For example, the ANS Task Force's website is a fundamental coordination tool that functions as a clearinghouse for ANS information and provides general information on ANS biology, impacts, and legislation, as well as more detailed information and guidance in areas such as prevention, monitoring, and control. The website is also used to archive ANS Task Force meeting minutes, agendas, presentations, plans, and other documents drafted by ANS Task Force members and regional panels. In 2016, the ANS Task Force undertook an effort to update and expand its ANS Experts Database. This database provides access to individuals who can address and assist with ANS management questions and efforts, such as identifying non-indigenous species found in the environment or participating in ANS response teams and management plan development.

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) developed a handbook to provide policy requirements and guidance to all National Forests and Grasslands for management activities of terrestrial and aquatic invasive species, including ANS. In addition, the USFS recently released its national Fisheries and Aquatic Ecology Strategy that guides the agency's work on best management practices and public outreach and education to prevent the spread of ANS. The Bureau of Land Management (BLM) also developed best management practices to ensure that its activities do not spread ANS. These include practices for fire management programs, special recreation permits, and fisheries activities.

In 2016 and 2017, the U.S. Army Corps of Engineers (USACE)'s Invasive Species Leadership Team continued to coordinate and collaborate with ANS Task Force members, regional invasive species councils, Federal and State agencies, and other stakeholders. The Team also reviewed and coordinated policy, regulations, and best management practices for preventing and controlling ANS that impact USACE missions. Likewise, the USFWS staff provided coordination throughout the Nation to assist regional ANS management. These activities included technical assistance, field assistance, grants management, capacity building, and participation in partnerships focused on ANS management. As an example, in FY 2016 and 2017, the USFWS allocated approximately \$930,000/year to partners to implement the ANS Task Force-approved Quagga-Zebra Mussel Action Plan (QZAP) for Western U.S. Waters. Grants were competitively awarded to the projects that advanced the highest priority actions within QZAP, with the ultimate goal of safeguarding the West from further spread of these invasive mussels.

The U.S. Geological Survey (USGS), in partnership with the Great Lakes Commission, Great Lakes Fisheries Commission, and National Oceanic and the Atmospheric Administration (NOAA), established the [Invasive Mussel Collaborative](#) to identify the needs and objectives of resource managers, prioritize the supporting science, recommend communication strategies, and align science and management goals into a common agenda for advancing invasive mussel management and control. Since its establishment in 2015, the Invasive Mussel Collaborative has convened its steering committee and science team, published a website, developed a list serv, hosted a webinar series, and developed informational products focused on control techniques and emerging technology. The [Great Lakes Phragmites Collaborative](#) was established in 2012 by the Great Lakes Commission and U.S. Geological Survey (USGS). This collaborative is guided by a regional advisory committee and is working to increase awareness of the non-native Phragmites as an invasion threat and provide a foundation of resources to support contingency plans for containment and control. In 2016 and 2017, the Great Lakes Phragmites Collaborative continued to maintain a centralized website for Phragmites information, enable communication within the Phragmites community through a list serv with more than 700 members, host a webinar series for managers and scientists to share research and management techniques, and develop materials to support restoration of wetland and terrestrial sites following Phragmites control efforts.

ANS Task Force members may choose to coordinate efforts by drafting plans that focus on specific pathways, species, or locations. In 2016, the Tahoe Regional Planning Agency developed an Implementation Plan for the Control of Aquatic Invasive Species within Lake Tahoe. The implementation plan supplements the ANS Task Force-approved Lake Tahoe Region Aquatic Invasive Species Management Plan and is intended as a guide for resource managers at Lake Tahoe to identify and prioritize species, specific locations, and strategies for ANS removal and control. In 2016, NOAA began the process of updating its Monterey Bay National Marine Sanctuary Introduced Species Action Plan that is intended to maintain the natural biological communities and ecological processes in the Sanctuary and protect them from the potentially adverse impacts of introduced ANS.

ANS Task Force Regional Panels

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. As such, six regional panels have been established under the ANS Task Force as a critical and effective mechanism for achieving the goals of the ANS Task Force and a means to unify local actions into a regionally-coordinated response. The regional panels that have been established under 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); and
- Mid-Atlantic Regional Panel (established 2003).

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 priorities;
- Making recommendations to the ANS Task Force;
- Coordinating regional ANS activities in the region;
- Providing advice pertinent to regional ANS issues; and
- Reporting annually to the ANSTF.

The six regional panels provide a host of services and products that foster communication, cooperation, and collaboration that help ensure that the ANS Task Force meets its legislative mandates. Products produced by the regional panels have provided guidance for its members to manage ANS. Further, each panel creates a forum that allows for information sharing, collaboration, and coordination and ensures that local and regional operations are

efficient and avoid duplication of efforts and use of resources. They leverage expertise and knowledge, providing shared insights into what resources are available and what ANS efforts work within their respective region. The unique position of the regional panels also allows them to coordinate with a broad spectrum of parties on a wide range of complex ANS issues across regional boundaries.

Key coordination activities conducted in 2016 and 2017 by each of the regional panels are highlighted below. Additional regional panel projects are highlighted in the relevant goal sections of this report.

Great Lakes Panel

The Great Lakes Panel (GLP) fosters binational collaboration and coordination on ANS research, education, and policy through the active participation of members representing Canadian federal, provincial, and nongovernment agencies. The networking and relationship-building opportunities provided through the GLP allow for collaborative campaigns, projects, and products that leverage resources from the private, public, and non-profit sectors. The GLP met twice during 2016. Meetings included ad-hoc committee sessions on grass carp and risk assessment, as well as plenary sessions on tracking progress on ANS prevention and control; organisms in trade; and advancements in management approaches for sea lamprey and Asian carp. The GLP also continued efforts to identify emerging priorities for ANS prevention and control, as recorded in committee priority documents. These documents are designed to guide funding from outside sources toward high priority needs and provide an incentive for grant seekers to develop and seek funding for high-priority projects.

GLP committees play a lead role in identifying priorities and progress on ANS prevention and control. For example, in 2016 and 2017, the GLP grass carp ad hoc committee provided a forum for ongoing communication and coordination specific to grass carp and to track and advance progress of GLP's document Grass Carp Priorities for the Great Lakes. These priorities were conducted to elevate awareness of the risks, complexities for management, and needs associated with preventing new introductions and establishment of grass carp in the Great Lakes Basin. In addition, the GLP risk assessment ad hoc committee was established in 2016 to advance development of a risk assessment clearinghouse designed for invasive species experts to access, review, and compare risk assessments generated by multiple agencies, academic institutions, and others.

In 2016 and 2017, the Great Lakes Commission supported GLP Research Coordination Committee efforts to assess, summarize, and report on invasive species funding since the implementation of Great Lakes Restoration Initiative. The final summary will highlight progress on and identify gaps in targeting priorities identified by the GLP, and will help inform future ANS investments.

Western Regional Panel

The Western Regional Panel on ANS (WRP) works collaboratively with diverse partners across the west to leverage local management actions into a coordinated regional response. The WRP hosts an annual meeting to address emerging issues, and continues to refine ANS management strategies, exemplified by its work on quagga and zebra mussel spread through the recreational boating pathway and its Building Consensus in the West work (see Prevention Spotlight).

The WRP has several standing committees dedicated to addressing the needs of the western regional panel members; these include the Coastal Committee, Membership Committee, Annual Meeting Committee, and the Executive Committee. In 2016, the WRP Coastal Committee finalized a white paper, Biofouling in the U.S. Pacific States and British Columbia, to serve as the foundation for comprehensive regional management to address this pathway.

Mississippi River Basin Panel

The Mississippi River Basin Panel (MRBP) facilitates coordination and implementation of regional ANS programs and projects, identifies priorities and emerging issues, and develops recommendations for the ANS Task Force. The MRBP met twice during 2016, during which the Prevention and Control, Research and Risk Assessment, and Outreach and Education committees reviewed past accomplishment and developed 2017 work plans. Key accomplishments in 2016 and 2017 included the development of an implementation plan to harmonize state grass carp regulations to establish a consistent national policy strategy, finalizing a Request for Proposals for baitfish pathway analysis, and soliciting support for research on eDNA markers, live releases of organisms for ceremonial practices, and snakehead impacts and management.

In 2016, the MRBP worked with National Sea Grant Law Center to host an Attorneys General workshop to address the threat of trade in live organisms. The workshop increased awareness about the pathway and laid the foundation for future discussions of possible solutions to this ANS threat in the Basin. The Panel also hosted an international symposium at the 2016 American Fisheries Society annual meeting in Kansas City, Missouri. This

symposium brought together resource managers as well as scientists and engineers studying the underlying physical processes, physiology, and behavior of Asian carp to sensory cues. In 2016, the MRBP also provided financial assistance for Chinese scientists to make site visits in the Mississippi River Basin and meet with United States managers, researchers, and commercial fishermen to further develop and refine unified harvest fishing methods for Asian carp in the Mississippi River.

Northeast Aquatic Nuisance Species Panel

The Northeast Aquatic Nuisance Species (NEANS) Panel works with States within the region as well as neighboring Canadian Provinces on ANS issues. 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. In 2016, the NEANS Panel developed messages for ANS public service announcements, distributed boat washing efficacy study results, and promoted techniques for ANS prevention. In addition to biannual meetings, the panel also convenes mid-term conference calls to keep the panelists well-connected and to prepare recommendations for the ANS Task Force. The NEANS Panel's Climate Change Work Group continued its work in 2016 and 2017 to formulate an existing and likely ANS list based on changing environmental conditions while the Spread Prevention Work Group worked to develop a universal watercraft decontamination standard operating procedure.

Gulf and South Atlantic Region Panel

Through the biannual meetings of the Gulf and South Atlantic Regional Panel (GSARP), members are able to develop working relationships to facilitate communication and coordinate ANS management activities across the region. In 2016, the GSARP completed its third year of their small grants program, which creates opportunities for focused research on regional ANS priorities. Grants recipients are requested to present their results at one of the biannual meetings to help disseminate the information across the region and to increase coordination between academia and the State and Federal ANS managers. Research completed in 2016 included work on apple snail, giant salvinia, and didymo management efforts.

Mid Atlantic Panel

The mission of the Mid-Atlantic Panel on Aquatic Invasive Species (MAPAIS) is to assist State and Federal agencies and other stakeholders in developing and implementing strategic, coordinated, and action-oriented approaches for ANS management in the mid-Atlantic region, and to coordinate and communicate these activities with the other Regional Panels, the ANS Task Force, and other partners. The two MAPAIS meetings in 2016 focused on issues of regional significance, website rebuilding, and boat decontamination programs. Since 2007, MAPAIS has conducted an annual grants competition to fund on-the-ground activities addressing MAPAIS's mission and regional priorities. In 2016 and 2017, selected projects focused on constructing ANS boat inspection stations, researching eDNA of amphibian pathogens, and conducting an economic analysis of ANS risk in the bloodworm trade. Projects funded in prior years that continued work into 2016 included conducting a program to train nutria detection dogs, managing New Zealand mud snail populations, and writing a Mid-Atlantic ANS field guide.

ANS Task Force Committees

To facilitate technical coordination, the ANS Task Force has established three standing committees: the Communication, Education, and Outreach (CEO) Committee; the Research Committee; and the Prevention Committee. 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 professional volunteers. 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 formed to develop National ANS Management and Control Plans to manage specific species.

In 2016, the ANS Task Force formed an ad hoc Boating Partnership Committee in recognition of the role that boats and other recreational activities play in spreading ANS. The Committee began working with the American Boat and Yacht Council (ABYC) in 2016⁴ to develop a Technical Information Report that will guide boat, trailer, and boat component manufacturers on designing products that simplify inspection and decontamination and minimize the unintentional transfer of ANS. In addition, the CEO Committee worked with the USFWS to refresh and rebrand the Stop Aquatic Hitchhikers! campaign. This national campaign promotes best management practices to control the spread of ANS such as Clean, Drain, Dry, so that recreationalists become part of the solution rather than part of the problem in spreading ANS.

⁴ The document was finalized by ABYC and their partners in the Summer of 2017 (outside the scope of this report). ABYC is now pursuing steps to conduct a marketing and outreach program to raise awareness of ANS and promote steps manufacturers can take to help minimize the transportation of ANS.

National ANS Management and Control Plans

The Act also 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. When the ANS Task Force determines that control of an ANS is warranted, recommended actions are organized into a comprehensive management plan that focuses on essential tasks designed to minimize the impact to areas where ANS have already invaded and prevent spread into additional habitats. Species management 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. Successful implementation of these plans requires the participation of Federal, State, and regional entities.

There are currently nine National ANS Management and Control Plans approved by the ANS Task Force:

- Brown tree snake, approved June 1996.
- Eurasian ruffe, approved November 1996.
- European green crab, approved November 2002.
- Mitten crabs, approved November 2003.
- Caulerpa species (an invasive algae), approved October 2005.
- Snakehead, approved November 2006, revision approved May 2015.
- New Zealand mudsnail, approved May 2007.
- Asian carp (black carp, bighead carp, grass carp, and silver carp), approved November 2007.
- Lionfish, approved May 2015.

In addition to these nine plans, the Western Regional Panel drafted the Quagga Zebra Action plan for Western U.S. Waters, which was approved by the ANS Task Force in 2010.

Prevention

Prevention is the most cost-effective and environmentally protective tool for managing ANS and any resulting impacts from those introductions. Prevention 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. ANS Task Force members have developed several pathway management programs that support efforts to prevent introductions. These programs include public awareness campaigns, risk assessment and mitigation tools, and efforts to identify and prevent species introduction into the country or between States. Key prevention activities that occurred in 2016 and 2017 are highlighted below, with a focus on pathways that have been identified as high priority by the ANS Task Force.

Prevention Spotlight

The quagga mussel and zebra mussel (collectively referred to as dreissenid mussels) are among the most devastating ANS to invade North American fresh waters. Once established, these mussels can clog water intake and delivery pipes, infest hydropower infrastructure, adhere to boats and pilings, foul recreational beaches, and cause many other costly problems. Initially introduced into the Great Lakes in the late 1980's through the discharge of contaminated cargo ship ballast water, dreissenid mussels are now well established in over 600 lakes and reservoirs in the United States. The mussels have not been detected in the vast majority of Western waters, presenting an urgent opportunity to prevent further damage in the United States. Without increased and immediate action, quagga and zebra mussels will cause irreparable ecological damage to Western waters and long-term costs will be in the billions.

Recognizing the need for consistent and effective action, the Western Regional Panel (WRP) of the ANS Task Force formed the Building Consensus in the West subcommittee. This highly collaborative effort brings together natural resource managers, law enforcement officers, and Assistant Attorneys General in a proactive approach to protect Western waters from dreissenid mussel infestation. Building Consensus in the West advances the goals under the ANS Task Force-approved Quagga-Zebra Mussel Action Plan for Western U.S. Waters. Since overland transport of small-craft boats is a significant vector for spreading dreissenid mussels from one waterbody to another, a key focus of the subcommittee is to develop a multi-State vision for watercraft inspection and decontamination (WID) programs. Building Consensus in the West strives to increase economies and efficiencies for agencies administering WID programs, create consistencies in messaging and experiences for recreational boaters, and develop standard protocols and definitions for waterbody classification, monitoring, and regulation among Western states. These efforts have cascaded into successful improvements in communication, partnerships, WID program protocols and reciprocity, and model legislation for State WID authorities, including the development of the following documents:

- A Student Training Curriculum for Watercraft Inspectors and Decontaminators to Prevent and Contain the Spread of Aquatic Invasive Species in the U.S.A.;
- The Trainer Manual for Aquatic Invasive Species Inspection and Decontamination Courses;
- Model legislative provisions and guidance to promote reciprocity among State watercraft inspection and decontamination programs;
- Model regulation for State watercraft inspection and decontamination programs;
- Key definitions for use in WID programs; and
- Waterbody classification based on monitoring for invasive mussels.

Watercraft Inspection and Decontamination

The transport of watercraft from one waterbody to another has been found to be a significant pathway of ANS. Organisms can attach to boats, become tangled on propellers or boat trailers, or survive within bilge water, ballast tanks, and motors. Introductions of ANS has resulted in displaced native fish populations, decreased water quality, damaged watercraft, and closed public boat ramps. Consequently, ANS can result in the loss of recreational opportunities and negatively impact the quality of boating and other outdoor recreation experiences.

The ANS Task Force and its members have contributed to efforts to reduce spread of ANS via trailered watercraft. For example, advanced training in watercraft inspection and decontamination (WID) continued to be offered in 2016 and 2017 by the Pacific States Marine Fisheries Commission (PSMFC) and was supported by the USFWS and Bonneville Power Administration. This professional training ensures that WID programs across the west are consistent and of high-quality. In 2016 and 2017, the Bureau of Reclamation (Reclamation) awarded contracts to support WID services in the states of Utah and New Mexico as well as expanded interagency agreements with the National Park Service (NPS) and USFWS to support WID programs at the Lake Mead National Recreation Area and Lakes Havasu and Pleasant on the Lower Colorado River.

2016 marked the 10th year of the Lake Champlain Boat Launch Steward Program, coordinated by the Lake Champlain Basin Program. This program is run to collect information from lake visitors in order to conduct risk assessments on launched vessels. Stewards also provide boaters with information about ANS and best management practices to prevent their introduction and spread. In 2016, stewards talked with 25,697 boaters and inspected 10,818 vessels launching and retrieving. Of the vessels surveyed, 16.7% were found to harbor aquatic plants, animals, or detritus, and 7.0% were found to harbor one or more ANS. Similarly, the Tahoe Regional Planning Agency conducted inspections and decontaminations on Lake Tahoe in 2016 and 2017 using funding provided to implement the ANS Task Force-approved Lake Tahoe ANS Management Plan. In 2016, the Tahoe Regional Planning Agency partnered with the Invasive Species Action Network to employ a “Secret Shopper” project to evaluate the Tahoe ANS Prevention WID Program. The results of the project found that the established procedures and protocols are being followed and are effective at keeping Lake Tahoe free from new ANS infestations through the watercraft pathway.

Ballast Water Management

Another significant pathway for the introduction and spread of ANS is the discharge of ballast water from ships. In 2016 and 2017, the U.S. Coast Guard (USCG) continued to work with the Environmental Protection Agency (EPA) to implement both the USCG’s Ballast Water Management regulations and the EPA’s 2013 Vessel General Permit program. In 2016, the EPA drafted a Vessel Ballast Water Management Technical Development Document to assess the current ballast water management practices and costs. The USCG continued its partnership with the Smithsonian Environmental Research Center to run the National Ballast Information Clearinghouse. Each year, approximately 10,000 unique ships report ballast discharges to the Clearinghouse, providing a “big picture” of ballasting operations and trends in and around the United States’ Exclusive Economic Zone.

The Great Lakes Commission convened a regional ballast water workshop to review the status of preventing ANS introduction and spread through ballast water discharge. The workshop provided an opportunity for the Great Lakes and St. Lawrence community – including representatives of Federal, State and Provincial agencies, industry, ports, researchers, environmental groups and other stakeholders – to come together, share information and develop a common base of understanding of contemporary conditions – and associated challenges and opportunities – of ballast water management. The workshop included presentations and discussion on the current regulatory framework, the status of treatment technology, the state of the science, and stakeholder perspectives on ballast water management in the United States and Canada.

Organisms in Trade

Global trade continues to spread ANS into more ecosystems as large numbers of aquatic species are purchased, shipped, and transported every day into the United States and between states through pathways, such as the live bait, aquarium, and water garden trades. Such species represent a significant ANS risk as organisms may escape or be intentionally released by their owners. The USFWS oversees the injurious species provisions of the Lacey Act (Title 18), which makes it unlawful to import into the United States or transport between the enumerated jurisdictions (continental United States, the District of Columbia, Hawaii, the Commonwealth of Puerto Rico, or any possession of the United States) species listed as “injurious wildlife” under the Act. In 2016, the USFWS listed ten freshwater fish and one crayfish as injurious species because of their risk of becoming invasive in ecosystems within the United States. The USFWS also listed 201 species of salamanders as injurious because of the risk they posed of introducing a lethal salamander fungus called *Batrachochytrium salamandrivorans* (Bsal), into the United States. This listing was supported by an [USGS risk assessment](#) that used characteristics of Bsal ecology, spatial data on imports and pet trade establishments, and salamander species diversity to identify high-risk areas with both a high likelihood of introduction and severe consequences for local salamanders.

States across the country have also responded to the risk of organisms in trade by enacting laws that prohibit the sale of ANS and undertaking extensive public education campaigns to reduce the risk of release. State laws and regulations, however, are not consistent across State lines. To address this issue, the MRBP, National Sea Grant Law Center, and National Association of Attorneys General held an interdisciplinary workshop in October 2016. The workshop included representatives from State governments, including State attorney general offices, natural resource agencies, and law enforcement officers and laid the foundation for future discussions of solutions for this ANS threat to the Mississippi River Basin.

In 2016 and 2017, the Great Lakes Commission took steps to address the threat of organisms in trade by developing and deploying the Great Lakes Detector of Invasive Aquatics in Trade (GLDIATR), a web-crawling software designed to find ANS species for sale on the Internet. In the first month after deployment, GLDIATR flagged over 200 unique websites and sellers with 58 different ANS taxa offered for sale. This project continued to be funded by the Great Lakes Restoration Initiative in 2016. The Great Lakes Commission used this funding to refine and expand the use of GLDIATR, including targeting sales of high risk ANS and developing customized user interfaces and reporting for each Great Lakes state and province.

Risk screening is an important management tool to inform the management of ANS risks from the live animal and plant trade. The USFWS developed a risk screening process to evaluate the likelihood of a non-native species colonizing the United States and causing harm to the environment, economy, or human health. By the end of FY 2017, over 100 species had been screened by USFWS for potential ecological risk. These assessments are available to States, industries, and the public to aid in their management of risks associated with ANS. In addition, the USGS has high-level capacity in ANS risk assessment. Models have been developed to predict potential range based on environmental characteristics, predict where a species is likely to appear, and detect large established populations by using remotely sensed imagery to distinguish ANS from the native community. Examples of assessments in 2016 include models for Elodea in Alaska, Argentine black and white tegu lizards in the southeastern United States, and non-native freshwater fishes in South Florida's National Parks. These models and maps are used to design ANS sampling and monitoring plans so that resources can be focused in areas with the highest risk of invasion.

Interbasin Transfer

The USACE operates electric dispersal barriers located in the Chicago Area Waterway System to prevent movement of Asian carp from the Mississippi River Basin to the Great Lakes. In 2017, the Chicago Sanitary Ship Canal Dispersal Barrier project transitioned from Construction to Operation and Maintenance status. The USACE also initiated a study to evaluate options and technologies near the Brandon Road Lock and Dam site in Will County, Illinois, near Joliet, to prevent the upstream transfer of ANS from the Mississippi River Basin into the Great Lakes Basin, while minimizing impacts to existing waterway uses and users.

Early Detection and Rapid Response

Early Detection and Rapid Response (EDRR) 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. EDRR increases the likelihood that localized ANS populations will be found, contained, or eradicated before the species becomes widely established, thereby avoiding the need for costly, long-term control efforts. ANS Task Force members are developing and testing novel approaches, such as molecular-based tools, to enhance early detection and providing fast access to subject matter experts as well as information on taxonomy and control methods. Key EDRR activities that occurred in 2016 and 2017 are highlighted below.

EDRR Spotlight

The Lake Champlain Aquatic Invasive Species Rapid Response Task Force is coordinated by the Lake Champlain Basin Program, an ex-officio member of the ANS Task Force, and is composed of representatives from Federal and State agencies and Provincial organizations with jurisdiction over Lake Champlain Basin waters. Each representative has expertise in ANS and is ready to respond to the new introduction of ANS or the spread of an existing species to a new body of water within the Lake Champlain Basin. The team is trained in Incident Command System (ICS) to allow for an effective and efficient response to new ANS invasions, including holding mock exercises.

In August 2016, a camp counselor discovered Asian clams near the Green Mountain Conservation Camp docks in Lake Bomoseen, Vermont. Asian clams are native to the eastern Mediterranean and temperate areas of Asia and can crowd out native species and increase occurrences of algae blooms. A lake-wide survey conducted by the Vermont Department of Environmental Conservation and the Lake Champlain Basin Program found that the clam population was distributed over an 80-acre area, making eradication from the lake financially and technically challenging. Past eradication responses in nearby Lake George, New York using benthic barrier mats reinforced that while successful management of adults was possible, the difficulty in detecting the microscopic juvenile stage of the clam may limit control options. Rather than pursuing direct control measures, the response recommended by the Lake Champlain Aquatic Invasive Species Rapid Response Task Force focused on containment and spread prevention using an intensified boat launch steward program and watercraft decontamination stations to reduce the risk of spread to other water bodies.

Database Management

Federal agencies continue to advance tools to assist local efforts. For example, 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 and provides information about introduction pathways, geographic distribution, ecology, and the impacts of ANS. In 2016, Android and iPhone apps for the NAS database became available to the public, allowing remote reporting of nonindigenous aquatic species sightings. The USGS also added new features to the database that gives users the ability to develop and customize species maps. The maps and information provided within the NAS database are used for a variety of purposes, including conducting risk assessments, improving sampling design for monitoring of ANS, and predictive modeling of potential ranges and future invasions. The NAS database also identifies new sighting locations and sends alerts to States and other interested parties that allow ANS to be readily recognized and managed. Also in 2016, the NAS database made significant progress in reinstating information on aquatic plants to the website. The USGS published updated species accounts for 19 species of aquatic plants (chosen as species of importance through discussion with the six ANS Task Force Regional Panels), including the addition of over 130,000 specimen records.

Surveillance Tools

The use of eDNA as a surveillance tool is rapidly expanding with a wide range of research projects designed to expand our knowledge of how this approach compares to traditional biological survey methods underway. To facilitate information sharing on this tool, Reclamation held the first Annual eDNA Training and Technical Exchange Workshop in August 2016. This 2-day training covered methods for environmental DNA (eDNA) sample collection, DNA isolation, marker design, testing, and quality metrics as well as a practical session on actual field projects that focused on managing, interpretation, and use of eDNA data for environmental management.

In May 2016, USGS scientists trained conservation officers from Illinois, Michigan, and Ohio to use a portable eDNA detector that USGS developed with private industry to detect invasive bighead and silver carp eDNA from water samples in the field. Conservation officers from Canada and the Wisconsin Department of Natural Resources also attended the training in preparation for potential future use of this technology in their jurisdictions. The portable eDNA detection kit assay can be fitted to detect additional species and improve the sampling method for use in open water applications. In September 2017, the USGS, WDNR, and USFWS field tested the kit to detect round goby in Wisconsin. Law enforcement is currently using this technology to spread awareness about ANS moving through the bait trade; this work will help guide future law enforcement use of this technology.

The USGS has conducted research to improve detection sensitivity, better preserve eDNA samples, understand how eDNA changes over time once it's shed from live organisms, decrease the time between sampling and results, and compare results of eDNA monitoring with those of traditional monitoring techniques (such as snorkeling and identifying larval fishes). Specific research undertaken by the USGS in 2016 and 2017 included developing genetic markers and sampling protocols for Asian carp, Burmese python, rusty crayfish, sunfishes, crayfishes, New Zealand mudsnail, Eurasian watermilfoil, and northern pike. The USGS also continued its research to develop Next-Generation Sequencing, a state of the art genetic tool to detect the presence of ANS in plankton net samples. The USGS developed three sequencers with capability to produce more than 800,000,000 reads in less than 48 hours. In 2016, the USGS invested in the infrastructure needed to store and processes these large data sets. In addition, the EPA's Office of Research and Development's Mid-Continent Ecology Division, in collaboration with the USFWS, developed adaptive early detection survey designs and assessment tools for fish and invertebrates. The EPA is also developed protocols to incorporate DNA and eDNA metabarcoding into early detection monitoring as a taxonomic identification tool.

In 2016, the first detection of dreissenid mussel larvae was documented in Montana. This detection triggered the State of Montana to set up the Montana Mussel Response Incident Command System (ICS). The USGS sent a team of scientists to Montana in late 2016 to provide technical assistance on the biology, detection, ecological impacts, and potential control options for dreissenid mussels as the ICS team developed their response plan. In 2017, Secretary Zinke announced 'Safeguarding the West from Invasive Species', a partnership between the Western Governors Association, Western Tribes and States and the Department of the Interior to identify opportunities for the Federal government to strengthen efforts, in coordination with States and tribes, to address invasive mussels in the Columbia River Basin and across the West. In support of this effort, the USGS evaluated genetic markers for dreissenid mussel early detection and is working to improve eDNA sampling and analysis protocols. Supplementary to this work, the USFWS developed a protocol to verify the presence of invasive mussels by locating their eDNA in water samples. The ability to identify the presence of dreissenid mussels before they become established will help managers develop protocols to ensure that measures are implemented to prevent the transfer of mussels via boats and equipment at the first positive result-effectively preventing further spread.

The USGS also continued to advance the development of other surveillance and management tools to help suppress

populations of Asian carp in the Mississippi River. In 2016, the USGS validated the use of light traps as a method for early detection of Asian carp larvae, assisted with identification of larvae and eggs captured by USGS scientists or other agencies, and conducted several workshops with Federal agencies and their partners on larval Asian carp identification. The USGS also provided the toxicology for piscicides (i.e., fish pesticides) needed for eliminating Asian carp in rapid response scenarios. The USGS began developing selective toxic bait for black carp that could be deployed rapidly if this species is found in areas where they pose a threat to endangered mussels.

Surveillance and Early Detection

Monitoring programs designed to detect new invasions increase the feasibility of eradication by catching infestations early. These programs ultimately protect conservation investments by avoiding long-term control and management costs. As an example, detecting zebra and quagga mussels quickly is essential to prevent further spread and minimize damage to water facility infrastructure and fisheries; accordingly, many ANS Task Force members are engaged in mussel monitoring efforts. In 2016, the USGS released an assessment of boat ramps to aid in developing a monitoring program for Dreissenid mussels in the Columbia River Basin. That same year, the BLM was able to down list the status of dreissenid mussels in Pelican Lake, Utah from inconclusive to not-detected. In 2017, Reclamation increased its monitoring capacity in its Pacific Northwest and Great Plains Regions (staff, materials, equipment) to enhance the extensive monitoring that Reclamation has undertaken since 2007 for quagga and zebra mussels across 17 Western States.

Asian carp monitoring in the Chicago Area Waterway System has intensified since collection of positive eDNA samples and capture of a bighead carp in Lake Calumet in June 2010. The USFWS has actively monitored for Asian carp via netting, electrofishing, eDNA sample collection, and the use of underwater camera technology. This data collection contributed to a large multi-agency dataset that is being used to monitor abundance and trends of native and non-native species. The Mississippi Interstate Cooperative Resource Association (MICRA) also worked with multi-agency partnerships in the Ohio River and Upper Mississippi River Basins to develop and implement annual Monitoring and Response Plans for Asian Carp in the Mississippi River Basin with financial support from the USFWS. In 2016, the USGS deployed a real time telemetry network within a Microsoft SQL Server relational database platform that includes data from the Illinois Department of Natural Resources, the USACE, and the USFWS in the Upper Illinois and Des Plaines Rivers to monitor and detect Asian carp below the electric barrier and prevent movement into the Great Lakes.

In 2016, the Michigan Department of Natural Resources, in collaboration with the Ohio Department of Natural Resources, USGS, and USFWS, initiated the development of an Adaptive Management Framework to control Grass Carp in Lake Erie. To assist states and others conducting surveillance for Grass and Black Carps, the USGS and USFWS developed a protocol for Black Carp collected in North America and for Grass Carp collected where they are not known to be established. Ploidy (fertility) testing was done at a USFWS facility where USGS scientists assess maturity, evidence of spawning and diets, and archive tissue samples for potential future genetic and stable isotopes work including determination of fish origin.

In 2016 and 2017, the USFWS and EPA continued to provide general guidance to Federal, State, and regional partners on the development of a comprehensive program for the detection and monitoring of ANS in the Great Lakes. Consistent with the 2012 amendment to the Great Lakes Water Quality Agreement between Canada and the United States (Annex 6 on Aquatic Invasive Species), this effort is used to develop species watch lists, identify priority areas for surveillance, and provide guidance on implementation of monitoring protocols. The USFWS and EPA provided science-based support to State and regional partners on sampling design for early detection and prepared a draft document offering strategic recommendations for decision makers on development of a surveillance framework to maximize the likelihood of detecting and containing new ANS introductions.

In addition to invasive mussels and Asian carp, ANS Task Force members engaged in monitoring efforts for many other ANS in locations across the Nation. For example, “Fish Slams” are semi-annual events coordinated by the USGS in cooperation with USFWS and the Florida Fish and Wildlife Conservation Commission. During these events in 2016 and 2017, multiple teams of scientists, technicians, and volunteers conducted intensive sampling for non-native fishes in south Florida waterways that have not been routinely monitored. The focus was on detecting new species and documenting the spread of established species. USGS scientists also continued to conduct surveys for introduced smallmouth bass and other warm and cool water fishes in historically cold-water reaches of the Yellowstone River to provide managers with information needed to target rapid response removal efforts.

The USFWS surveyed for New Zealand mud snails at Warm Springs National Fish Hatchery in Washington using eDNA techniques. This pilot project demonstrated the ease with which eDNA may be integrated into an ANS monitoring program at National Fish Hatcheries. The USFWS also worked to conduct a cooperative effort with the Oklahoma Department of Wildlife Conservation to monitor for New Zealand mud snails within Oklahoma’s rivers. To date, the New Zealand mudsnail has not been found within Oklahoma’s State boundaries. Other surveys conducted by the USFWS include nonnative fish species in the Everglades Cooperative Invasive Species

Management Area, fish and plant surveys along the New York State Canal system, and ANS early detection sampling efforts in four Lake Superior “hotspots.”

NOAA Washington Sea Grant, in partnership with the Washington Department of Fish and Wildlife, coordinated a volunteer-based, European green crab early detection program at targeted sites within Washington’s inland marine waters. NOAA Alaska Sea grant conducted a similar citizen-science program that used volunteers to gather data on marine ANS in 22 Alaska communities. In 2016, NOAA also partnered with Occidental College’s Vantuna Research Group to survey non-native fouling assemblages (i.e., accumulation of waterborne organisms on structure surfaces) in bays and harbors throughout Southern California. This effort concluded that ANS are more dominant on overwater structures as compared with native species. The results of this work will be used to illustrate ANS impacts to infrastructure and recommend mitigation measures to reduce the risk of spread.

Surveillance efforts for ANS are often conducted concurrently with routine biological surveys. Although these surveys are primarily intended to monitor status and trends of native and nonnative taxa, identification of a high-risk species may provide valuable information to help guide more formal early detection operations. For example, as part of USGS’s Glen Canyon Dam Adaptive Management Program, researchers conducted routine surveys of fish in the Colorado River from Glen Canyon Dam to Lake Mead. These surveys, conducted in conjunction with Arizona Game and Fish Department and the USFWS, are intended to monitor status and trends of native and nonnative fishes, but also provide a means of early detection of invasive fishes.

Rapid Response Efforts

ANS Task Force members develop rapid response plans and conduct exercises to ensure that they are prepared when new ANS populations are detected. For example in 2016, the Columbia River Basin Team of the 100th Meridian, with participants from the USFWS, NPS, USFS and Wyoming Game and Fish, conducted a rapid response exercise for invasive dreissenid mussels at Grand Teton National Park. This exercise helped refine appropriate jurisdiction, response details, and improve decisions to inform ANS management actions in an emergency situation.

Legal issues have the potential to delay ANS response actions. The MAPAIS worked with the National Sea Grant Law Center, National Association of Attorneys General, and Environmental Law Institute to research State laws regarding undertaking eradication or control efforts on private land or waters. The study revealed that legal authorities to access private land for ANS control without landowner consent varies state by state, particularly with respect to the need for agency approval to access private lands to manage infestations. The research team is using this information to improve strategies to access private land for eradication and control of ANS and to lay a foundation for collaboratively addressing this widespread problem.

The Brown Treesnake Rapid Response Team led by USGS is made up of Guam-based biologists and regional cooperators from the Commonwealth of the Northern Mariana Islands who have specific training in finding and capturing these invasive snakes. The Team was established as a means to determine the credibility of brown treesnake reports on snake-free islands and determine if removal measures are needed. Actions are informed through years of research on biological and ecological characteristics of brown treesnakes as well as functional aspects of the tools employed for EDRR. To date the Brown Treesnake Rapid Response Team has led interagency deployment efforts to islands throughout Micronesia, Hawaii, and the Marianas lasting as little as 2 weeks and as long as 2.5 months, depending on the circumstances of the report, resources available, and statistical confidence desired in making a determination. In January 2016, there was a comprehensive, interagency Brown Treesnake Rapid Response Team deployment to the island of Saipan in response to multiple snake sightings near the international airport. This response was almost 2 months in duration and involved 29 people searching 760 km of transects with over 1500 hours invested. The associated 9 week trapping effort produced over 4,800 trap nights. No brown treesnakes were detected.

In September 2016, the capture of a single silver carp within the Raccoon Creek of Robert C. Byrd Pool of the Ohio River warranted a rapid removal response. The response included the use of acoustic telemetry to locate tagged Silver Carp as well as deployment of approximately 1,650 feet of gillnetting and eight hours of electrofishing by the USFWS and other members of the Ohio River Sub-basin Asian Carp Planning Team. Crews removed four bighead carp, yet no silver carp were found. This response effort shed light on the lack of information on Asian carp distribution within the Robert C. Byrd Pool and the need to immediately increase monitoring efforts within that pool.

Containment and Control

Containment and control of existing ANS populations 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. The ANS Task Force members and regional panels have conducted ecosystem-level approaches to control ANS that include eradication, population suppression, and limiting spread. Key containment and control activities that occurred in 2016 and 2017 are highlighted below.

Control Spotlight

Nutria are invasive, semi-aquatic, South American rodents that were first released into Maryland in 1943. Since their release, nutria have destroyed thousands of acres of wetlands through their destructive feeding habits. Efforts to eradicate nutria in Maryland began in 2002 following a two-year pilot project to determine if nutria could feasibly be eradicated from the Chesapeake Bay and, if they could be, whether or not the nutria-damaged marshlands would recover.

The Chesapeake Bay Nutria Eradication Project is funded largely by the USFWS with operations carried out by the U.S. Department of Agriculture's Wildlife Services. The program is also supported by a coalition of 25 private, local, State, and Federal partners, which is critical to the success of the project. The partners work together to obtain necessary financial and other support needed for project operations.

In the Project's first year, nearly 5,000 nutria were removed. Regular evaluation and development of new control techniques including detection dogs, tagged nutria, detection platforms, and GIS integration allowed removal efforts to expand each year. As of 2016, all known nutria populations have been removed from over a quarter million acres of the Delmarva Peninsula. The Chesapeake Bay Nutria Eradication Project is now approaching the final phase of confirming eradication at the landscape level. This "verification" phase requires staff to revisit previously trapped watersheds multiple times over several years to detect and remove any nutria that were not previously found.

The partnerships formed under the Chesapeake Bay Nutria Eradication Project serve as a model for similar projects in the 16 other states and other countries impacted by nutria. For more information on the Chesapeake Bay Nutria Eradication Project, please visit: <http://www.fws.gov/chesapeakenutriaproject/>.

The ANS Task Force and its members have developed comprehensive ecosystem programs or strategies that encompass multiple regions. For example, NOAA, along with its partners and thousands of volunteers, works to restore coastal, marine, and migratory fish habitat across the nation. As ANS are often a primary stressor on these ecosystems, ANS management is often a component of NOAA's restoration efforts. In 2016, NOAA assisted the University of California, Santa Barbara with removal of the invasive alga, *Sargassum horneri*, at Catalina Island. Efforts involved using citizen divers to eradicate the algae from several plots, monitor changes in the habitat, and perform outreach on ANS throughout the Los Angeles area.

Since 2010, the Great Lakes Restoration Initiative (GLRI) has funded over 300 invasive species projects, with the majority of these being control and containment activities. ANS Task Force members and their partners have implemented control measures in several locations, including efforts to control red swamp crayfish in Wisconsin, grass carp in Michigan, Hydrilla (an aquatic weed) in New York, and silver and bighead carp in the Chicago Area Waterway System. The USACE used GLRI funds to complete construction of sea lamprey barriers and traps in the Great Lakes Basin and remove invasive wetland and riparian plant species from five EPA-designated Areas of Concern (AOCs) located in New York, Ohio, Illinois, and Michigan. Great Lakes Restoration Initiative funds also supported a demonstration project for the USACE to eradicate Hydrilla from the Erie Canal, New York. 2016 marked the third year of this effort, which thus far has reduced Hydrilla by 90%. In 2016, the USACE addressed floating aquatic plant problems (e.g., Water Hyacinth, Water Lettuce, and Water Primrose) in Florida and Louisiana.

In 2006, the USFWS removed Beckett's water trumpet from priority areas in the San Marcos River and

replanted native plant species. Annual monitoring has been conducted to ensure that the species does not become re-established. 2016 was the fourth year that the plant was not detected, indicating that this effort to remove ANS from endangered Texas wild rice habitat appears to have succeeded. The USFWS also collaborated with Reclamation, U.S. Department of Agriculture, and Palo Verde Irrigation District to eradicate giant salvinia in the Lower Colorado River. During this project, field crews perfected a spraying technique that targets giant salvinia, resulting in this plant being 90% contained within targeted areas.

In Washington, the USFWS continued a major multi-partners effort to conduct Elodea surveys and removals on a 54 mile stretch of the Chehalis River. Efforts to eradicate and prevent the spread of Elodea were also conducted by USFWS in collaboration with local and state agencies in Alaska. In 2015, several Alaskan lakes around Anchorage Bowl and the Kenai Peninsula that are significant seaplane hubs for commercial and recreational travel were treated with an herbicide to eradicate the invasive plant and restore native habitat. In 2016, post-treatment monitoring and additional early detection survey efforts were conducted to determine the need for additional treatments. In 2017, year one of a multi-year herbicidal treatment plan began in a small tributary of the Yukon River Basin near the city of Fairbanks in Interior Alaska.

In 2016, The NEANS Panel partnered with the Connecticut River Watershed Council to conduct a community effort to remove water chestnut from southern New Hampshire and Vermont waters. The USFWS also conducted control efforts for water chestnut, focusing efforts on Tonawanda Creek and the western Erie Canal, along with water hyacinth and water lettuce on the Lower Colorado River. All detected colonies and individual plants were removed.

The Lake Champlain Basin Program is one of many partner organizations that contribute to the survey and control of water chestnut populations in Lake Champlain and the surrounding watershed. In 2016, water chestnut was removed from 77 sites within the Basin. Similarly, in the Mid-Atlantic, the Chesapeake Bay Program and Maryland Department of Natural Resources has controlled water chestnut population on the Bird and Sassafras Rivers. This work has been conducted with the help of volunteers for the last several years, avoiding the need for chemical control. Water chestnut seeds can remain viable in sediments for up to 12 years, requiring follow-up surveys each year to ensure that the Bird and Sassafras rivers remain free from this floating aquatic invader.

One of the longest-running and most effective invasive control technology programs is the Sea Lamprey Control Program, implemented by the USFWS, acting as an agent through the Great Lakes Fishery Commission. The Program uses an integrated pest management approach to target and suppress sea lamprey populations, which supports restoration of the Great Lakes multi-billion dollar fisheries industry. In December 2015, the EPA registered a sea lamprey mating pheromone, 3kPZS, as the first vertebrate pheromone biopesticide. This registration opened the door to use the pheromone in the Sea Lamprey Control Program. The USGS continued to study biology and physiology of sea lamprey to better understand how best to use sea lamprey pheromones to improve control. In addition, USGS studies released in 2017 showed that light and electricity can be used to increase the efficiency of sea lamprey traps, thereby improving removal of adult lamprey.

The NPS began a three-year project to eradicate non-native trout from twelve high-priority lakes in Northern California in 2016. Using knowledge gained from a decade of restoration work, non-native fish are being eradicated at a larger scale than previously thought possible, maximizing the benefits of restoration.

The BLM and USGS worked with State partners in Arizona to remove invasive American bullfrog populations and measure the response of native amphibians and reptiles to this eradication. The USGS used phylogeographic and population genetic approaches to reconstruct the invasion history of American bullfrog into Montana to provide guidance on resource allocation for management. USGS researchers evaluated the potential for American bullfrog to invade and establish in waters of Grand Teton National Park and Yellowstone River and conducted surveys to map their spread and describe their impacts in waters that were already invaded in this region.

Research

Research supports all facets of ANS management and is needed to quantify and clarify the effects that ANS are having on native species and habitats along with socio-economics and human health. Increased knowledge of the biology, environmental and economic impacts, and associated control methods allow for the most effective management of ANS. Accordingly, ANS Task Force members conduct research to provide information on early detection and assessment of newly established invaders; aid monitoring efforts; improve understanding of the ecology of invaders and factors in resistance of habitats to invasion; develop and test prevention and control alternatives; and develop and assess approaches for restoring disturbed habitats after administering control actions. Key research activities that occurred in 2016 and 2017 are highlighted below, with a focus on research areas that have been identified as high priority by the ANS Task Force.

Research Spotlight

For small, rare, secretive, and other species that are difficult to detect, eDNA provides an attractive tool for aquatic inventory and monitoring programs. Recent studies have demonstrated improved species detection and catch-per-unit effort, an indirect measure of the abundance of a target species, from eDNA when compared with electrofishing, snorkeling, and other traditional field methods. Thus, detection of species using eDNA may improve biodiversity assessments and provide information about status, distribution, and habitat requirements for lesser-known species or for newly established ANS populations.

ANS detection using eDNA techniques has become an important surveillance method, but often requires specialized laboratories and equipment. To address this obstacle, the USGS, in partnership with the Lucigen Corporation and with funding from the Great Lakes Restoration Initiative, began an evaluation in 2016 of a loop-mediated isothermal amplification (LAMP) method that, when used with a portable hand-held kit, detects eDNA from water samples in as little as one hour. If successful, the LAMP method will allow field staff to test for eDNA in the field, significantly decreasing the training and the time needed to obtain results. Rapid detections will allow managers to make timely decisions to prevent, contain, and control ANS. Future efforts will continue evaluation of the LAMP method and kit under field conditions and develop procedures and information needed to allow conservation officers and law enforcement agencies to use the kit to prevent illegal transport of ANS.

ANS Research Programs

ANS Task Force members conduct research on high-priority and emerging ANS issues across the country. For example, USGS scientists test and develop methods to better detect ANS, determine their likelihood of spread and impact, track their distribution, and refine methods to contain and control ANS. In 2016 and 2017, the USGS focused their ANS research on advance technologies, such as remote sensing and genetics, and developing species-specific detection and control tools, with a specific focus on Asian carp, sea lamprey, and invasive snakes.

The Aquatic Nuisance Species Research Program is the primary research and development program within USACE to address ANS that impact navigable waters, infrastructure, and associated water resources. Under this program, the USACE developed new methods in 2016 and 2017 for prevention, detection, monitoring and control of ANS, and disseminates this information to USACE field offices and other applicable parties.

The MAPAIS conducts an annual grant competition to fund on-the-ground activities addressing the regional panel's mission and regional priorities. Since 2007, the Panel has awarded \$327,184 in project funding, which has leveraged over half a million dollars in partner funds. In 2016, the MAPAIS selected three new projects for funding. The first project supported the start-up of a pilot boat launch steward program at the 13 Pennsylvania boat launches on Pymatuning Reservoir. As a result of this effort, ANS were removed from 148 boats in 2016. The second project focused on use of eDNA to detect the emergent infectious pathogens in amphibian populations. This project is designed to teach eDNA collection techniques to environmental educators, citizen scientists, and government agencies, and then to evaluate their effectiveness in detecting amphibian disease outbreaks. Finally, MAPAIS supported a project in 2016 that evaluated the economics of the commercial movement of bloodworms. This project found that alternative packaging for bloodworms would solve the problem of transferring ANS through the bloodworm trade, and the economic costs associated with such a change would be minimal.

The USFWS, Gulf States Marine Fisheries Commission (GSMFC), and GSARP continued to collaborate on a small grant program that facilitates research for priority species or areas in the Gulf and South Atlantic region. In 2016, fifteen projects were funded through this program totaling \$350,000. Funding projects were diverse in scope and included developing control strategies for lionfish, *Hydrilla*, apple snails, and giant salvinia; monitoring for didymo, Asian carp, and Malaysian trumpet snail; and quantifying potential impacts from Asian carp in the Southern states.

Asian Carp

A growing number of technologies are currently under development or have been proposed for use in controlling populations and preventing additional spread of Asian carp. This report summarizes key efforts by ANS Task Force members; greater details can be found in the ACRCC's 2016 Asian Carp Action Plan (<http://asiancarp.us/documents/2016AsianCarpActionPlan.pdf>), 2016 Monitoring and Response Plan (<http://asiancarp.us/documents/MRP2016.pdf>), and the 2016 Annual Report to Congress (<http://www.asiancarp.us/Documents/WRRDA2016.pdf>).

The USGS developed and evaluated deterrent tools such as carbon dioxide, complex sound barriers, and new toxicants that could be used to suppress propagule pressure of Asian carp. Laboratory and pond trials demonstrated that both silver carp and bighead carp consistently respond to complex sounds and avoid areas with elevated carbon dioxide levels. These techniques may act as a barrier to keep fish from moving into new areas. During the winter of 2016, the USGS completed an under-ice lethal control study using carbon dioxide and demonstrated 100% mortality of bighead and silver carp. In 2017, a field trial of carbon dioxide to limit the spread of bighead and silver carps was conducted at the Emiquon Nature Preserve in Lewiston, Illinois. The method worked well at low water velocities but was ineffective at higher velocities. Also in 2017, the USGS completed a behavioral gradient study using carbon dioxide to determine concentrations at which bighead and silver carp avoid carbon dioxide and scientists worked with engineers at the University of Wisconsin-Platteville to design three carbon dioxide injection systems capable of achieving the desired concentration.

In 2016 and 2017, USGS scientists completed numerous laboratory and pond experiments to develop underwater sound as a tool to control Asian carp movement. Trials were conducted to determine optimal levels of sound for field use. In collaboration with the University of Minnesota-Duluth, the USGS determined the potential for Asian carp to habituate to the sound and the appropriate configuration of speakers for optimal sound coverage. The USGS also developed a chemical structure-activity relationship database to streamline the discovery and evaluation of potential new selective toxicants for controlling Asian carp. USGS scientists are using the database in bioassay trials to evaluate the toxicity of the most promising chemicals. In 2017, the USGS conducted field trials with non-lethal microparticles at Arrow Rock State Historic Site in Arrow Rock, Missouri. The trials concluded that approximately 90% of bigheaded carps would have consumed a lethal dose. The USGS is planning additional field trials of toxic microparticles.

To improve bioenergetics models for use in Asian carp risk assessments, the USGS assessed the adequacy of food resources for Bighead and Silver Carp to survive in Lakes Erie and Michigan. The USGS also developed a simulation model that incorporates hydrologic and biological data to predict which tributaries are suitable for Asian carp spawning and the likelihood of egg survival (called FluEgg). The model has been used in the Great Lakes and Ohio River Basins and could be applied in rivers across the nation and to other invasive fish. In 2016, the USGS also assessed vegetation communities throughout Lake Erie to identify potential areas where grass carp might have negative effects and as an indicator of grass carp herbivory.

The USACE instituted revised dam gate operations at Locks and Dams 5 and 8 on the Upper Mississippi River to make it more difficult for Asian carp to penetrate weak areas (slower water velocities) in the dam flows. In addition, the USACE partnered with the University of Minnesota Aquatic Invasive Species Research Center to assess the efficacy of the electric barriers at Lock and Dams 2, 5, and 8 and improve their effectiveness. At Lock 19 near Keokuk, Iowa, the USFWS used sonar imagery to examine fish use and provide information necessary for development of an effective deterrent at this site.

The USFWS developed three trawling methods to target Asian carp: an electrified butterfly frame trawl (paupier), a surface trawl, and an electrified push frame trawl (dozer trawl). To determine if these gears are more effective than standard boat electrofishing, the four sampling techniques were simultaneously deployed in Illinois River backwaters, tributaries, and side channels from June through October 2016. All techniques successfully sampled silver carp with certain gears demonstrating higher success at sampling a wider range of size classes. These results will be used to help inform new sampling strategies and achieve a higher confidence in sampling efficiency and probability of Asian carp detection.

Together with university partners, NOAA's Great Lakes Environmental Research Laboratory is also conducting research to inform risk assessments of Asian carp. Data collected by the laboratory's Long Term Research Program are used as inputs to computer simulation models to predict where Asian carp would establish if they are introduced to the Great Lakes and project effects of carp on Great Lakes food webs. Model results are also used by economists to predict bioeconomic impacts of ANS in the Great Lakes.

Other Invasive Fishes

Reduction of the common carp population in Lake Malheur, Oregon is needed to improve ecosystem health and recover degraded habitat for wildlife. To manage this ANS, the USFWS conducted experiments in 2016 and 2017

to determine the threshold biomass for common carp in order to suppress their populations and allow habitats to recover. The USFWS also conducted a study to determine the electrofishing waveforms and voltages needed to destroy common carp embryos.

In 2016 and 2017, USGS researchers continued to study sea lamprey pheromones and alarm cues that could be used to: (1) attract sea lamprey to unsuitable spawning habitat or areas that can be treated with lampricides; and (2) deter sea lamprey from entering areas that have optimal spawning habitat or are difficult to treat with lampricides. This work resulted in published studies that assessed aspects of pheromonal control of sea lamprey behavior as a control tool.

NOAA developed a curtain trap that will capture invasive lionfish while avoiding by-catch if the trap is lost. If the concept proves effective during testing, the traps will be made publically available. If applied widely, the traps could both reduce lionfish abundance and create opportunities for fishermen to produce income through capture and sales to the seafood market.

In the Northwestern region, the impact of nonnative game fishes on endangered salmonids is currently unknown. To help fill this knowledge gap, NOAA developed eDNA sampling methods in Lake Washington to identify the spatial distribution and habitat use of walleye, an illegally introduced predator of endangered salmon species. NOAA also examined the history of fish stocking in the western United States with specific interest in how State agencies have changed stocking of predatory gamefish as a result of Endangered Species Act (ESA) listings.

Dreissenid Mussels

The USGS has an active Dreissenid mussel program with ongoing research to: (1) develop water-temperature dependent molluscicide toxicity data to support EDRR actions and eradicate localized zebra mussel infestations; (2) evaluate the use of uncontained open-water chemical applications for dreissenid mussel control; (3) evaluate the use of carbon dioxide as a dreissenid control tool; (4) develop dreissenid cell lines for toxicant screening; and (5) develop and evaluate toxicant incorporated microparticles for dreissenid mussel control. In 2016, the USGS conducted a workshop to prioritize short- and long-term goals for USGS Dreissenid research. In 2017, the USGS conducted an open-water field trial of Zequanox (a dreissenid toxicant recently registered for open-water use by the EPA) in Round Lake, Michigan. The lake will be monitored for 2 years post-treatment to assess ecosystem impacts.

Potassium chloride is an accepted treatment for zebra and quagga mussels; lethal concentration tests have been conducted on several warm and coldwater fish species. However, no information is available for endangered fish species found in the Colorado River Basin. In 2016, the USFWS conducted acute toxicity tests for the bonytail chub, humpback chub, razorback sucker, and Colorado pike minnow. These data provided baseline potassium chloride tolerance levels that can be used by resource managers to develop invasive mussel management protocols that will minimally impact endangered native fish species.

To reduce the risk of zebra mussel veligers being transported and released into the wild with stocked fish, the MRBP funded an evaluation of the effectiveness of a potassium chloride and formalin treatment, known as the Edwards protocol, currently used to kill zebra mussel veligers when hauling fish to stocking locations. The research project determined that veliger life stage, temperature, and water conductivity are all important variables to consider when using the Edwards protocol and identified specific parameters for achieving successful risk reduction to kill zebra mussel veligers when hauling fish to stocking locations.

Plant Control

In FY 2016, USACE supported 20 projects in five general focus areas (biological control, chemical control, ecological assessment, management strategies and applications, and harmful algal blooms) and two ongoing field demonstration projects. In FY 2017, the USACE focused on development and evaluation of chemical and biological control strategies for flowering rush, Hydrilla, common reed, giant salvinia, water primrose, and crested flowering heart. The program also funded key research for characterizing the invasion ecology and genetics of hybrid watermilfoils, investigating management options for starry stonewort, and identifying the feasibility of small regulatory ribonucleic acids for controlling harmful algal blooms. In collaboration with State and Federal partners, USACE also supported a field-scale demonstration of management techniques developed from previous research for controlling/eradicating monoecious Hydrilla infestations in the Erie Canal.

The USGS worked with State, academic, and other partners to develop gene silencing and microbial control tools for Phragmites at the landscape scale in the Great Lakes region. The goal of the genetic approach is to develop a species-specific control option for managers, that could be useful in sensitive areas or areas where conventional control efforts are not practical. The USGS also continued to work with partners to determine whether altering microbial communities associated with Phragmites could be an effective tool for widespread control.

Ballast Water Management

The EPA's National Exposure Laboratory led an effort to use High Throughput Sequencing that: 1) assessed the biodiversity present in ballast water entering three major ports within the United States; and 2) helped to better understand changes in ballast water-borne biodiversity associated with management practices, specifically ballast water exchange and UV treatment. These efforts explored the utility of nucleic acids based tools for understanding the risk of invasions posed by ballast water. Such tools can be employed to identify the factors driving the accumulation of non-native biodiversity via ballast water transport, and to examine the efficacy of management practices.

In 2016, the U.S. Department of Transportation, Maritime Administration (MARAD) tested instruments used to estimate biomass in ballast water discharge. The results from this research will be used to improve compliance monitoring for ballast water management systems.

In 2016, the USGS published a study that assessed the efficacy and residual toxicity of a sodium hydroxide-based ballast water treatment system using 1,000 liter mesocosms containing water from the Great Lakes carrier M/V American Spiritin's ballast tanks. The high efficacy and low residual toxicity observed indicates that a sodium hydroxide-based ballast water treatment system has great potential for successfully treating large volumes of ballast water released into freshwater systems.

Ecological Patterns

In 2016 and 2017, The EPA conducted a project to understand patterns of aquatic invasions at broad geospatial scales by exploring the importance of environmental and anthropogenic drivers in determining the spread of aquatic invasions. As a result, EPA researchers published an analysis demonstrating strong correlations between recreational freshwater fishing demand and ANS richness across the continental United States, confirming the important role of this driver even at broad spatial scales. In coordination with the USGS's Non-indigenous Aquatic Species Program, the EPA also published analyses describing spatio-temporal patterns of ANS across the United States. These data have been employed to identify clusters of watersheds that exhibit both elevated stress from accumulated ANS richness and unusually high concentrations of threatened, endangered, and rare aquatic animal species, providing methods that could be used to guide prioritization of conservation effort at a national scale.

In 2016, the USGS conducted the Great Lakes Regional Aquatic Gap Analysis Project to characterize all river and open water habitats in the Great Lakes region and identify where appropriate habitat for ANS may exist. These models can help predict which habitats may be invaded by those species if access is provided or conditions change in those species' favor.

Emerging Issues

The USGS conducts research on high-priority and emerging ANS across the country as part of its Invasive Species Program. In 2016, the USGS began evaluating Clustered Regularly Interspaced Short Palindromic Repeats (CRISPR) as a tool to edit genomes and create gene drives for control of ANS.

Education and Outreach

The lack of public awareness and the public's willingness to practice prevention behaviors remains one of the largest management obstacles to stopping the introduction and spread of ANS. Many ANS have been introduced through the actions of uninformed people, agencies, and industry; for example, disposing of live bait into a waterbody, launching an ANS-infested boat, releasing a pet into the environment, or stocking a private pond without prior approval, can lead to the introduction of ANS. These pathways 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. ANS Task Force Federal and ex-officio members, regional panels, States, Tribes, and other entities have created a wide variety of public education materials for distribution across the country including workshops, exhibits, pamphlets, information sheets, wallet identification cards, videos, websites, and traveling displays. Key education and outreach activities that occurred in 2016 and 2017 are highlighted below.

Education and Outreach Spotlight

Recreational activities such as boating, angling, waterfowl hunting, and scuba diving may spread ANS. Some aquatic species can attach to boats, while others can become tangled on propellers, anchor lines, or boat trailers. Many species can survive in bilge water, ballast tanks, and motors or hide in dirt or sand that clings to nets, buckets, anchors, and waders. In response to this threat, the ANS Task Force launched the “Stop Aquatic Hitchhikers!” national education campaign in 2002.

The “Stop Aquatic Hitchhikers!” campaign capitalizes on proven strategies and prevention messages. It promotes strong, concise, consistent, and appealing messages to engage boaters, anglers, and other recreationalists in understanding the threat of ANS. The goals of the campaign are to raise awareness, change behaviors, and build community capacity to stop the spread of ANS across the United States and beyond.

Research has shown that 97 percent of boaters and anglers are willing to take action to prevent the spread of ANS after they were exposed to “Stop Aquatic Hitchhikers!” and its “Clean, Drain, Dry” prevention message. Of those that have not seen the campaign’s logo, 9 of 10 respondents knew what it meant. This is the mark of an effective brand.

In 2016, the ANS Task Force’s Communications, Education, and Outreach Committee, working in concert with the USFWS, refreshed the campaign by creating a new website, updating the tag lines, and creating new co-branding capabilities. Currently, there is a network of over 1,400 campaign partners across the country that includes Federal, State, Tribe, and local agencies, colleges and universities, municipalities, townships, watershed districts, K – 12 school groups, businesses, media, non-profits, fishing tournaments, clubs and other organizations.

For more information, please visit: <http://stopaquatichitchhikers.org>

ANS Task Force Member Education and Outreach Efforts

ANS Task Force members and regional panels have created a wide variety of public education materials for distribution across the country. For example, the USACE Invasive Species Leadership Team completed several education and outreach projects including an invasive species video, an invasive species “Traveling Trunk” for use at USACE visitor centers and project offices nationwide, and a webinar series on a variety of invasive species topics.

The USFS partnered with several non-profit organizations and aquariums to provide education on pathways that spread ANS. The BLM participated in many outreach and education opportunities for ANS including providing ANS pocket guides at fishing events, participation at environmental education events, and developing and disseminating ANS advertisements publications that target anglers. The National Marine Manufacturers Association included information on ANS and recommended actions to prevent their spread in materials included with watercraft trailer sales. The National Marine Manufacturers Association also continued to add ANS information on the “Discover Boating” website to educate new and existing boaters

Similar to the USACE effort, the GSARP utilized an educational outreach “Trunk” to inform the public about the impacts associated with ANS. It was used by State and Federal agencies, conservation and environmental groups, and secondary level educators. The trunk consisted of a manual of talking points, a PowerPoint presentation, and profiles and hands-on specimens for five invasive plant species and nine animal species. The GSARP also established a clearinghouse of regional outreach materials to reduce duplication of effort by allowing existing materials to be customized to meet the needs of a particular State while generating a unified message about invasive species in the region.

The MRBP refurbished a Whac-A-Mussel arcade game and began shipping it to various outreach events. The game was used to draw people to ANS exhibits and educate them about zebra mussels and other ANS. The NEANS Panel distributed floating key chains with the “Stop Aquatic Hitchhikers!” message to boat owners and other recreational users. Each keychain included a Quick Response code, which directs individuals to the Panel website and invites them to take a voluntary survey to evaluate user awareness of ANS spread prevention measures for recreational watercraft and equipment.

The MAPAIS supported efforts to develop a comprehensive ANS hands-on toolkit that teachers and other educators can use to deliver classroom lessons and exercises. The material within the toolkit meets State Standards of Learning, targets a wide range of age groups, and motivates students to take action in their communities. The toolkits were distributed to appropriate agencies in all Mid-Atlantic States and made available to educators. In 2016, the MAPAIS also expanded the previously-funded Pennsylvania Field Guide to Aquatic Invasive Species to include all Mid-Atlantic States. The Mid-Atlantic Field Guide to Aquatic Invasive Species was designed to aid science professionals and other interested individuals in ANS early detection and reporting. The guide also highlights significant vectors of ANS spread and describes reasonable preventative actions.

To keep unwanted pets from becoming the next invasive species in local waters, the USFWS partnered with the Invasive Species Action Network in 2016 to develop a “Don’t Let it Loose” webpage that provides targeted outreach to small, independent pet stores in Montana. This project also established a mechanism for returning unwanted pets to stores, thereby decreasing the likelihood that hobbyists will release unwanted pets to the environment. The project was met with such success that it is being expanded into North Dakota, South Dakota, Wyoming, Washington, Oregon, New Mexico, Idaho and Hawaii.

Conclusion

This report is transmitted to fulfill the requirements of Section 1202(k)(2) of the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990, as amended by National Invasive Species Act of 1996. The report highlights the collective activities of the ANS Task Force members and demonstrates the success of the ANS Task Force in working collaboratively on regional, national, and international scales to fulfill its mission to develop and implement a program for waters of the United States to combat ANS.

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 across the nation’s landscape. 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.

We invite you to participate in ANS Task Force meetings, committee meetings, and regional panel meetings to learn more about ANS Task Force activities.

For additional information on the ANS Task Force:

ANS Task Force website: <https://www.anstaskforce.gov/default.php>

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