A Report to the Aquatic Nuisance Species Task Force for 2013

The mission of the Mid-Atlantic Panel (MAP) is to assist state and federal agencies and other stakeholders in developing and implementing strategic, coordinated, and action-oriented approaches for the prevention and control of aquatic invasive species (AIS) in the mid-Atlantic region. The driving force behind the Panel's mission is to strengthen cooperation, coordination, and communication on AIS issues within the region and beyond.

The Panel met two times in 2013. The spring meeting was held June 5, 2013 in Harrisburg, Pennsylvania. Tim Schaeffer, Pennsylvania Fish and Boat Commission, updated the Panel on the issue of Asian carp outside the Great Lakes. Kierstin Carlson and Amy Stauffer, Western Pennsylvania Conservancy, presented an overview of the iMap Invasives project in Pennsylvania. Robert Morgan, Pennsylvania Fish and Boat Commission, provided information on didymo. Sara Grisé, Pennsylvania Sea Grant, updated the Panel on the *Pennsylvania Field Guide to Aquatic Invasive Species*, a project that was supported in part with MAP funding.

The fall meeting was held December 17-18, 2013 in Annapolis, Maryland. Robert Morgan, Pennsylvania Fish and Boat Commission, provided an overview of the discovery of New Zealand mudsnails in Spring Creek, State College, Pennsylvania. Marc Imlay, Mid Atlantic Invasive Plant Council, asked for Panel input and review on examples of biological control species. Bruce Vogt, National Oceanic Atmospheric Administration, presented information on blue catfish in the Mid Atlantic region. Jonathan McKnight, Maryland Department of Natural Resources, updated the Panel on a risk analysis review recently conducted on live Barramundi sales in Maryland. Pat Conzemius, Wildlife Forever, let the Panel know about Stop Aquatic Hitchhiker outreach materials available for boaters, anglers, and other recreational water users. Fredrika Moser, Maryland Sea Grant, provided an update on the bait vector project.

Small Grants Competition

The Panel has conducted an annual grants competition to fund on-the-ground activities addressing MAP's mission and regional priorities. Since 2007, the Panel has awarded over a quarter million dollars in project funding, and has leveraged over half a million dollars in partner funds (Attachment 1).

The MAP funding priorities for the 2013 small grants competition included the following:

1) **Identify and evaluate AIS educational efforts (general public and in schools) in the U.S. and in other countries**

Through increased travel and world trade, the number of AIS introductions continues to increase year by year, and public awareness of the impact from those species is little more than 2%.[1] There have been many AIS educational programs developed to tackle this topic, but relatively few studies to evaluate the effectiveness of such campaigns and develop best practices or recommendations for educational efforts. What successful public educational/awareness efforts are underway in other parts of the world? Has their effectiveness been demonstrated and how? Could they be piloted in the mid-Atlantic region to strengthen public awareness and support to slow AIS introductions?

2) Develop educational materials for K-12 classroom education

Control and prevention of AIS requires a major change in human behavior surrounding non-native aquatic species. Mainstreaming AIS education into K-12 classrooms ensures children will learn responsible prevention early in life, and spread this knowledge to their communities. Environmental education in AIS is also a subject that encourages the place-based, problem-solving, field activities that are so important to K-12 education. MAP is interested in the development and implementation of lesson plans, textbook chapters, teacher development training, and other educational materials that reflect the standards set by the States and will broadly reach K-12 students in the mid-Atlantic.

3) Develop and distribute social marketing products to educate the general public

The MAP would like to support the development of creative, innovative, and effective social marketing products for AIS prevention and control in the mid-Atlantic. The MAP is especially interested in coupling these products with an evaluation of their effectiveness in educating and changing the behavior of the public.

4) Build on current regional efforts in early detection and rapid response (EDRR)

In early 2009, MAP and Maryland Sea Grant completed a regional rapid response plan with funding from the National Oceanic and Atmospheric Administration. The plan emphasizes an Incident Command System approach to help initiate a synchronized response in the event of a new invasion in a state or watershed in the mid-Atlantic region. For more information visit: http://www.mdsg.umd.edu/images/uploads/siteimages/invasive_species/6_Stopping_the_spread.pdf. Proposals are encouraged that further expand activities to strengthen EDRR efforts.

5) Continue to develop vector management strategies for states and the region

In late 2009, MAP co-sponsored a workshop with Maryland Sea Grant on vector management as a mechanism to prevent introductions of invasive species. Recommendations from the workshop included improving management of ship fouling and live bait as well as addressing other ship and live trade pathways (http://www.mdsg.umd.edu/issues/restoration/non-natives/workshop09/). Proposals are encouraged that develop mechanisms for states and the region to pursue vector management options.

6) Encourage states to develop and implement AIS management plans

The MAP recognizes that state management plans can provide a catalyst for state and federal funding and resources. There is continued interest in funding proposals contributing to plan development and implementation.

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1 Helmholrz Centre For Environmental Research – UFZ (2009). Invasive Species: Will Europe At Last Unite To Combat Thousands of Alien Invaders? http://www.sciencedaily.com

The Panel funded the following three proposals in 2013:

1) "Environmental DNA monitoring of the invasive freshwater diatom, *Didymosphenia geminate*, in Mid-Atlantic waters" Project Leads: Stephen Keller and Robert H. Hilderbrand, University of Maryland Center for Environmental Science (UMCES)

- Summary: This project will use genetic monitoring on environmental DNA samples to establish a robust monitoring network for the highly invasive freshwater diatom, *Didymosphenia geminata* (aka, "Didymo"). Our project will establish a baseline inventory of Didymo presence and abundance in headwater streams throughout the Chesapeake Bay watershed, in partnership with the Maryland Biological Stream Survey and the National Park Service. Our results will estimate the geographic extent of Didymo invasion and its abundance within Maryland to test: (1) Does Didymo increase along gradients of land use, water quality, or biotic integrity? (2) Does Didymo consist of a single invasive strain, or are multiple strains present to allow identification of local invasion sources into new sites? We view this effort as proof of principle to establish a firm foundation for genetic monitoring of Didymo in the Mid-Atlantic, with future plans to expand inventory and monitoring in coordination with additional federal and state partners.

2) "Bushkill Township Invasive Species Management Project" Project Leads: Jason E. Smith, Hanover Engineering Associates, Inc.

- Summary: The Bushkill Township Invasive Species Management Project includes three primary components, including: 1) Invasive Species Identification and Mapping – Lafayette College, through the Department of Geology, will provide dedicated students and staff expertise to assist in the Bushkill Township Invasive Species Management Project. Summer research students will identify and map invasive species infestations throughout Bushkill Township, targeting purple loosestrife, common reed, and Japanese knotweed along roadways, public lands, and private lands wherever visible or accessible. Other invasive species encountered during the field identification and cataloging process may be added to the database and mapping, 2) Action Plan for Invasive Species Treatment – Hanover Engineering will prepare an Action Plan that is specific to the problematic wetland and riparian aquatic invasive species in Bushkill Township. This plan will include specific information intended to educate the various stakeholders (e.g. residents/landowners, Township, businesses, etc.) on the plant species, detailed treatment requirements/alternatives, regulatory requirements, and ongoing mapping and data cataloging, 3) Social Media and Application Development – Hanover Engineering will prepare a web-based GIS application for invasive plant species. The base data for this application is to be provided by Lafayette College. Once Hanover Engineering acquires these data, the GIS department will build a custom web-based application educating the public about invasive plant species in their immediate area and allowing users to report new locations and track their advance over time. The invasive species mapping, Action Plan, and other related materials will all be included on the Bushkill Township website. An article will be included in the Township's newsletter explaining the project and program, and will direct readers to the website and web-based GIS application.

3) "Invasive Species: From the Hudson River to your Classroom**",** Project Leads: Alan Berkowitz and Cornelia Harris, Cary Institute of Ecosystem Studies

- Summary: This project proposes to develop, implement, and evaluate a hybrid learning course for educators on aquatic invasive species. The graduate-level course will help educators, who in turn will reach more than 4,000 students a year, to understand the ecology, impact, and management issues surrounding aquatic invasive species through a blend of online, field, and traditional classroom methods. Research shows that a short, one-time professional development experience does little to impact teaching or learning, so this 10-week course will offer a sustained and in-depth opportunity for educators to engage with the ecology, impact, and management of aquatic invasive species. Through the initial course offering, we will reach upwards of 4,000 students, who will become messengers in their broader communities. In the future, we will be able to offer this course to other educators interested in aquatic invasive species. Finally, we and others at the Cary Institute of Ecosystem Studies will be able to use some of the course materials for our public outreach programs.

The projects listed below were funded by the Panel in 2012, and work continued in 2013. Progress reports for these grants are attached. In addition to these projects, the Panel provided money the Invasive Species Action Network to support the International Didymo Conference, which held in March 2013. A final report on the conference is attached.

a) Development of a Strategic Plan for Eradicating Established Nutria Populations in VA and NC. Project Leads and Co-Participants: Scott Klopfer and Michael St. Germain, Conservation Management Institute Virginia Tech, David Bishop, US Fish and Wildlife Service, Mike Fies, VA Department of Game and Inland Fisheries, Scott Barras and Todd Menke, US Department of Agriculture Wildlife Services, Colleen Olfenbuttel, NC Wildlife Resources Division

- Summary: The nutria (*Myocastor coypus*), or coypu, is listed as a nuisance species in Virginia and North Carolina. Recently these states have been coordinating efforts to control and manage nutria populations. Nutria eradication is difficult, but recent successes in the Chesapeake Bay have demonstrated that nutria populations can be eradicated. Successful control requires the development of a strategic plan that can address both logistical and technical aspects of eradication. Further, a plan that provides a well-conceived and efficient strategy will increase the likelihood of receiving the substantial funding that would be required for successful eradication. This project will develop a strategic plan for eradicating nutria through collaboration among natural resource management agency stakeholders and the application of knowledge gained from the ongoing Chesapeake Bay Nutria Eradication Program. This plan will provide specific details on actions, resources required, and procedures for controlling nutria in these areas.

b) Development of a West Virginia Invasive Species Management Plan
Project Lead and Co-Participants: Walter Kordek, WV Division of Natural Resources, Kent Karriker, Monogahela National Forest, Michael Powell, The Nature Conservancy, Sherrie F. Hutchinson, WV Department of Agriculture, Robert Radspinner, WV Division of Forestry.

- Summary: Aquatic and terrestrial nuisance species are a significant threat to the biodiversity and natural resource-based economies in the Appalachian region. West

Virginia relies heavily on forest products, agriculture, and natural resource-based tourism and recreation. The wood products industry in West Virginia exceeds $4 billion annually and accounts for nearly 30,000 jobs (Childs 2005). Wildlife associated recreation in West Virginia, such as hunting, angling, and wildlife watching generates over $1.2 billion in total economic impact for the state (USDI and USDC 2006). Currently, there is little coordination between agencies, private landowners, and other organizations that are engaging in nuisance species control efforts. There is no single authority responsible for coordination or information sharing, nor is there a legislative mandate or funding for coordination or cooperation. The primary activities that will be employed through this grant will fall into three broad categories including:

- Developing a shared vision among partners for the statewide plan by facilitating meetings and summarizing findings;
- Completion of a comprehensive statewide plan that has been reviewed and approved by partners including the Aquatic Nuisance Species Task Force;
- Informational meetings and briefings with the governor and staff about the threat of NNIS and the importance of implementing the state plan; and
- Outreach with the public to increase support for the completed plan and to engage additional stakeholders.

c) The Good, the Bad and the Ugly: An invasive species toolkit for educators
Project Leads: Kerry Wixted and Britt Slattery, Maryland Department of Natural Resources

- Summary: Most people are not aware of how our natural resources, human health, and economy are affected by invasive species. If we are to effectively combat these threats to our environment and our lifestyles, we must find more effective ways to engage the public in understanding their role in causing and reducing the spread of invasive species. DNR will develop a set of educational resources (a "toolkit") on the problems and solutions regarding invasive species, particularly in the Mid-Atlantic states. The project will provide:
    - Information, hands-on artifacts and other tools for use with students in multiple grade levels;
    - Lesson ideas for incorporating invasive species topics into a variety of educational disciplines, both in formal classrooms as well as in non-formal settings such as outdoor education centers, after-school and community programs;
    - Correlation to Maryland environmental literacy and common core learning standards, National science standards, and STEM (Science Technology Engineering and Mathematics) goals;
    - Suggestions for student and community monitoring and action projects;
    - Teacher/ environmental educator professional development to assure effective development and delivery.

Attachment 1. MAP Small Grants Program-Project Inventory 2007-2013

Title	Lead	Benefit	Focus	Match	Request	MAP	Final Report
2007: Biological Control and Nutrient Enrichment of Purple Loosestrife: Investigating the Effectiveness of Purple Loosestrife Control using *Galerucella calmariensis*	Walter P. Carson, Ph.D. walt@pitt.edu	Site surveys in PA, NY, and Ohio. Increased biocontrol efforts effective in low N soil. Decreasing nutrient input in invasion prone and high conservation sites will improve overall biocontrol success.	Control	$0	$9,967	$9,967	Yes; Carson, W.P., S.M. Hovick, A.J. Baumert, D.E. Bunker, and T.H. Pendergast. 2008. Evaluating the post-release efficacy of invasive plant biocontrol by insects: a comprehensive approach. Arthropod-Plant Interactions.
2007: Conducting an Aquatic Invasive Species Early Response Exercise in Pennsylvania	Sarah Whitney swhitney@psu.edu	Interagency workshop addressed policies, staffing, coordination, and communication, improving AIS rapid response planning.	EDRR	$8,638	$11,655	$11,655	Yes

2007: Current and projected distribution of the invasive rusty crayfish, *Orconectes rusticus*, in the Upper Susquehanna River basin	Thomas Horvath, Ph.D. horvattg@oneonta.edu	Invasive rusty crayfish population data collected and mapped for portions of the Susquehanna River basin. Data to be loaded to USGS database.	Map	$13,603	$9,870	$9,870	Yes
2007: Aquatic Invasive Species Prevention Signs for Pennsylvania Waters	Sarah Whitney swhitney@psu.edu	Consistent/one sign design created for use at all boat launches across the state. PA DCNR and FBC have agreed to use the signs. Local groups have expressed interest for private and community postings.	Outreach	$2,746	$10,195	$10,195	Yes
2008: Survey and Eradication of water chestnut on Delmont Lake	Crystal Gilchrist cgilchrist@perkiomenwatershed.org	Water chestnut surveys & control measures in partnership w/ local community. Outreach via various outlets.	Control	$35,532	$9,031	$9,031	Yes
2008: Tracking Invasive Species in Pennsylvania	Jeffrey Wagner jwagner@paconserve.org	Comprehensive dataset develop ed for tracking AIS in PA, existing AIS datasets inventoried and incorporated, geographic data entered into iMapInvasives.	Map	$17,542	$9,800	$9,800	Yes
2008: Aerial GPS Census and Mapping of Phragmites in Virginia	Kevin Heffernan kevin.heffernan@dcr.virginia.gov	Aerial surveys conducted with GPS data resulted in accurate and comprehensive documentation of Phragmites distribution in key Ches Bay shoreline areas; maps integrated with ArcIMS webtool & VA Phrag Mapping Application	Map	$12,000	$10,000	$10,000	Yes

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2008: Publication and Targeted Dissemination of AIS Prevention Literature in Pennsylvania	PA Fish& Boat Commission	Printed education material targeting specific AIS species & issues - disseminated by the agency's Waterway Conservation Officers.	Outreach	$140,635	$9,989	$9,989	Yes
2008: Maryland Department of Natural Resources Invasive Species Matrix Team	Sarah Widman swidman@dnr.state.md.us	Increasing AIS awareness targeting species that are not yet widespread in MD, but identified in portions of the state or Ches Bay watershed. Creation of signs for waterways or trailheads with instructions for reporting AIS to MDNR.	Outreach	$7,550	$7,000	$1,100	Yes
2009: Estimating risk of fish invaders in the Mid-Atlantic region	Paul Angermeier, Ph. D. biota@vt.edu	Prediction models for potential fish invaders based on species and drainages characteristics.	EDRR	$5,850	$10,000	$10,000	Yes, dissertation; contact PI for publication details
2009: Pilot Project for Data-Driven Nutria Study and Removal from Nags Head Woods Ecological Preserve	Aaron McCall amccall@tnc.org	Documentation and mapping of existing nutria population density with special focus on points of entry in and around the Preserve. Data collected used for Nutria Control Management Plan for NHW. Public outreach using brochures, signage.	Map	$4,484	$9,830	$9,830	Yes

2009: Coordination of Regional Monitoring Network and Implementation of Web-based Reporting System to Determine Status of the Chinese Mitten Crab in Chesapeake Bay, Delaware Bay, and the Mid-Atlantic Coast.	Gregory Ruiz, Ph. D. ruizg@si.edu	Increased understanding of current distribution of Chinese mitten crab in Eastern US, and whether self - sustaining populations are present through development of web-based reporting system.	Map	$0	$7,000	$7,000	Yes
2009: Aquatic Invasive Species Field Guide for Pennsylvania	Sara Grise` sng121@psu.edu	A consistent and clear resource developed for identifying, collecting, and reporting on AIS in PA.	Outreach	$27,767	$10,000	$10,000	Yes; field guide
2009: Outreach Regarding Virginia's Phragmites Invasion	Kevin Heffernan kevin.heffernan@dcr.virginia.gov	Provided current VA Phragmites abundance & distribution, negative environmental & economic impacts, management landowner workshops, presented at professional conferences, & peer reviewed publication.	Outreach	$13,000	$12,000	$3,000	Yes
2010: Early Detection and Rapid Response to Protect Crow's Nest and Dragon Run Marshes from Invasion by Phragmites Australis	Kevin Heffernan kevin.heffernan@dcr.virginia.gov	Protection of two of coastal VA's most pristine tidal marshes from non-native Phragmites invasion by controlling 10 acres of recently detected infestation.	Control	$5,000	$10,000	$10,000	DUE
2010: Years 2 and 3 - Survey and Eradication of Water Chestnut on Delmont Lake	Crystal Gilchrist cgilchrist@perkiomenwatershed.org	Continuation of efforts to remove water chestnut from Delmont Lake.	Control	$14,620	$14,569	$7,100	Yes

Attachment 1. MAP Small Grants Program-Project Inventory 2007-2013

2010: Invasive Carp Removal Project	Tim Morris tim@njconservation.org	Successful eradication of invasive carp from impoundments of Wickecheoke Creek (a Delaware River tributary). Project also resulted in eradication of first known introduction of invasive Chinese pond mussel in North America.	Control	$21,970	$4,000	$4,000	DUE
2010: Water Chestnut Eradication in the Sassafras and Bird Rivers	Mark Lewandowski mlewandowski@dnr.state.md.us	Eradication and control measures and rapid response plan for water chestnut in the Bird and Sassafras Rivers. Outreach to local citizen groups.	Control	$3,512	$7,718	$2,980	Yes
2010: A rapid survey for a new introduced species of shrimp in the Chesapeake Bay	Robert J. Diaz, Ph. D. diaz@vims.edu	Rapid surveys for Oriental Shrimp in the York River. Surveys complemented previous efforts in James River and MD western shore tributaries.	EDRR	$5,437	$5,440	$5,440	DUE
2010: Social marketing strategies to reduce nonnative bait introductions	Kerrie Kyde kkyde@dnr.state.md.us	Project cancelled due to limited participation.	Outreach	$24,305	$10,000	$5,000	N/A
2010: Creating Water Gardening AIS Prevention Training in Pennsylvania	Diane Oleson djo13@psu.edu	Education package for use with and by Penn State Master Gardeners, Extension Educators, and the public for preventing the spread of AIS through water gardening.	Outreach	$3,149	$7,980	$7,980	Yes; materials
2011: Beach Vitex Eradication Program in Virginia Beach	Charles McKenna cmckenna@vbgov.com	Eradication and control of beach vitex in the greater Virginia Beach area; mapping distribution for monitoring program.	Control	$8,776	$6,000	$6,000	2013
2011: Invasive sedge control and native species restoration at Island Beach State Park, Ocean County, New Jersey	Louise Wootton, Ph. D. woottonl@georgian.edu	Control & monitoring program for Asiatic sand sedge focused on coastal sand dunes with scheduled herbicide treatment, and native replantings.	Control	$55,600	$15,000	$15,000	2013

Attachment 1. MAP Small Grants Program-Project Inventory 2007-2013

2011: Support for a Nutria Eradication Program in Virginia	Scott Klopfer sklopfer@vt.edu	Knowledge of current nutria population distribution to support eradication strategies. Coordination of interagency efforts.	Map	$10,753	$14,947	$14,947	Yes
2011: Mapping Invasive Species Distribution in Selected Areas of the Ohio River Basin	Jane Konrad konrad@pitt.edu	Training of teachers/ educators in the Ohio River basin to ID and map AIS with their students. Data collected to be processed & shared w/ regional databases, state agencies, & others.	Map	$6,000	$14,800	$14,800	Yes
2012: The Good, the Bad and the Ugly: An Invasive Species Toolkit for Educators	Kerry Wixted kwixted@dnr.state.md.us Britt Slattery bslattery@dnr.state.md.us	Engage public about their role in invasive species reduction. Toolkit creation for both formal classrooms &non-formal settings; multiple grade levels.	Outreach	$33,330	$14,900	$10,000	2015
2012: Development of a West Virginia Invasive Species Management Plan	Walter Kordek waltkordek@wvdnr.gov	Development of comprehensive statewide aquatic and terrestrial invasive species plan that will include education, prevention, early detection, inventory, various treatment methods, monitoring, and restoration.	Control	$16,729	$15,000	$13,000	2015
2012: Development of a Strategic Plan for Eradicating Established Nutria Populations in Virginia and North Carolina	Scott Klopfer sklopfer@vt.edu Michael St. Germain mstgerma@vt.edu	Development of a strategic plan that will provide specific details on actions, resources required, and procedures for controlling nutria. Ultimate goal is to estimate costs of implementation and eradicate nutria within the Chowan-Roanoke and Lower Chesapeake hydrologic subregions in VA and NC.	Control	$12,917	$14,996	$10,000	2015

2013: Invasive Species: From the Hudson River to your Classroom	Alan Berkowitz and Cornelia Harris, Cary Institute of Ecosystem Studies	This project proposes to develop, implement, and evaluate a hybrid learning course for educators on aquatic invasive species through a blend of online, field, and traditional classroom methods.	Outreach	$0	$16,000	$13,500	2015
2013: Environmental DNA monitoring of the invasive freshwater diatom, Didymosphenia geminate, in Mid-Atlantic waters	Stephen Keller and Robert H. Hilderbrand, University of Maryland Center for Environmental Science	Use genetic monitoring on e-DNA samples to establish monitoring network for highly invasive Didymo	Control	$0	Year 1: $10,518 Year 2: $4,421	$13,500	2015/2016
2013: Bushkill Township Invasive Species Management Project	Jason E. Smith, Hanover Engineering Associates, Inc.	Management Project includes three primary components, including: 1) Invasive Species Identification and Mapping, 2) Action Plan for Invasive Species Treatment, 3) Social Media and Application Development – Hanover Engineering will prepare a web-based GIS application for invasive plant species.	Map	$5,000 (leverage funds, non-match)	$12,290	$10,000	2015
				Match	**Request**	**MAP**	
			TOTAL:	**$516,445**	**$334,916**	**$284,684**	

Project Title: Development of a Strategic Plan for Eradicating Nutria Populations in Select Areas of Virginia and North Carolina (M/INV-3a)

PIs/Institution/Contact Information: Mr. Scott D. Klopfer, Conservation Management Institute – Virginia Tech, 1900 Kraft Drive Suite 250, Blacksburg, VA 24061, (540) 231-8825, sklopfer@vt.edu

Project Duration: 8/1/12 – 7/30/14
Report Submission Date : 9/9/13

Project Objectives: This can be an abstract for the project or a description of the project goals and objectives.

The nutria (*Myocastor coypus*), or coypu, is listed as a nuisance species in Virginia and North Carolina. Recently these states have been coordinating efforts to control and manage nutria populations. Nutria eradication is difficult, but recent successes in the Chesapeake Bay have demonstrated that nutria populations can be eradicated. Successful control requires the development of a strategic plan that can address both logistical and technical aspects of eradication. Further, a plan that provides a well-conceived and efficient strategy will increase the likelihood of receiving the substantial funding that would be required for successful eradication. This project will develop a strategic plan for eradicating nutria through collaboration among natural resource management agency stakeholders and the application of knowledge gained from the ongoing Chesapeake Bay Nutria Eradication Program. This plan will provide specific details on actions, resources required, and procedures for controlling nutria in these areas. Our ultimate goal is to eradicate nutria within the Chowan-Roanoke and Lower Chesapeake hydrologic subregions in Virginia (VA) and North Carolina (NC). The specific objectives of this proposed project are:

1. to gather available information to develop the best management practices available for eradicating established nutria populations,
2. to use that information to identify specific actions for controlling nutria, and
3. to complete a strategic plan that will facilitate implementation

Project Description: What was done to achieve the project goals or objectives.

To date, we have completed a draft of the strategic plan based on a template created directly from the strategic plan of the USDA/USFWS Chesapeake Bay Nutria Eradication Project (CBNEP). We used this document as a base from which to modify and discuss similar goals, objectives, and tasks for the Mid-Atlantic project.

The first draft of this document was circulated to our project collaborators in both Virginia and North Carolina including the USDA APHIS-Wildlife Services, Virginia Department of Game and Inland Fisheries, North Carolina Wildlife Resources Commission, and the US Fish and Wildlife Services. The comments received are being incorporated into a revised document that will be submitted as the completed strategy in October 2013.

Project Results: What were the significant results from the actions you took?

Judging by the comments we received from the reviewers, the scope and breadth of the strategies outlined by the CBNEP reflect more detail and depth than would be appropriate for the Mid-Atlantic Nutria Project as conceived. This is not surprising given that the CBNEP strategic planning effort was completed while this large-scale eradication effort was in process.

Our efforts in Virginia and North Carolina are more focused on understanding the geographic scope of the infestation and in identifying the appropriate approaches for first controlling the additional spread of nutria, and then garnering support for a large-scale eradication effort where such eradication is both feasible and supported.

This has been a useful exercise so that the members of the Steering committee have an opportunity to have a glimpse of what sorts of strategies will be necessary to operate a comprehensive and successful eradication program. It has also allowed us to more clearly articulate a strategy and plan that will address the most pressing information and communication needs to address to sustain the momentum on this program.

Project (Anticipated) Outcomes and Outreach: Please discuss how your project helped address your particular AIS problem and how that is leading or can lead to changes in AIS management. Clarify, how this project is making a difference in mid-Atlantic aquatic invasive species management.

This project will result in a more comprehensive approach to controlling the populations of nutria within the Mid-Atlantic Region. There is little doubt this population is expanding and is likely already encompassing a geographic area larger than that covered by the CBNEP. Further expansion will likely mean an exponential increase in costs and time for eradication assuming eradication continues to be a reasonable goal of this program. This project will lay the groundwork to direct the next actions of the ad hoc Steering Committee so that what resources are available can be directed squarely on the most important objectives.

Future Directions: What has yet to be accomplished? What are the next steps as a result of this work?

In the next few weeks, we will be finalizing the strategic planning document and begin addressing some of the tasks outlined. We anticipate completing this specific project on time.

Publications or Presentations: none

Students Supported: none

Progress Report Submitted to Maryland Sea Grant

September 27, 2013

Development of a West Virginia Invasive Species Management Plan (M/INV-3b)

Annual Performance Report 1

Award Number: F12AP01037 (USFWS) **Award Period:** 8/1/2012 to 7/31/2014
Award SC No: Sa7528131-B **Reporting Period:** 8/1/2012 to 7/31/2013

Principal Investigators:

1) Walter S. Kordek, Wyoming Division of Natural Resources

Funding	2012	To Date	Total
Federal	$13000	$0	$13000
Match	$3250	$0	$3250
Total	$16250	$0	$16250

Project Objectives

The spread of aquatic and terrestrial nuisance species like didymo, purple loosestrife, Japanese knotweed, invasive crayfish, and zebra mussel can have devastating impacts on native plant and animal communities, fish and wildlife habitats, agricultural productivity, recreational opportunities, commercial and urban forest resources, human health, and ultimately local economies. Nationally, damage and control costs associated with management of nuisance species have been estimated to be more than $138 billion per year (Pimentel et al. 2000), not taking into consideration the extensive environmental damages caused by them. Cumulatively, competition from invasive species leads to the elimination of native habitats and the wildlife that depend on them, and to the degradation of land and water resources. In addition to degrading native habitats, invasive species disrupt ecosystem patterns and processes, such as hydrology, nutrient cycling, natural succession, and soil stability.

Aquatic and terrestrial nuisance species are a significant threat to the biodiversity and natural resource-based economies in the Appalachian region. West Virginia relies heavily on forest products, agriculture, and natural resource-based tourism and recreation. The wood products industry in West Virginia exceeds $4 billion annually and accounts for nearly 30,000 jobs (Childs 2005). Wildlife associated recreation in West Virginia, such as hunting, angling, and wildlife watching generates over $1.2 billion in total economic impact for the state (USDI and USDC 2006). In addition, the intact forests of West Virginia also contribute to the overall quality of life in the region by reducing energy costs, lowering pollution, protecting watersheds from erosion and sedimentation, and providing for long-term carbon sequestration.

Currently, there is little coordination between agencies, private landowners, and other organizations that are engaging in nuisance species control efforts. There is no single authority responsible for coordination or

information sharing, nor is there a legislative mandate or funding for coordination or cooperation. To address these issues, the West Virginia Division of Natural Resources proposes to hold a series of meetings throughout the state to engage federal, state, and local agencies, community associations, academia, businesses, and non-profit organizations in the development of a comprehensive statewide aquatic and terrestrial invasive species plan. This plan will provide a common structure for coordinating and guiding invasive species detection and response efforts. The plan will also identify technical, enforcement, and financial assistance for activities needed to eliminate or reduce the environmental, public health, and safety risks associated with these species. The plan will provide a catalyst for state and federal funding, resources, and coordination and provide direction to support a coordinated statewide invasive species program. The expected project output is a fully vetted statewide plan, and the expected outcome is a vehicle to engage and coordinate stakeholders.

Summary of Progress Towards Objectives

Over the past year, there has been a targeted effort to research, gather materials, and synthesize data to draft a West Virginia Invasive Species Strategic Plan (WVISSP). Currently the plan is in draft form and is circulating for its second round of professional review.

Meetings have been held with, and presentations made to, various organizations including:

Americorps
Appalachian Forest Heritage Area (AFHA)
National Park Service - New River Gorge (NPS-NERI)
Potomac Highlands Cooperative Weed and Pest Management Area (PHCWPMA)
The Nature Conservancy (TNC)
United States Department of Agriculture (USDA-APHIS-PPQ)
United States Fish and Wildlife Service (USFWS)
USDA Forest Service (USFS)
USDA Natural Resource Conservation Service (NRCS)
West Virginia Conservation Agency (WVCA)
West Virginia Department of Agriculture (WVDA)
West Virginia Department of Environmental Protection (WVDEP)
West Virginia Division of Forestry (WVDF)
West Virginia Division of Highways (WVDOH)
West Virginia Division of Highways (WVDOH)
West Virginia Division of Natural Resources (WVDNR)
West Virginia Garden Clubs (WVGC)
West Virginia Invasive Species Working Group (WVISWG)
West Virginia Native Plant Society (WNPS)
West Virginia Nursery and Landscape Association (WVNLA)
West Virginia Rivers Coalition
West Virginia University Extension (WVU)

Early in the project, the professional community met and brainstormed on plan purpose, structure, and contents. Over the next few months, participants supported the plan in its development by sharing information, submitting draft material, and providing comments and resources. These individuals are now in the process of reviewing the

second draft of the plan and soliciting additional comment as needed from colleagues. Upon revisions, a third draft of the plan will be made available to decision-makers of various state and national organizations. Language is also currently being drafted for Memoranda of Understanding which will be submitted to decision-makers who approve the plan, with the goal of officially incorporating the WVISSP into organizations' planning processes.

Summary of Accomplishments

The result of everyone's work is a draft plan that describes the status of invasive species in West Virginia, their economic and biological impacts, and outlines strategies that will help align individual management plans with state and federal objectives. The plan identifies administrative responsibilities that need to be carried out to ensure it is put to use, and management outcomes that creators expect to see as a result of the plan.

Table of Contents may provide the best snapshot of the state of the plan at this time:

Summary of Project Uses

This plan is the first attempt to comprehensively address the problem of invasive species in West Virginia.

It is intended to enable West Virginia and all entities operating within its borders to address the threats posed by all terrestrial and aquatic non-native invasive species, including pathogens, which occur or may occur, in West Virginia. Because invasive species impacts usually supersede jurisdictional boundaries, any operational, species, land management, and site construction plans that deal with non-native invasive species (NNIS) will be most effective if aligned with federal, regional, and state invasive management priorities. This plan makes that possible by incorporating landscape-scale priorities into state-specific recommendations.

It is hoped that this plan will receive a significant policy response in the form of an executive order, legislation, and/or state-level funding for increased invasive species coordination and management. It will add weight to non-profit and university funding requests for research and management efforts in West Virginia. It will help governmental and state agencies direct resources, coordinate plans, assess progress towards goals, and revise strategies as needed. This plan is designed to catalyze the development and implementation of species-specific and region-specific invasive management plans and programs.

Data Management Plan

The WVISSP itself is not generating new data, but is consolidating numerous diverse pieces of data to form a snapshot of the invasive species situation in West Virginia. The plan will be available to decision-makers, natural resource managers, planners, etc., as well as the general public, but it has not yet been determined in what form or how it will be made available. It is likely that it will be published in booklet format and made available online in PDF format.

Cooperating Organizations

Number of Organizations: 22

Americorps
Appalachian Forest Heritage Area (AFHA)

National Park Service - New River Gorge (NPS-NERI)
Potomac Highlands Cooperative Weed and Pest Management Area (PHCWPMA)
The Nature Conservancy (TNC)
United States Department of Agriculture (USDA-APHIS-PPQ)
United States Fish and Wildlife Service (USFWS)
USDA Forest Service (USFS)
USDA Natural Resource Conservation Service (NRCS)
West Virginia Conservation Agency (WVCA)
West Virginia Department of Agriculture (WVDA)
West Virginia Department of Environmental Protection (WVDEP)
West Virginia Division of Forestry (WVDF)
West Virginia Division of Highways (WVDOH)
West Virginia Division of Highways (WVDOH)
West Virginia Division of Natural Resources (WVDNR)
West Virginia Garden Clubs (WVGC)
West Virginia Invasive Species Working Group (WVISWG)
West Virginia Native Plant Society (WNPS)
West Virginia Nursery and Landscape Association (WVNLA)
West Virginia Rivers Coalition
West Virginia University Extension (WVU)

Contact: Assistant Director for Research, Maryland Sea Grant, 4321 Hartwick Road, Suite 300, University of Maryland, College Park, MD, 20740, or call (301) 405-6373.

Progress Report Submitted to Maryland Sea Grant

September 19, 2013

The Good, the Bad and the Ugly: An invasive species toolkit for educators (M/INV-3C)

Annual Performance Report 1

Award Number: F12AP01037 (USFWS) **Award Period:** 8/1/2012 to 7/31/2014
Award SC No: SA7528131-C **Reporting Period:** 8/1/2012 to 7/31/2013

Principal Investigators:

1) Kerry L. Wixted, Wildlife and Heritage Service, Maryland Department of Natural Resources

Funding	2012	To Date	Total
Federal	$13500	$0	$13500
Match	$0	$0	$0
Total	$13500	$0	$13500

Project Objectives

Invasive species of plants, animals and pathogens affect our every day life, often in very visible ways as they change our natural landscape, but many times in ways that are not readily apparent to the public. They are one of the major threats to native plants and wildlife, particularly those which are threatened or endangered 4, 6. Annual losses due to aquatic invasive species in the Great Lakes region alone have been estimated to cost at least $200 million 3. Invasives of every type spread as a result of animal activity, water and/or wind; but human actions, whether intentional or accidental, are a primary cause. As our native flora and fauna, their habitats, and human health continue to be affected by the spread of invasive species, we must find more effective ways to engage the public in understanding their role in causing - and more importantly, in reducing - these threats to our ecological, economic, and human welfare.

One of the most cost-effective ways of dealing with invasive species is to prevent invasions from occurring 1, 2, 5. Unfortunately, much of the public does not realize their actions can result in the introduction and spread of invasive species. Public awareness of aquatic invasive species issues tends to be sporadic and driven by new cycles. As events occur, local or national reporting will focus public attention upon an event and it will become topical for a short period. Events like the discovery of northern snakeheads in Maryland, the initial zebra mussel expansion, and the current Asian carp controversy are examples of the cyclic nature of media-driven awareness. Each event is based upon response to an unfolding ecological catastrophe. In order to create a deeper level of public awareness and have some hope of preventing invasive species introductions, we will need to develop a more proactive approach to public education on this timely and important topic. Strong education and outreach efforts can increase public awareness while also promoting prevention. Environmental educators are aware of the importance of invasive species and are hungry to teach people about it. What many environmental educators lack

are the basic tools with which to carry the message. Therefore, this project aims to develop a comprehensive toolkit with resources which teachers and other educators can use to deliver classroom lessons and exercises that fit their needs, meet educational requirements, and reach target age groups in order to teach about the basic tenets of the problem and about specific aquatic invasive species and other invaders, and to motivate students to take action in their communities. In addition to the toolkit, professional development will also be offered to educators.

Summary of Progress Towards Objectives

To achieve the project goals, the Invasive Species and Conservation Education Matrix Teams met to put together a detailed outline of content and all materials to be developed. Sixteen invasive species were chosen for representation with the project. Background material on the invasive species to be covered was written by Invasive Species Matrix Team members and submitted to project leads. Once the background material and outline were finalized, educators across the state were contacted to assist with material development.

A webinar was held on March 19th, 2013 to orient a team of 12 educators and 5 DNR staff to the project and to assign group tasks. Educators were placed on writing teams, and rough draft lesson plans were developed by May 31st 2013. On July 1st, 2013, an educator professional development day was held to go over activities and to make revisions. Lesson plans were revised and final activities were sent in for review on August 15th, 2013. Lesson plan revisions continued through September 16th, 2013.

Once revisions are complete, select activities will be sent to educators for field testing through November 2013. Educators will be given evaluation forms to submit comments to writing teams to further revise lesson plans.

On October 9th, 2013, the project and sample activities will be presented at the North American Association for Environmental Education conference in Baltimore, Maryland. In addition, a half day professional development workshop will be provided at the Maryland Association for Environmental and Outdoor Education conference in February 2014 in Ocean City, Maryland.

Summary of Accomplishments

Sixteen factsheets on invasive species covered in the project have been compiled. Over 40 lesson plans for K-12 students have been developed to educate students on these invasive species, and the issue of invasives as a whole. The lesson plans cover topics such as 1) the historical context on invasive species, 2) how invasive species are introduced and spread, 3) impacts of invasive species to natural areas, 4) impacts of invasive species to student's lives, and 5) student and community action projects to address problems with invasive species. These engaging and hands-on lesson plans will be field tested through November and then will be presented in professional development workshops beginning February 2013.

Summary of Project Uses

Once the project is finalized, the intention is for it to educate students, educators, and community members on the ecological, economical, and human health impacts of invasive species. In addition, the project includes information, ideas, and encouragement that students, educators, and community members need to reduce, monitor, or remove invasive species from their communities, and to deliver the message to others about helping

to stem the tide of invasive species' introduction and spread.

Additional field testing will continue through Spring 2014. At the conclusion of the field tests, evaluations will be collected and compiled in order to edit existing lesson plans.

Once lesson plans are finalized, we will purchase and design artifacts to supplement the activities and to assemble into hands-on kits which will be available for loan throughout Maryland, with an additional kit provided as a model for each of the mid-Atlantic states. A video will be produced from new and existing coverage of invasive species and will be duplicated for the kits. Copies of all lesson plans and supplemental information will be placed on CDs and duplicated for the kits.

A supporting webpage with the lesson plans and resources will be developed and launched by August 2014. Additional training workshops will be held through July 2014, and training kits will be distributed among Mid-Atlantic States by August 2014.

Data Management Plan

We are not collecting any data/information.

Conferences and Special Programs

Number of Events: 2

North American Association for Environmental Education- 40min presentation- October 9, 2013
Maryland Association for Environmental and Outdoor Education- 1/2 day workshop- February 2014

Contact: Assistant Director for Research, Maryland Sea Grant, 4321 Hartwick Road, Suite 300, University of Maryland, College Park, MD, 20740, or call (301) 405-6373.

Progress Report Submitted to Maryland Sea Grant

September 18, 2013

International Conference on the invasive alga Didymosphenia geminata (M/INV-3D)

Final Performance Report

Award Number: F12AP01037 (USFWS) **Award Period:** 8/1/2012 to 7/31/2013
Award SC No: SA7528131-D **Reporting Period:** 8/1/2012 to 7/31/2013

Principal Investigators:

1) Leah C. Elwell, Invasive Species Action Network

Funding	Total
Federal	$7500
Match	$0
Total	$7500

Project Objectives

The Invasive Species Action Network will offer a conference to managers, scientists, conservationists and anglers with the most current information on Didymosphenia geminata. The goal of the conference is to foster a better understanding and improve management knowledge of the species.

Summary of Progress Towards Objectives

On March 12 and 13, 2013 in Providence Rhode Island, the Invasive Species Action Network and the North East ANS Panel co-hosted the International Didymo Conference. The leading scientists and managers associated with didymo attended the conference to share their work and experiences. The conference was attended by professionals from across the United States, Canada as well as attendees from Chile, New Zealand and Europe. The conference consisted of several notable keynote speakers, contributed sessions, panel discussion and group consensus on next steps.

Summary of Accomplishments

Bringing the leading researchers together with managers who are grappling with how best to manage this species was an important step in creating the communication lines for addressing didymo now and in the future. As a direct result of the conference a group of participants are undertaking a management/policy recommendations white paper on didymo. This paper is projected to be available in early 2014.

Summary of Project Uses

The management/policy recommendations white paper which is under development will be available to anyone and will be distributed electronically in early 2014. This document will assist managers in dealing with didymo both in mid-Atlantic regions and across the USA. Additionally, many of the presenters and some researchers who were unable to attend are contributing to a special issue of the peer-reviewed journal Diatom Research (publisher Taylor & Francis). This special issue will be published in 2014.
The project is 100% completed. The bonus outcomes of the white paper and peer-reviewed journal will be available in 2014.

Data Management Plan

I am not collecting or submitting data. But have shared presentations from the conference as listed below in resources.

Cooperating Organizations

Number of Organizations: 2

Mid-Atlantic Panel on ANS
Northeast ANS Panel

Undergraduate Students Funded Through This Grant

Number of Students: 1 Number of Degrees Awarded: 0

No students

Masters Students Funded Through This Grant

Number of Students: 1 Number of Degrees Awarded: 0

No students

Master Students Not Funded Through This Grant

Number of Students: 1 Number of Degrees Awarded: 0

The project was unable support students to travel to the meeting. However, several students will primary authors in the special issue and contributors on the white paper, both great professional opportunities.

Doctoral Students Funded Through This Grant

Number of Students: 1 Number of Degrees Awarded: 0

No students

Doctoral Students Not Funded Through This Grant

Number of Students: 1 Number of Degrees Awarded: 0

The project was unable support students to travel to the meeting. However, several students will primary authors in the special issue and contributors on the white paper, both great professional opportunities.

Post-Doctoral Students Funded Through This Grant

Number of Students: 1

No students

Sea Grant Fellows Funded Through This Grant

Number of Students: 1

No fellows

Conferences and Special Programs

Number of Events: 1

International Didymo Conference 2013

Proceedings, Symposia

Number: 1

Program booklet - including abstracts from all speakers:http://www.stopans.org/Didymo_Conference_Program_Booklet_FinalV2.pdf

Peer-reviewed Journal Articles, Book Chapters

Number: 1

While not funded from the award money, participants are contributing to a special issue of the peer-reviewed Diatom Research publication. Publication date is projected for 2014.

Miscellaneous Document Types, i.e., posters, radio scripts, conference papers/power points, workshop summaries, topical websites (abstract and URL), other educational material not listed above

Number: 1

Participants that were willing to share their presentations can be found here: http://www.stopans.org/Didymo_Conference_2013_Results.htm

Contact: Assistant Director for Research, Maryland Sea Grant, 4321 Hartwick Road, Suite 300, University of Maryland, College Park, MD, 20740, or call (301) 405-6373.