

1 **Appendix A**

2 **Aquatic Invasive Species Programs and Activities: 50-State Summary**

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5 ***Methods***

6 We inventoried AIS-related management actions in all 50 states to determine what information  
7 may be needed to allow AIS managers to consider and incorporate predicted global change  
8 impacts into their programs, . For each state we documented the status of AIS management  
9 plans, state programs and activities, climate change concerns, climate change actions, and  
10 research activities and needs. We reviewed publicly available documents, publications, and  
11 online materials. For further clarification, when appropriate, ELI discussed AIS programs,  
12 research needs, and management strategies with AIS managers, scientists, and decision-makers.  
13 Each state summary was sent to both state agency and EPA regional staff for review and  
14 comment in November and December of 2006. Comments were disposed and summaries were  
15 finalized in January 2007.





- 1 • State officials are also concerned with species moving from one part of the state to another due to climate  
2 changes.  
3

#### 4 **Climate Change Actions**

- 5 • Alaska’s ANS Management Plan focuses on prevention and identification of the most prominent threats. It  
6 recognizes that the Southern areas with “warmer climate, more developed lands, more disturbed habitat, and  
7 better road access” are areas of particular concern. It identifies ports with high traffic as posing greater risk.  
8 • The Weed Ranking Project provides a way to prioritize work. It ranks not only non-native species present in  
9 the state, but also species not currently found in the state, but likely to invade due to climate change. A “climate  
10 match” program loosely associates species with one of Alaska’s ecosystems (maritime, boreal, or arctic) to  
11 address these concerns.  
12

#### 13 **Research Activities & Information Used**

- 14 • Regional Alaskan groups are monitoring for green crab and, where found, setting traps as a control method.  
15 • Proposed mapping and inventorying of reed canary grass.  
16 • Research on the effects of rats on the ecosystem through local projects and case studies, including examining  
17 the effects of rats on intertidal invertebrates and soil composition and testing rodenticides.  
18 • State officials are inventorying all exotic plant species. This collection includes about 130 species, of which  
19 approximately 20 are expected to be a problem. Of these 20, only a few are found in riparian areas.  
20 • Statewide northern pike management plan to be completed by end of 2006 by ADFG. Upper Susitna/Copper  
21 River Pike Surveys to determine how widespread pike are in the area.  
22 • Ballast water-related research will be funded in FY07/08 by NOAA Sea Grant and administered by ADFG.  
23 • Risk assessment for aquatic sea lice to be funded in FY07/08 by NOAA SeaGrant and administered by ADFG.  
24 • Ongoing shore zone mapping research to characterize the physical and biological attributes of each section of  
25 the shoreline.  
26 • Ranking the invasiveness of non-native animals and fish.  
27

#### 28 **Research Needs**

- 29 • Better and more control techniques for pike (ideally, a vertebrate-specific pesticide). Control options are  
30 limited to netting and a few chemicals.  
31 • Development of aquaculture systems that will not allow salmon to escape.  
32 • Knowledge about how quickly green crabs are entering the state. In general, this species moves slowly, but  
33 officials must learn more about its migration in order to determine the scope of any potential problems.  
34 • Development of pheromones and trapping methods for green crabs. Research questions include: Is it possible  
35 to develop techniques to trap them out completely? What are the best techniques for managing them at a low  
36 level, with compounds that will attract them quickly into traps? Also, what is the ideal type of trap?  
37 • A better understanding of the different ecological needs of green crabs according to their location.  
38 • An understanding of how reed canary grass affects water quality.  
39 • An understanding of pathways to prevent invasion of colonial tunicates.



1 **Research Needs**

- 2 • Develop effective control methods for crayfish. The University of Arizona is undertaking some research into  
3 crayfish life histories to identify vulnerabilities for control.
- 4 • Determine advantages and disadvantages of biological, mechanical, and chemical control options for hydrilla,  
5 salvinia, and other aquatic nuisance plants.
- 6 • Information on how to coordinate activities of multiple state agencies with overlapping jurisdiction.
- 7 • Research on the effectiveness of weevils for biocontrol, though this is hampered by a lack of funding.
- 8 • The Giant Salvinia Task Force is monitoring the spread and attempting to document efficacy.









- 1 • **The Silvio O. Conte National Fish and Wildlife Refuge Invasive Plant Control Initiative.** The Refuge  
2 developed an Invasive Plant Control Initiative in response to the threat to natural diversity posed by invasive  
3 plant species. This initiative examines the problem of freshwater invasive plants from a regional perspective  
4 and identifies tasks that will enhance the capability within the region to address identified issues. Also, in  
5 cooperation with a number of partners, the Refuge used a grant from the National Fish and Wildlife Foundation  
6 to develop a strategic plan discussing the current invasive plant situation, outlining future actions for the  
7 Connecticut River Watershed and Long Island Sound, and recommending funding for high-priority invasive  
8 plant control projects in 1998. As part of the initiative, a partnership of federal, state, municipal, business and  
9 non-profit groups formed to control water chestnut, a recent invader to the watershed. Components of the  
10 strategy include mechanical harvesting of the source population and organizing volunteers to monitor water  
11 bodies for satellite populations within the watershed, and to hand-pull populations when found.
- 12 • **Research, Connecticut Agricultural Experiment Station (CAES).** CAES is researching control methods for  
13 nuisance aquatic plants, mapping their distribution and documenting the water conditions in which they are  
14 likely to occur. Studies are being conducted on control with herbicides and the effects of these products on  
15 nontarget plants. Water samples from treatment sites are being tested for herbicides to determine how  
16 concentrations change with time, where the herbicide may migrate, and what concentrations are necessary to  
17 achieve control with minimal impacts on desirable plants. Water from nearby wells is often tested to determine  
18 if aquatic herbicides can contaminate groundwater. Studies on the effectiveness of mechanical removal by  
19 methods including hydroraking and cutting are also in progress. Biological control strategies, including studies  
20 on the distribution and preferences of the milfoil weevil (*Euhrychiopsis lecontei*) and a search for plant  
21 pathogens, are underway. A continuing statewide surveillance and mapping program of aquatic vegetation  
22 began in 2004. From 2004-2006, 126 lakes, including small private ponds, have been surveyed using global  
23 positioning system technology and GIS. Reference plants are being obtained from each water body and are  
24 being cataloged at herbaria CAES and the University of Connecticut. Plant samples are also being frozen at -  
25 80 C for future molecular identification. Water chemistry and sediment data are being gathered from each lake  
26 to assess the preferences of nuisance plants and determine the potential for other lakes to become infested.

### 27 28 Climate Change Concerns

- 29 • Residents release water hyacinth and water lettuce from their water gardens into state waters. With a warming  
30 trend, these species could overwinter and set seed. There is no evidence of overwintering yet.
- 31 • If the growing season is longer, water chestnut could sprout earlier, persist longer into the fall, and produce  
32 more seeds. The plants produce seeds more than once, flowering through the summer and fall before they start  
33 decomposing. A warmer climate would make for a longer growing period. The plants might also grow faster  
34 with more light.
- 35 • Lists of potential “new invaders” need to be developed and updated as new information becomes available.  
36 ED/RR programs need to be developed and made operational for all taxonomic groups as the potential for new  
37 non-native invasive species may increase due to climatic changes.

### 38 39 Climate Change Actions

- 40 • Restoration of coastal habitats, e.g., *Phragmites* control in saltwater tidal marshes. This includes restoring tidal  
41 flows and reintroducing saltwater, which result in a gradual replacement of *Phragmites* by native vegetation.

### 42 43 Research Activities & Information Used

- 44 • *Phragmites* control methods include restoring tidal flows, mowing, herbicide application, and herbicide  
45 application with mowing, before selecting the herbicide glyphosate.

### 46 47 Research Needs

- 48 • For aquatic plants, need a better systematic survey of the location of aquatic species in the state, including in  
49 small private ponds, as well as trials on effective control methods for ANS.
- 50 • For water chestnut, need to better understand: germination of seeds based on temperature (whether a very cold  
51 winter would cause more seeds than usual to germinate at once in the following spring); salinity limits; and  
52 biological controls.
- 53 • Because correct identification of species is critically important to determining rapid response plans, there is  
54 need for the development and use of genetic markers that will allow positive identifications.







- 1 • Database and GIS system development with emphasis on interagency/interstate data sharing and user-friendly
- 2 public access or report generation capabilities.
- 3 • Efficacy of channeled apple snail (CAS) control methods and techniques.
- 4 • CAS risk assessment and thermal and salinity tolerance studies.
- 5 • Tilapia risk assessment; temperature and salinity tolerance research pertaining to culture activities



1 **Climate Change Actions**

2 (None reported.)

4 **Research Activities & Information Used**

5 (None reported.)

7 **Research Needs**

- 8 • Implementation of effective quarantine methods for incoming organisms.
- 9 • Efficient detection methods for the newest invasive species.
- 10 • Better understanding of species range, including whether or ranges are expanding. Officials have GIS
- 11 capabilities, but it is difficult to get people to update range maps and do the field work (staff shortage).
- 12 • Information about how to smother the mushroom anemone.
- 13 • Officials are developing a proposal for a literature review and research on effective control chemicals that will
- 14 not harm coral reefs.
- 15 • Mechanisms to predict incoming invasive species.
- 16 • More information on control methods, including biocontrols.
- 17 • Technology on cleaning hulls easily and safely.
- 18 • Information and technology for the control of aquaculture releases (while the supersucker is being tested on
- 19 algae, it is not practical for all areas, especially shallower reefs).
- 20 • Collection limits on sea urchins, as they are used to control invasive seaweed.
- 21 • Chemical control methods for apple snails, which escaped from aquaculture ponds and invaded taro wetlands.
- 22 The use of copper is too damaging.
- 23 • More effective control methods for giant reed. Glyphosate is not effective enough. Arsenal is another option,
- 24 but officials are unsure if it can be used in water. They need to know more about the non-target effects. Giant
- 25 reed is harder to kill than many plants because of the depth of the root system. Another problem is locating
- 26 existing populations. A developing method of thermal location would be very helpful, but it is still in the trial
- 27 and error stage.
- 28 • Better techniques for surveillance and detection. Officials rely strongly on the general public to report unusual
- 29 events. Hiking groups and fishermen report such events often, but without this information the state would
- 30 have no way to know what is happening. There are not enough staff to carry out surveillance.
- 31 • Mechanisms to keep aquarium releases from occurring.
- 32 • *Salvinia molesta*, *Pistia*, and *Eichhornia* control and prevention.



- 1 • Information on the effects (economic and ecosystem-related) of specific aquatic invasive species.
- 2 • An effective herbicide with less environmental impact and that can be applied in smaller amounts (researchers
- 3 are currently looking for this type of herbicide).
- 4 • Bottom barriers—researchers are assessing the duration of placement for effective control and the potential for
- 5 growth of aquatic plants after sediments have settled on the barriers.
- 6 • Soil-mix company who will recycle the milfoil into a soil mix.
- 7 • Better ways and more state partners for educating the public about why it is important to control Eurasian
- 8 watermilfoil. National or statewide database that would provide up-to-date information on current research
- 9 being done for each invasive species would be helpful.



1 **Climate Change Concerns**

- 2 • Climate change may have an indirect impact by allowing some species to expand into new ranges where they  
3 have not historically been found. If certain regions warm up (or cool down), they may be colonized by species  
4 that were only marginally adapted to the cooler (or warmer) temperatures.
- 5 • Illinois' ANS Plan includes vectors that are exacerbated by climate change: "As use of the Great Lakes  
6 intensified as a transport route for commerce, the rate of introduction of aquatic nuisance species also increased.  
7 More than one-third of the organisms have been introduced in the last 30 years, a surge coinciding with the  
8 opening of the St. Lawrence Seaway. Other human activities contributing to the transport and dispersal of  
9 aquatic nuisance species in the Great Lakes and inland state waters include the release of organisms from the  
10 ballast water of ships, transport and release from the bottoms of ships, movement or intentional release of  
11 aquaculture and sport fishery species along with their associated (free living and parasitic) organisms, release of  
12 organisms associated with pet industries or pest management practices, recreational boating, bait handling,  
13 water transport and ornamental and landscape practices." See Illinois State Comprehensive Management Plan  
14 for Aquatic Nuisance Species (1999).

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16 **Climate Change Actions**

17 (None reported.)

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19 **Research Activities & Information Used**

20 (None reported.)

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22 **Research Needs**

- 23 • Research on Asian carp—IDNR needs a good understanding of their specific reproduction requirements,  
24 biomass and population estimates, preferred habitats, and the effects of competition with Great Lakes native  
25 fish. Officials would like to know how many invasive fish exist, their size, and where they are located, in order  
26 to better target them.
- 27 • Examination of the consistencies and inconsistencies between different state laws is needed. Many state laws  
28 are changing and, if the National Aquatic Invasive Species Act is passed, it will be important to know what the  
29 states are all doing in this area.













1 **Climate Change Concerns**

- 2 • Aquatic Invasive Species Management Plan states that “with global climate change, [AIS] may spread even  
3 further as freshwater and ocean temperatures moderate.”  
4

5 **Climate Change Actions**

- 6 • The AIS Management Plan has a category entitled “No Action at This Time,” which emphasizes the need to  
7 “[l]earn more before acting” (p. 14). The category lists climate change as an issue. Specifically, the plan states  
8 that “Maine’s cold climate and ocean temperatures now limit warm water species. But warming temperatures  
9 and fluctuating weather patterns may in time be more favorable to their introduction. At the same time,  
10 changing conditions may become less favorable for coldwater species, thus contributing to an overall shift  
11 toward warm water assemblages. Taking the long view, Maine will monitor climatic conditions to provide  
12 early warning of potential infestations.”  
13

14 **Research Activities & Information Used**

- 15 • A two-year research project studying the relative effectiveness of various manual methods for controlling  
16 variable water milfoil, as well as the viability of variable milfoil fragments under various conditions, has  
17 recently been completed. This research will be continued in the future and will focus on the impacts of variable  
18 water milfoil on native ecosystems.
- 19 • Professor Dan Buckley, University of Maine at Farmington, routinely involves his students in invasive aquatic  
20 plant surveys, assessments, and mapping projects in Maine, as well as research on fragment regeneration.  
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22 **Research Needs**

- 23 • Research to find a native organism that can function as a safe, effective biological control for variable water  
24 milfoil.  
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**Climate Change Actions**

- An ongoing nutria study will be used by the U.S. Army Corps of Engineers to implement a four-year marsh restoration project, potentially covering 150 acres of marsh in the Blackwater National Wildlife Refuge. The Corps is using sediment spraying to raise the level of the marsh, which helps to restore the marsh grass.

**Research Activities & Information Used**

(None reported.)

**Research Needs**

- Research on nutria pheromonal attractants and weaknesses in reproductive biology.
- Zebra mussels and their control techniques in lakes and rivers.
- Fish species-specific control techniques.
- Innovative control techniques for snakeheads that would allow officials to apply a lethal control.
- Information on chemicals that would either attract fish or exclude them from areas.
- A contained area to study snakeheads in order to develop innovative techniques to sample and control them.
- Information on better *Phragmites* control methods, other than herbicides (e.g. biocontrol).



1 problem in the state. In contrast, water chestnut cannot be legally possessed and is not traded in the  
2 marketplace. If the climate warms up enough to allow water hyacinth to overwinter, it could be a threat.  
3

4 **Climate Change Actions**

5 (None reported.)  
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7 **Research Activities & Information Used**

8 (None reported.)  
9

10 **Research Needs**

11 (None reported.)

1                                   **SUMMARY OF AQUATIC INVASIVE SPECIES MANAGEMENT**  
2                                   **MICHIGAN**

3  
4    **AIS Management Plan**

5    **Aquatic Nuisance Species (ANS) Management Plan (2002).** The plan, developed by the Michigan Department of  
6    Environmental Quality, Michigan Department of Natural Resources, and Michigan Department of Agriculture,  
7    outlines educational programs, possible legislative actions, objectives for implementation, and strategies on  
8    cooperating for the control of aquatic nuisance species spread and the prevention of new introductions.  
9

10   **AIS Programs & Activities**

- 11    • **Aquatic Nuisance Species Council, Michigan Department of Environmental Quality (MDEQ), Michigan**  
12    **Department of Natural Resources (MDNR), Michigan Department of Agriculture(MDOA), National**  
13    **Wildlife Federation, Michigan United Conservation Clubs, Michigan Education Association, and**  
14    **Michigan State University – Department of Fisheries and Wildlife.** The Council implements the ANS  
15    Management Plan and does planning and strategy for member agencies and associations. As of 2006, council  
16    members are considering rapid response plan. The Council monitors AIS and promotes control, but not  
17    eradication (the state does not spend money to eradicate AIS where it is impossible). The Council also focuses  
18    on measures to prevent further introductions and spread of ANS.
- 19    • **Invasive Species Advisory Council, MDEQ, MDOT, MDNR, and MDOA.** The Council is responsible for  
20    overseeing all management of nuisance species in the state (aquatic and terrestrial).
- 21    • **Education and Outreach, MDEQ Office of the Great Lakes.** MDEQ officials conduct outreach on how to  
22    prevent the spread of ANS. The agency also offers removal and control training for local governments,  
23    conservation groups, citizens, and associations and issues permits for the use of chemicals for ANS removal.
- 24    • **Status and Trends Surveys, MDNR - Fisheries Division.** When habitat biologists encounter ANS during  
25    their annual fish Status and Trend Surveys, they kill and preserve it for later identification. Any recurrence is  
26    noted in the files. Officials will occasionally eradicate on a case-by-case basis, but this is rare.
- 27    • **Purple Loosestrife Program, Michigan State University and Michigan Sea Grant College Program.** This  
28    program introduces biological control agents (natural insect enemies) to existing purple loosestrife populations.  
29

30   **Climate Change Concerns**

- 31    • MDEQ is concerned about ANS expansion as waters warm. Hydrilla and water lettuce are overwintering in  
32    northern areas.  
33

34   **Climate Change Actions**

- 35    • Officials are addressing the overwintering of hydrilla and water lettuce in northern areas with outreach and  
36    education efforts.  
37

38   **Research Activities & Information Used**

- 39    • The 2002 ANS Management Plan includes: research on treatment of ballast water; surveys of purple loosestrife  
40    throughout Michigan; research on whether practical round goby control actions can be taken through the use of  
41    pheromones; assessment of impacts of round gobies and collection of baseline data on ruffe; and testing for  
42    effects of zebra mussel on zoobenthos and the diet and growth of yellow perch.  
43

44   **Research Needs**

- 45    • The 2002 ANS Management Plan includes: prevention, including monitoring, data for rapid response,  
46    probabilities for establishment, hot list of potential AIS, boater and angler survey regarding implementation  
47    methods; control, biocontrol, pesticides, physical control, social/political/economic acceptability of control,  
48    effectiveness and pathways; specific research and monitoring of aquatic nuisance species impacts; potential  
49    invasive risks of genetically modified aquatic plants and fish to Michigan’s aquatic ecosystems and to  
50    aquaculture and sport fishing; capacity-building in Michigan for aquatic nuisance species data and quality  
51    scientific research by promoting data availability and collaboration among agencies, researchers, and industry.

- 1 • Research on impacts of controls (especially chemical controls). Officials wish to research the long term
- 2 costs/benefits and evaluations of the environmental impacts of ANS. They are interested in whether long term
- 3 studies will show the weevil to be an effective milfoil biocontrol, as well as the impacts of control methods on
- 4 water quality and ecosystem stability.







- 1 • Development of an ANS workshop on communication strategies for the 2007 North American Fish and  
2 Wildlife Conference in Portland, OR.  
3

4 **Research Needs**

- 5 • Information on the effects of crayfish on other aquatic species.  
6 • Methods to control crayfish.  
7 • Adequate monitoring and inventories in order to understand the full spectrum of biodiversity in streams  
8 • Monitoring in order to gauge changes and detect species as soon as they appear.







1 **Research Needs**

- 2 • Development of Cooperative Extension education and outreach.
- 3 • Identification of a tamarisk-eating weevil that is effective in the south.
- 4 • Development of more effective herbicides for treating tall whitetop and tamarisk.
- 5 • More information about the effect of chemicals on non-target species (macroinvertebrates and their recovery).
- 6 • More research on other biological controls for invasive species.



1 **Climate Change Actions**

- 2 • NH DES has just expanded the list of prohibited species to include a total of 27 plants. This was done to  
3 account for the northward migration of southern species. NH DES hopes that by listing plants as prohibited,  
4 they will not be circulated in the state through the aquatic plant industry, thereby lessening their likelihood of  
5 introduction through that avenue. Neighboring states to New Hampshire are also following suit.  
6

7 **Research Activities & Information Used**

- 8 • Develop specific strategies for aquatic herbicide use that incorporate plant phenology, water quality, and  
9 treatment timing for optimal, cost-effective, and selective control of variable milfoil.  
10 • Compare and characterize the plant and nematode communities, along with water chemistry and sediment  
11 conditions, associated with variable milfoil in its native range and in New Hampshire lakes, and find possible  
12 plant-nematode association for biological control of variable milfoil.  
13 • Evaluate the effects of chemical and physical properties on variable milfoil, develop an effective monitoring  
14 tool, and determine optimal aquatic habitat for milfoil establishment and growth. Conduct geophysical and  
15 vegetation surveys, water quality sampling, and integrate data.  
16 • Identify lake attributes that influence distribution of native and non-native milfoils. Use multivariate statistics  
17 and logistic regression to determine whether invasive milfoil species are correlated with chemical,  
18 morphological, biological, and spatial characteristics of New Hampshire lakes. Results of this study will  
19 identify classes of lakes that may be susceptible to invasion.  
20 • The Plant Replacement Program works to establish a native, non-nuisance assemblage dominated by low-  
21 growing species. This effort involves both removal of the current dominant milfoil population over a target area  
22 early in the growing season and planting or seeding with the desired species.  
23 • Investigate the effects of water and sediment chemistry, sediment physical properties, number and size of  
24 contiguous wetlands, and watershed geology on variable milfoil abundance or presence/absence.  
25 • NH DES is studying the effectiveness of the herbicide 2-4 D. NH DES did intensive GIS mapping of a lake and  
26 arranged 2-4 D pellets in a consistent manner to target plants exactly where they are growing and to ensure that  
27 the chemical goes directly to the plants. NH DES is monitoring to ensure effectiveness.  
28 • NH DES partnered with Plymouth State University to conduct a research project on the effects of a 2,4-D  
29 treatment on the chemistry, biology, and ecology of a small portion of Squam Lake. Data from pre- and post-  
30 herbicide treatment are included in the study. Data from this study should be released in fall 2007.  
31

32 **Research Needs**

- 33 • Variable milfoil research.  
34 • Chemical and biological control methods.  
35 • Research on the biology and ecology of plants and what makes them invasive, as well as the habitat  
36 characteristics that invasive plants favor.  
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**Climate Change Actions**

(None reported.)

**Research Activities & Information Used**

(None reported.)

**Research Needs**

- Research on the upper temperature tolerance of fish, impact of varying degrees of water quality on fish, the mechanisms through which non-native trout out-compete or displace native trout; and knowledge about native trout’s life history characteristics.
- More detailed studies on the effects of piscicides on amphibians and mollusks, particularly the early life stages of tadpoles and aquatic insects.
- Method for field detection of antimycin in streams.
- Research on antimycin’s persistence time in waters of different qualities.
- Continue statewide surveys for non-native crayfish to develop a database and synthesize results for directing management strategies.
- Conducting research on the effects of non-native crayfish on aquatic ecosystems.
- Investigate influences of atmospheric conditions on golden algae blooms.
- Expand statewide survey of amphibians for chytrid fungus.



- 1 • **Zebra Mussel Monitoring in Eaton Brook Reservoir and Downstream Tributaries, FL-LOWPA -**  
2 **Madison County Planning Department.**
- 3 • **Monitoring and Research, FL-LOWPA - Steuben County Soil and Water Conservation District, in**  
4 **cooperation with Cornell University Experimental Ponds Program.** The district is conducting research on  
5 the presence and impact of the European aquatic moth (an exotic species that feeds on Eurasian watermilfoil).
- 6 • **The Milfoil Project (Weevil Control Program), Lake Bonaparte Conservation Club.** The club is  
7 conducting milfoil control using weevils.
- 8 • **Milfoil Control, Upper Saranac Lake Foundation.** The town contracted with divers to hand-pull milfoil in  
9 the Upper Saranac Lake.
- 10 • **Research, Cornell University – Research Ponds Facility.** Researchers are monitoring and managing aquatic  
11 plant communities throughout the northeast and New York State and demonstrating physical, biological and  
12 chemical control methods for aquatic nuisance species.
- 13 • **Research, Cornell University – Aquatic Research Facility.** Researchers are contributing to a 50+ year long-  
14 term data set on Oneida Lake, New York that includes information on invasives and an aquatic foodweb  
15 ranging from nutrients to top predators. An experimental facility examines foodweb impacts of New York  
16 invasives in research settings ranging from small scale aquaria to large scale mesocosms.
- 17 • **Water Chestnut Control, State University of New York Oneonta Biological Field Station in cooperation**  
18 **with state agencies, nongovernmental organizations, and private stakeholders.** Focus on nutrient export  
19 associated with control activities.
- 20 • **Japanese Knotweed Initiative, Delaware River Invasive Plant Partnership (DRIPP).** DRIPP develops  
21 educational brochures and works with local community volunteer sites to provide best scientific guidelines and  
22 demonstration control sites (showcasing repeated cutting to keep knotweed under control and prevent it from  
23 spreading).
- 24 • **Japanese Knotweed Study, New York City Department of Environmental Protection, in conjunction with**  
25 **Green County Soil and Water Conservation District.**
- 26 • **Delaware River Invasive Plant Partnership, States of Delaware, New Jersey, New York, and**  
27 **Pennsylvania.**

28  
29 **Climate Change Concerns**

- 30 • With climate change, purple loosestrife could move further north, where biocontrol insects may not survive.  
31 The range of plants and insects may shift and southern invasive species could move into New York.
- 32 • Water hyacinth is sold all over the state. Currently, it does not survive the winter in New York. However, this  
33 could change with climate change.
- 34 • Climate change could cause changes in the native vegetation and, depending on the rate at which that happens,  
35 could lead to more pest problems.

36  
37 **Climate Change Actions**

38 (None reported.)  
39

40 **Research Activities & Information Used**

- 41 • Comparing the dynamics of decomposition for invasive weeds (*Phragmites*) and native cattails (*Typha*) to  
42 determine the benefit of restoration efforts.
- 43 • Examining how nutrient level changes and exotic mussels affect the Lake Erie food web and fish community.
- 44 • Developing a genetic probing technique to quickly screen water samples for zebra mussel veligers.
- 45 • Studying role of embayments and inshore areas as nursery grounds for alewife and other species.
- 46 • Assessing the role of zebra mussels in influencing metal cycling in freshwater ecosystems and evaluating  
47 whether zebra mussels may serve as bioindicators for the presence of toxic metals in freshwater systems.
- 48 • Studying the effects of zebra mussels on the spawning shoals of walleye and lake trout.
- 49 • Japanese knotweed study of treatment and monitoring plots to test 3 control methods: (1) repeated cutting; (2)  
50 herbicide injections; and (3) limited excavation with replanting.
- 51 • Researching aquatic vegetation, biocontrol of Eurasian watermilfoil, and alewife.
- 52 • Identifying a non-herbicide approach for treatment of knotweed.

1 **Research Needs**

- 2 • Research on plants not currently targeted for biocontrol, such as curly-leafed pondweed.
- 3 • More information about how to restore wetlands after the biocontrol.
- 4 • Determine whether biocontrol organisms identified overseas are specific enough for the species that are being
- 5 targeted (Knotweed, Water Chestnut, and *Phragmites*), and whether they can be introduced safely into North
- 6 America.
- 7 • Demonstrate economic and agricultural impacts of invasive species.
- 8 • Information on biocontrol (predators, pests, diseases) for sea lampreys.
- 9 • Research on mussel control methods, especially the quagga mussel.
- 10 • Information about how knotweed affects aquatic species.
- 11



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2 **Research Activities & Information Used**

3 (None reported.)

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5 **Research Needs**

- 6 • More information on the best way to control hydrilla (herbicides vs. grass carp).
- 7 • More information on the biology and ecology of invasive species (i.e. seed longevity) that would help improve
- 8 control methods.











- 1 • Pennsylvania Sea Grant and partners conducted a pilot study on the distribution and sensory biology of the  
2 flathead catfish in order to develop strategies to prevent its spread.  
3

4 **Research Needs**

- 5 • Economic impacts of AIS in Pennsylvania.  
6 • Species-specific control technologies.  
7







- 1 • Monitoring efforts to identify rise in mussel activity.
- 2 • Distribution of information to those that use the water bodies. Outreach and education is currently on a project-
- 3 by-project basis (lack of capacity is a big problem).
- 4 • Understanding of curly leaf pondweed biological impacts on lake ecosystems.
- 5 • Targeted monitoring for ANS presence in lakes throughout South Dakota.
- 6 • Development of a rapid response strategy for ANS detection and management in South Dakota.
- 7 • An overall strategic plan for ANS, extending beyond the responsibilities of SDGFP and which incorporates
- 8 involvement from federal, state, local and private interests throughout the state.
- 9
- 10



1 **Research Activities & Information Used**

- 2 • Investigation of the effects that the western mosquito fish is having on efforts to reintroduce the barrens top  
3 minnow in Western Tennessee. Researchers want to determine the relationship between the two species and  
4 what they can do to alleviate some of the problems.

5

6 **Research Needs**

- 7 • Research on the ozone effects on Barrens Minnow.  
8 • More research on the hemlock wooly adelgid, a potentially problematic species for native hemlock and fish  
9 populations.  
10 • More monitoring.  
11 • Assistance with the current EPA re-registration of antimycin.  
12 • More information on burning as a control method.  
13 • More information on interactions between chemicals and other native animals/plants in the area.



- 1 • Research on evapotranspiration rates for *Arundo donax* and salt cedar, as compared to native vegetation rates.
- 2 • Research on the impacts of *Arundo donax* infestations on channelization and stream fishes.
- 3 • Remote sensing and acreage estimations for *Arundo donax*, salvinia, water hyacinth, waterlettuce, saltcedar, etc.
- 4 • Research on the impacts of Eurasian watermilfoil weevils on *Myriophyllum spicatum* in the Rio Grande.
- 5 • Research on apple snail infestations of Texas rice crops and native riparian vegetation.
- 6 • Evaluation of Chinese tallow control efforts.
- 7 • Research on the impacts of grass carp on the Galveston Bay Ecosystem.
- 8 • Research on the impacts of *Arundo donax* wasps on giant reed populations.
- 9 • Research on the conditions for hydrilla expansion.
- 10 • Monitoring and tracking of aquatic invasive species in freshwater and estuarine systems to facilitate early
- 11 detection and rapid response.
- 12 • Research on the ecological, social, and economic impacts of emerging aquatic invasive species in Texas'
- 13 coastal watersheds, bays and estuaries.
- 14





1 programs; (6) Documenting water quality parameters pertinent to zebra mussel survival; (7) Producing a report  
2 that documents the findings of the Lake Champlain Zebra Mussel Monitoring Program; and (8) Maintaining the  
3 Lake Champlain Zebra Mussel Monitoring Program website.

- 4 • **Lake Champlain Basin Aquatic Nuisance Species Management Plan, VT DEC and New York**  
5 **Department of Environmental Conservation, in cooperation with state and federal agencies, regional**  
6 **bodies, and nongovernmental organizations.** The plan focuses on facilitating the coordination of ANS  
7 management efforts, providing opportunities for federal cost sharing, and implementation.

### 8 9 *Climate Change Concerns*

10 (None reported.)

### 11 12 *Climate Change Actions*

13 (None reported.)

### 14 15 *Research Activities & Information Used*

- 16 • Research continues to develop new non-chemical control methods to reduce reliance on lampricides.

### 17 18 *Research Needs*

- 19 • Research is needed on the following: current distribution of specific species; specific impacts of ANS on  
20 ecosystems and native species; economic impacts of ANS; appearance of *Phragmites* where beetles have  
21 reduced the presence of purple loosestrife; impacts of ANS in other states and effectiveness of control  
22 programs; time and resources needed to review applications and monitor for new aquatic species; sea lamprey  
23 control technology; using pheromones to lure lampreys; and densities of mussels throughout its life stages and  
24 the effect of filtering on plankton populations.

25





1 the Puget Sound Council develop a two-year plan and budget to protect and restore Puget Sound, including  
2 actions to prevent and control invasive aquatic plants and animals. The plan and budget became part of the  
3 Governor’s budget to fund activities in the Puget Sound basin.

- 4 • **Invasive Species Council.** The 2006 Legislature created this policy level Council to coordinate among state  
5 agencies on aquatic and terrestrial invasive species issues. The Office of the Interagency Committee staffs this  
6 Council. The Council will prepare a long range strategy for managing invasive species in the state.

### 7 8 *Climate Change Concerns*

- 9 • Climate change will likely expand the range of some of AIS.

### 10 11 *Climate Change Actions*

12 (None reported.)

### 13 14 *Research Activities & Information Used*

- 15 • Ecology is funding the University of Washington to conduct research into the sub-lethal impacts of aquatic  
16 herbicides on salmonids.
- 17 • Washington State University is conducting herbicide field trials for parrot feather, yellow flag iris, and hairy  
18 willow-herb.

### 19 20 *Research Needs*

- 21 • Information on the types of legislation that may be enacted and on possible funding sources. For example, a  
22 state that wants to take a pathway approach for recreational watercraft could benefit from a list of programmatic  
23 approaches and a list/summary of state laws, so that states can understand their options.





1 **Climate Change Concerns**

- 2 • Over the next century many species found in northern Illinois could survive in Wisconsin. New species may  
3 take over with any shift in climate, particularly if native species cannot adapt. Fish are especially vulnerable.  
4 For example, trout have a narrow tolerance range for temperature; if the temperature in headwater streams rises  
5 by three to five degrees, those trout may be threatened and niches may open up for AIS such as Asian carp.  
6

7 **Climate Change Actions**

- 8 • John Magnuson, Emeritus Professor at the Center for Limnology, has been funded to study climate change  
9 impacts.  
10

11 **Research Activities & Information Used**

- 12 • Studies have been conducted on biocontrol (native beetles) for Eurasian Watermilfoil.  
13 • Pilot tests have been conducted on a dozen or more lakes to lessen the impact from AIS.  
14 • Database management captures all monitoring data and watercraft inspection. Research on building a  
15 system is ongoing.  
16 • Model predictions are being conducted to determine which lakes are more vulnerable to AIS.  
17

18 **Research Needs**

- 19 • Research on hybrid watermilfoil. WDNR has discovered a hybrid of Eurasian watermilfoil (a cross between  
20 Eurasian and northern milfoil) and associated implications regarding control methods. The effects of chemicals  
21 on the hybrid are not fully understood. Research on the physical identification of the hybrid strains would also  
22 be useful. Because hybrids closely resemble Eurasian watermilfoil, currently the only way to identify is  
23 through genotyping, which is very expensive. Research on the origin of the hybrid would also assist in  
24 understanding how it is generated.  
25 • Research on infestation. Determining how to predict which waters would be most vulnerable to infestations by  
26 AIS would help focus monitoring efforts. For instance, low calcium and Ph levels can hinder establishment and  
27 reproduction of zebra mussels.  
28 • Management research on successful rapid response methods, i.e., trapping out crayfish to allow native species  
29 to rebound, control of rainbow smelt by dumping in more walleyes, and introducing bass to control crayfish.

