

Appendix A

Aquatic Invasive Species Programs and Activities: 50-State Summary

Methods

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

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

3
4 **AIS Management Plan**

5 Plan under development.

6
7 **AIS Programs & Activities**

- 8 • **Aquatic Plant Management Control Program, Alabama Department of Conservation & Natural**
9 **Resources (DCNR) - Division of Wildlife and Freshwater Fisheries (DWFF) and U.S. Army Corps of**
10 **Engineers - Mobile District.** The program conducts surveys to determine presence of aquatic nuisance plants
11 and control for aquatic nuisance plants using herbicides.
- 12 • **Private Waters, Alabama DCNR - DWFF.** The program provides technical guidance to private pond owners
13 for aquatic nuisance species removal.
- 14 • **Mobile Bay National Estuary Program, Alabama-Mississippi Rapid Assessment Team (AMRAT).** This
15 program conducts a 3-5 day survey of all aquatic invasive species present in the coastal waters of Alabama and
16 Mississippi to establish a baseline. It was launched in 2003 with 50 scientists surveying Mobile Bay and targets
17 the Mississippi Sound and adjacent waters. The 2004 survey was conducted by more than 100 scientists from
18 about 26 organizations and constituted the largest rapid assessment of living resources ever held in the Gulf of
19 Mexico.

20
21 **Climate Change Concerns**

- 22 • A lack of a cold winters in recent years has allowed invasive plants and fish (e.g., Nile tilapia) to overwinter and
23 move farther north than before, which may or may not be attributed to climate change.

24
25 **Climate Change Actions**

26 (None reported.)

27
28 **Research Activities & Information Used**

- 29 • In determining where to undertake control work, the DCNR-DWFF looks for areas with significant impacts to
30 fisheries, as well as detrimental impacts to boating access and angler usage.
- 31 • Identification of areas to survey is based on prior knowledge of areas with plant problems.

32
33 **Research Needs**

- 34 • More effective herbicides, with better long-term control.
- 35 • More information and an enhanced strategy for emergent control.
- 36 • Experts on non-native species to conducts surveys, as well as funds to secure their services.

SUMMARY OF AQUATIC INVASIVE SPECIES MANAGEMENT

ALASKA

AIS Management Plan

Aquatic Nuisance Species Management Plan (2002). The plan, developed by the Alaska Department of Fish and Game, includes six management goals: (1) Coordinate all ANS Management Programs in Alaska and collaborate with regional, national, and international programs; (2) Prevent the introduction of new ANS into Alaska waters; (3) Detect, monitor, contain, reduce, or eradicate populations of ANS as quickly as possible with minimum environmental impact; (4) Educate the public and appropriate resource user groups about the importance of preventing ANS introductions and how the harmful impacts of ANS can be reduced; (5) Identify, develop, conduct, and disseminate research on ANS of concern in Alaska; and (6) Take appropriate steps to ensure that federal and state regulations promote the prevention and control of ANS. The plan includes actions for Atlantic salmon management, green crab management, as well as additional preventative projects.

Alaska also has a Statewide Invasive Pike Plan. This plan will be updated during fiscal year (FY) '07 or FY '08.

AIS Programs & Activities

- **Kenai Peninsula Cooperative Weed Management Area, Homer Soil and Water Conservation District (SWCD), Alaska SWCD, and Kenai SWCD.** The SWCDs have established an advisory board and listed priorities for the Weed Management Area.
- **Noxious and Invasive Plant Program, Upper Susitna SWCD.** This program targets the local airport to prevent the transport (airplanes, luggage, and shoes) and spread of Orange hawkweed. Other activities include herbicide application and volunteer weed pulling in cooperation with the University of Alaska-Fairbanks' Cooperative Extension Service.
- **Weed Ranking Program, Alaska Natural Heritage Program, University of Alaska, Anchorage – Environmental and Natural Resources Institute.** The Alaska Natural Heritage Program, in cooperation with other federal and state agencies, developed the Weed Ranking Project, which lists and ranks non-native plant species.
- **Alaska Exotic Plant Information Clearing House (AKEPIC) Mapping Project, Alaska Natural Heritage Program, University of Alaska, Anchorage – Environmental and Natural Resources Institute.** The Alaska Natural Heritage Program also partners with USDA Forest Service - State and Private Forestry, National Park Service, and the U.S. Geological Survey - Alaska Science Center on the AKEPIC. The AKEPIC draws much of its information from surveys, includes cooperative weed management areas, and a rapid response program.
- **Alaska Committee for Noxious and Invasive Plants Management, University of Alaska, Fairbanks – Cooperative Extension Service.** This committee was established in 2003 to encourage and work towards a coordinated statewide effort to prevent and manage invasive and noxious species. It also works to improve awareness on the problems associated with invasive species.
- **Alaska Invasive Species Working Group.** This group was formed in 2006 to work towards an all-taxa, statewide invasive species cooperative effort. Members include state, federal, non-governmental organizations, and Alaska Native organizations. The group is currently working on an Alaska Invasive Species Needs Assessment.
- **Northern Pike Education Program, Alaska Department of Fish and Game (ADFG) – Sport Fish Division.**
- **Kachemak Bay Research and Reserve Green Crab Community Monitoring Program, Prince William Sound Science Center, ADFG, National Oceanic and Atmospheric Administration, and local communities.** This program provides a protocol for school children to learn the biology of green crabs in order to do monitoring work.

Climate Change Concerns

- Alaska's ANS plan predicts an increase in invasive species as warmer temperatures allow overwintering. Species of concern include the mitten crab, yellow perch, and walleyed pike.
- The state is conducting a risk assessment study for mitten crab because climate change will most likely result in the arrival of this species.
- Although it has not yet occurred, temperatures have warmed to the point where shellfish could survive through the winter, resulting in a shellfish outbreak.

- 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 **SUMMARY OF AQUATIC INVASIVE SPECIES MANAGEMENT**
2 **ARIZONA**
3

4 **AIS Management Plan**

5 Plan under development. The development of an invasive species management plan has been recommended by an
6 Arizona Invasive Species Council, which is chartered by Governor Napolitano and co-chaired by the Arizona Game
7 and Fish Department and the Arizona Department of Agriculture. An aquatic nuisance species plan and
8 communication strategy has been drafted and is awaiting finalization.
9

10 **AIS Programs & Activities**

- 11 • **Invasive Species Council, Arizona Game and Fish Department (AZGFD) and Arizona Department of**
12 **Agriculture (AZDA).** The council conducts a "Stop Aquatic Hitchhikers Program" and works with 100th
13 Meridian to inform watercraft operators/owners and marina operators to take proper precautions. The Council
14 also conducts monitoring.
- 15 • **Giant Salvinia Removal on the Colorado River, U.S. Department of Agriculture (USDA), Arizona, and**
16 **Colorado.** Research and development of USDA biocontrol using weevils (not yet implemented). Under a
17 statewide policy, landowners are required to deal with infestations themselves—agencies do not partake in
18 control activities. These efforts are coordinated through the Giant Salvinia Task Force.
- 19 • **Giant Salvinia Task Force, U.S. Bureau of Land Management, US Bureau of Reclamation, U.S. Fish and**
20 **Wildlife Service, Arizona Game and Fish Department, Arizona Department of Agriculture (ADA),**
21 **California Department of Fish and Game, California Department of Food and Agriculture, Palo Verde**
22 **Irrigation District, and others.** One of 20 statewide weed management area groups, each is responsible for a
23 particular region, where they implement control efforts. This particular task force has used intensive inventory,
24 mechanical control, and herbicide application since 2001. Biological control (Salvinia weevils) was
25 implemented in 2004 and has been followed by supplemental releases. An early detection/rapid response
26 program is in place for other exotic plants (a rapid response was undertaken recently for water hyacinth). The
27 Task Force works closely with the State Department (IBWC) and Mexico.
- 28 • **Hydrilla Eradication, ADA.** The ADA and land owners continue treatment of two isolated populations of
29 hydrilla in the Phoenix and Tucson areas as part of the regular enforcement of the state's noxious weed laws.
30

31 **Climate Change Concerns Reported by State Personnel**

- 32 • It is generally accepted that climate has a relationship to the distribution of species, natural or introduced, and
33 that the state needs to anticipate ecosystem changes as a result of changes in water temperature and
34 environmental conditions.
- 35 • The State Wildlife Action Plan recognizes both climate change and invasive species as identified threats.
- 36 • As plant populations increase heavily during the summer, significantly warmer temperatures may generate more
37 plant growth.
38

39 **Climate Change Actions**

- 40 • The "Stop Aquatic Hitchhikers Program" and the 100th Meridian inform watercraft operators/owners and
41 marina operators to take proper precautions.
42

43 **Research Activities & Information Used**

- 44 • Animal and Plant Health Inspection Services (APHIS) has conducted a programmatic environmental assessment
45 for the weevil.
- 46 • USDA has used research from the University of Arizona concerning new attempts at biological control, as well
47 as methods currently used in other countries.
- 48 • U.S. FWS, U.S. Bureau of Reclamation, and AZGFD have sponsored preliminary investigations into genetic
49 biological control.
- 50 • AZGFD and AZDA have conducted some monitoring.
51

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 **SUMMARY OF AQUATIC INVASIVE SPECIES MANAGEMENT**
2 **ARKANSAS**

3
4 **AIS Management Plan**

5 Plan under development.
6

7 **AIS Programs & Activities**

- 8 • **Noxious Weed Programs (Purple Loosestrife, Giant Salvinia, and Water Hyacinth), Arkansas State Plant Board.** The board implements regulations pertaining to invasive species.
9
10 • **Hydrilla Control, State of Arkansas in cooperation with the U.S. Army Corps of Engineers.** At Lake
11 Ouachita, officials are trying to reduce the infestation by providing grass carp as a biological control.
12 • **Arkansas River Study, Arkansas Game and Fish Commission.** Ongoing large river sampling of many
13 species, including Asian carp.
14

15 **Climate Change Concerns**

- 16 • Officials believe that new invasive species will survive the winter and persist in the state. Species already
17 established may be allowed to spread into northern areas.
18 • Invasive species may enter the state as a result of increased interstate commerce and boating.
19

20 **Climate Change Actions**

- 21 • The state recently enacted regulations targeting water hyacinth due to overwintering concerns.
22 • The state is beginning to formulate a state ANS plan, and will include measures that consider warming
23 temperatures.
24 • Regulation of the aquaculture industry.
25

26 **Research Activities & Information Used**

- 27 • Purple loosestrife surveys.
28 • Giant salvinia surveys.
29 • Monitoring of zebra mussels, hydrilla, and Asian carp, as well as documentation of the occurrence and
30 magnitude of the infestation.
31

32 **Research Needs**

- 33 • Information on the Asian carp, including its abundance, impacts, and pathways.
34 • Information on zebra mussels, including their impacts and pathways.
35 • Information about species that may potentially enter the state as a result of interstate commerce.

SUMMARY OF AQUATIC INVASIVE SPECIES MANAGEMENT CALIFORNIA

AIS Management Plan

Plan under development.

AIS Programs & Activities

- **Aquatic Pest Control Program, California Department of Boating and Waterways (CDBW).** This Program focuses on control of water hyacinth, *Caulerpa taxifolia*, and *Egeria densa*. The CDBW also uses annual hyperspectral aerial survey to monitor changes in infestations over time. The CDBW uses short and long term methods of water hyacinth control, involving chemical, mechanical and biological control measures. The department also works with the California Department of Fish and Game on *Caulerpa* eradication efforts in southern California under the direction of the Southern California Caulerpa Action Team. Officials are also trying to educate aquarium owners on *Caulerpa*. The *Egeria densa* Control Program for the Delta focuses mainly on herbicide control.
- **Hydrilla Eradication Program, CDFA Integrated Pest Control Branch.** The program conducts annual surveys and eradication efforts for hydrilla. Eradication consists of physical, biological, and chemical methods.

Climate Change Concerns

- Aquarium owners as vectors for *Caulerpa* spread.
- Increased interstate transport.

Climate Change Actions

- Using annual hyperspectral aerial survey to monitor changes in infestations over time.
- Educating aquarium owners about *Caulerpa*.
- Implementing prevention methods including quarantine regulations, inspection program to ensure compliance with quarantine regulations, and border inspection stations to screen incoming traffic.
- Working to detect invasive species using insect traps, manual inspections for exotic weed species, and/or surveys to determine size and boundaries of population.

Research Activities & Information Used

- Using annual hyperspectral aerial survey to monitor changes in infestations over time.
- Surveying annually for hydrilla.
- Monitoring invasions with insect traps and manual inspections.

Research Needs

- Additional research on the biology/DNA of *Caulerpa* and how it would adapt in Southern California, as well as research on eradication methods. Officials would also like to undertake greater surveillance.
- Additional outreach and public education regarding *Caulerpa*. Individuals (hobbyists) need to learn how to handle *Caulerpa* (it is important to teach people how to look out for it in the natural environment).

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

3
4 **AIS Management Plan**

5 No plan available.
6

7 **AIS Programs & Activities**

- 8 • **Aquatic Plants Management Program, Colorado Department of Agriculture (CDA).** The program
9 operates several projects throughout the state. Work consists of some manual removal and chemical treatments.
10 Presently, the focus is on the Rio Grande Watershed, upper part of Colorado River, North Platte River, San
11 Miguel River, and the Republican River watershed. (The main coordinator for the San Miguel Project is The
12 Nature Conservancy.) There are also control efforts under way for Siberian Elm, including mechanical
13 removal, herbicide application, and cut stump treatment. There are plans to implement biological control for
14 tamarisk as well.
15 • **Biocontrol of Tamarisk, CDA.** The Department’s Insectary in Palisade, Colo., is the clearinghouse for the
16 project. Officials are working in collaboration with USDA and Colorado State University to release beetles in
17 Colorado, Wyoming, South Dakota, Montana, Oregon, Kansas and Idaho to control tamarisk. About 60,000
18 tamarisk leaf beetles have been released in seven states with additional releases planned. In August 2005,
19 beetles were released at three Colorado sites: Adams, Mesa and Yuma Counties. In 2006, beetles were released
20 at Dinosaur National Monument in Moffat County and several additional sites in Colorado and the West.
21 • **Aquatic Animal Management Program, Department of Natural Resources – Division of Wildlife**
22 **(CDOW).** Major activities of the Division on aquatic invasive species include: (1) angler education; (2)
23 hatchery maintenance; (3) activities to detect location of New Zealand mud snails (NZMS); and (4)
24 participation in the Western Regional Panel of the Aquatic Nuisance Species Task Force. Colorado State Parks
25 is cooperating with CDOW by providing them with GIS/GPS training, ANS mapping access/support and
26 collaborating on various education projects, control methods and statewide planning efforts.
27 • **Eurasian Watermilfoil (EWM) activities, Colorado State Parks.** The Stewardship Section of Colorado State
28 Parks is the central coordinator and GIS clearinghouse for EWM efforts in Colorado. The program is actively
29 working towards several short and long term objectives that include coordination, mapping, data collection,
30 grant writing, planning, early detection/rapid response, partnering with local universities on research, education
31 campaigns, convening stakeholders, studying economic impacts, and implementation of boat washing stations.
32

33 **Climate Change Concerns**

- 34 • Species that can not overwinter in Colorado, such as giant salvinia or water hyacinth, may persist if climate
35 changes occur and water temperatures increase. This depends on whether the water is hot or spring fed and the
36 location of the species within the state.
37

38 **Climate Change Actions**

- 39 • Angler education program focuses on prevention through outreach, including posting angler alert signs at trout
40 fishing locations and live fishing tackle stores.
41 • Hatchery maintenance program ensures that fish production units remain free of invasive species.
42

43 **Research Activities & Information Used**

- 44 • Involvement with the tamarisk biocontrol program. One of the first field sites used to test the biocontrol beetles
45 in North America was located near Pueblo, Colorado. The CDA Insectary has been involved in the project for
46 several years and received a permit to store up to one million beetles for use in biocontrol in 2005.
47 • Weed researchers are studying aquatic invasives, including the use of biocontrol. They are also collaborating
48 with federal agencies such as U.S. Geological Survey.
49 • Maintaining records of the location of newly-discovered species in the inventory program.
50

51 **Research Needs**

52 (None reported—too numerous to note.)

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

3
4 **AIS Management Plan**

5 **Connecticut Aquatic Nuisance Species Management Plan.** Connecticut’s Department of Environmental
6 Protection (DEP), Sea Grant College Program and Institute of Water Resources served as the lead agencies for the
7 development of the plan, in coordination with a diverse array of agencies and organizations. The plan provides a
8 statewide approach for prevention, detection, monitoring, control and management of existing and potential aquatic
9 nuisance species. The plan has been approved by DEP and will be sent to the Federal Aquatic Nuisance Species
10 Task Force for final approval. As of December 2006, Connecticut will be eligible to apply for U.S. Fish and
11 Wildlife funds that may be used to establish an aquatic nuisance species program at DEP.

12
13 **AIS Programs & Activities**

- 14 • **Non-Native Invasive Plant Species Program, Connecticut Department of Environmental Protection**
15 **(DEP).** The program conducts the following activities: (1) Rapid response and eradication of newly-introduced
16 aquatic plants, including water chestnut (the DEP Fisheries Division and Wildlife Division and the Office of
17 Long Island Sound are working with U.S. FWS to carry out eradication projects and surveys); Restoration of
18 coastal habitats, including *Phragmites* control in saltwater tidal marshes; and implementation of a Rapid
19 Response Plan for *Hydrilla verticillata* that was prepared by Wildlife Division staff.
- 20 • **Invasive Plant Council (IPC).** Established in 2003 under state law (CGS Sec. 22a-381), membership includes
21 representatives from state agencies, universities, Invasive Plant Atlas of New England, non-profit conservation
22 groups, and the Connecticut Nurseryman’s Association. To date, a total of 81 non-native invasive plant species
23 have been listed with prohibitions on importation, moving, sale, purchase, transplantation, cultivation or
24 distribution. The IPC is currently working on obtaining funding to create a non-native invasive plant program
25 that will focus on early detection, rapid response, education and prevention.
- 26 • **Wetlands Habitat and Mosquito Management (WHAMM) Program, DEP - Wildlife Division.** The control
27 of *Phragmites australis* has been a major component of recent wetland restoration efforts. In the future, the
28 Wildlife Division hopes to amend regulations to allow aerial application of herbicides for *Phragmites*, which
29 would result in fewer chemicals applied to wetlands and reduce costs by 90%. The WHAMM Program also
30 plans to research new alternative herbicides for *Phragmites* control.
- 31 • **Water Chestnut Harvesting Program, DEP - Fisheries Division and Wildlife Division, Office of Long**
32 **Island Sound Programs, U.S. FWS - Connecticut River Coordinator's Office (Connecticut River**
33 **Fisheries Program).** The program conducts water chestnut management (surveys, removal, education) and
34 monitoring for undiscovered water chestnut populations.
- 35 • **Lakes Management Program, DEP - Bureau of Water Management, Division of Planning and Standards.**
36 The program conducts the following activities: dredging of Silver Lake in Meriden/Berlin to hinder growth of
37 Eurasian watermilfoil; funding to control variable watermilfoil in Bashan Lake with 2-4D; spot-treatment of
38 Eurasian watermilfoil with limited amounts of herbicides; inventory and vegetation surveys of aquatic invasive
39 plants, including listing of management options; partnerships with communities to perform winter draw down,
40 dredging, weed harvesting, and herbicide use.
- 41 • **Invasive Plant Atlas of New England (IPANE), New England Wildflower Society (NEWS), University of**
42 **Connecticut, Silvio O. Conte National Fish and Wildlife Refuge.** The Invasive Plant Atlas of New England
43 (IPANE)’s mission is to create a comprehensive web-accessible database of invasive and potentially invasive
44 plants in New England that will be continually updated by a network of professionals and trained volunteers.
45 The database will facilitate education and research that will lead to a greater understanding of invasive plant
46 ecology and support informed conservation management. An important focus of the project is the early
47 detection of, and rapid response to, new invasions.
- 48 • **Connecticut Sea Grant College Program, Sea Grant, University of Connecticut.** The program is: working
49 with Connecticut and New York agencies and organizations to develop an ANS Management Plan for the Long
50 Island Sound; working with DEP to develop a state aquatic nuisance species management plan; conducting
51 outreach and education; participating on the Northeast Aquatic Nuisance Species regional panel; and supporting
52 research on red alga (*Grateloupia turururu*), colonial tunicate (*Didemnum sp*), baitworms and associated
53 packing materials; and the economic impact of fouling organisms on marine aquaculture operations.

- 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 **SUMMARY OF AQUATIC INVASIVE SPECIES MANAGEMENT**
2 **DELAWARE**

3
4 **AIS Management Plan**

5 No plan available. (The state’s invasive species management plan includes small section on AIS, in addition to
6 terrestrial species.)
7

8 **AIS Programs & Activities**

- 9 • **Survey and inventory of aquatic vegetation in Delaware ponds, Department of Natural Resources and**
10 **Environmental Control (DNREC) – Division of Fish and Wildlife (DFW).** This program has two
11 components: (1) control of aquatic nuisance species in public ponds, and (2) survey and mapping of aquatic
12 vegetation in public ponds (invasive and rare species). Species surveyed and mapped range from open water
13 species to the emergent shoreline vegetation. The department uses the maps to calculate the acreage figures,
14 which can be used to document the species changes over time.
- 15 • **Delaware Landowner Incentive Program (DELIP), DNREC – DFW.** DELIP provides grant assistance to
16 private landowners for habitat restoration, including invasive species control projects.
- 17 • **Phragmites Control Program, DNREC – DFW.** The program uses helicopter application of herbicides to
18 control *Phragmites* in state wildlife areas and private lands (cost-share arrangement between landowners and
19 the state).
- 20 • **Technical assistance to pond owners, DNREC – DFW.** The division provides assistance with invasive weed
21 control, including recommendations on herbicides, manual control, or biocontrol and dissemination of best
22 management practices such as riparian buffer strips and nutrient control.
- 23 • **Delaware Invasive Species Tracking System, Delaware Natural Heritage Program, Delaware Invasive**
24 **Species Council, and U.S. Geological Survey – Leetown Science Center.** The system is a prototype for
25 invasive species reporting and tracking. The goal is to develop an online tool for mapping and cataloging
26 locations of invasive species in the state.
- 27 • **Wildlife Habitat Incentives Program, USDA Natural Resources Conservation Service and DNREC.** This
28 is a cost share program for private landowners who control *Phragmites* on their property. The DNREC
29 provides a share of the cost (30 percent) and conducts the spraying. The USDA and the landowner also provide
30 shares of the cost (58 percent and 12 percent, respectively).
- 31 • **Delaware River Invasive Plant Partnership, States of Delaware, New Jersey, New York, and**
32 **Pennsylvania.**

33
34 **Climate Change Concerns**

35 (None reported.)
36

37 **Climate Change Actions**

- 38 • DNREC surveys and maps species ranging from open water to emergent shoreline vegetation. The department
39 uses maps to calculate the acreage figures, which can be used to document species changes over time.
40

41 **Research Activities & Information Used**

- 42 • The Delaware Invasive Species Tracking System is being developed as an online tool for mapping and
43 cataloging locations of invasive species within the State of Delaware.
- 44 • DNREC conducts surveying and mapping of aquatic vegetation in the ponds (invasive and rare species).
45

46 **Research Needs**

- 47 • Map of areas with high populations of invasive species.
- 48 • Watershed approach in working with landowners in order to better prevent invasive species spread.
- 49 • A database of effective control methods for invasive species.

1 **SUMMARY OF AQUATIC INVASIVE SPECIES MANAGEMENT**
2 **FLORIDA**
3

4 **AIS Management Plan**

5 Plan under development. (An online citizen’s guide is available at
6 <http://www.dep.state.fl.us/lands/invaspec/2ndlevpgs/Aquaticplnts.htm>).
7

8 **AIS Programs & Activities**

- 9 • **Aquatic Plant Management Program, Florida Department of Environmental Protection (FL DEP),**
10 **Bureau of Invasive Plant Management.** The program designs, funds, coordinates, and contracts invasive non-
11 native aquatic plant control efforts in Florida's 1.25 million acres of public waters.
- 12 • **Annual survey for new infestations, FL DEP.** Each year, 16 field biologists, each responsible for a particular
13 region, conduct inventories in all 460 public waterbodies (containing most of the state’s surface water).
- 14 • **Hydrilla maintenance control, FL DEP.**
- 15 • **Plant management services, FL DEP.** Regional biologists are available to provide plant management services
16 such as consultation and guidance to private and public landowners or managers.
- 17 • **Aquatic invasive species control, South Florida Water Management District.** Activities include a weekly
18 treatment schedule and water use restrictions for aquatic herbicides.
- 19 • **Maintenance, Southwest Florida Water Management District (SWFWMD).** Aquatic plants including
20 invasive species are controlled to maintain the flow capacity of flood control systems.
- 21 • **Surface Water Improvement Program (SWIM), SWFWMD.** This restoration project is primarily geared
22 towards preserving or restoring habitat and water quality. As part of restoring the natural hydrology of certain
23 wetlands, the district plants a number of upland and aquatic native plants and also manages invasive plants in
24 estuarine areas and lakes.
- 25 • **Mitigation Program, Florida Department of Transportation (FL DOT) and SWFWMD.** FL DOT funds a
26 wetland mitigation program to compensate for road construction damage. The program involves preservation
27 and restoration of native habitats, including invasive plant management and replanting of native vegetation.
- 28 • **Aquatic Plant Control (APC) Program, US. Army Corps- Jacksonville District.** This is a cost-share
29 program with the state for control efforts in public water bodies.
- 30 • **Non-Native Fisheries Laboratory / Non-Native Fish Research Lab, Florida Fish and Wildlife**
31 **Conservation Commission.**
32

33 **Climate Change Concerns**

- 34 • Climate change may cause more hurricanes, which decreases the likelihood for hydrilla to grow. Significant
35 amounts of rain and floodwater hinder the growth of hydrilla due to resulting reduced sunlight.
36

37 **Climate Change Actions**

- 38 • An annual inventory may allow the state to observe and understand changes in invasive species populations
39 over time.
40

41 **Research Activities & Information Used**

- 42 • The Non-Native Fish Research Lab is responsible for assessing the role of 32 exotic fishes with reproducing
43 populations in Florida as of January 2003. These fish include the illegally introduced walking catfish and
44 swamp eel from Southeast Asia, tilapia from Africa, the Mayan cichlid from Central America, and the legally
45 introduced butterfly peacock from South America.
46

47 **Research Needs**

- 48 • Information to improve the efficacy of herbicides and timing of treatments.
- 49 • Further investigation of selectivity issues. The SWFWMD tries to be as selective as possible in targeting
50 invasive plants and protecting/promoting the recovery of native plant communities by adjusting the timing of
51 treatments, application rates, and treatment techniques to maximize treatment selectivity.

1 SUMMARY OF AQUATIC INVASIVE SPECIES MANAGEMENT
2 GEORGIA

3
4 ***AIS Management Plan***

5 Plan under development.

6
7 ***AIS Programs & Activities***

- 8 • **AIS management activities, Georgia Department of Natural Resources (DNR) - Wildlife Resources Division, Fisheries Management.** The department responds to problematic invasive species with monitoring, containment, and removal. Giant salvinia, a primary problem, is being controlled with chemical treatments. Apple snail control and management includes surveys, destroying egg masses, and initiation of a apple snail task force in December 2005.
- 9
10
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12
- 13 • **Rice eels management, DNR - Wildlife Resources Division, Fisheries Management; University of Georgia; U.S. Fish and Wildlife Service; and National Park Service.** Officials have been periodically surveying for the eel since its discovery in the late 1980s in artificial ponds at a nature center. The surveys in these ponds have occurred once a month since 2004. The next step will be to develop control recommendations.
- 14
15
16
17
- 18 • **Flathead catfish control program.** In 2006 the Georgia legislature allocated funding to control and manage invasive flathead catfish in Georgia. The increase in funding allowed for a fisheries biologist and two fisheries technicians to be hired to work on eradication and control methodologies.
- 19
20
- 21 • **Survey of lakes and reservoirs, Georgia Power (a regional utility) and DNR - Wildlife Resources Division, Fisheries Management.** Georgia Power surveys its lakes and reservoirs three to four times a year for aquatic invasive plants and applies spot treatments of herbicides when they are found. DNR assists with these activities.
- 22
23
24
25

26 ***Climate Change Concerns***

- 27 • Climate change is a potential threat to apple snail control efforts. If climate change results in warmer temperature at higher latitudes, the snail may have the potential to expand its habitat.
- 28
29

30 ***Climate Change Actions***

31 (None reported.)

32
33 ***Research Activities & Information Used***

34 (None reported.)

35
36 ***Research Needs***

- 37 • Interstate communication to prevent travel across borders with illegal exotic species.
- 38 • Access to taxonomists to correctly identify and learn about species.
- 39 • Official state program on invasive species that includes a systematic control approach and organized response.
- 40 • Development of better ways of communicating with the public about invasive species.
- 41 • More information about control and capture methods and the ecological impacts of invasive species.
- 42 • More herbicide options and ways to expedite the registration process for new herbicides.
- 43 • Investigation of human dimension of ANS introductions (i.e. intentional actions such as aquarium dumping, sticking or relocation and unintentional actions such as escapes of water garden species or use of invasives in landscaping and ornamental projects).
- 44
45
- 46 • Evaluation of the effectiveness of ANS outreach and education efforts as a means of modifying behavior (i.e. decreased releases and increased reporting).
- 47
- 48 • Evaluation of ecological and economic impacts of invasive non-native aquatic plant species in Georgia.
- 49 • Biological or alternative control methods for flathead catfish in south Georgia.
- 50 • Efficacy of containment, control or eradication activities for Asian swamp eels.
- 51 • Early detection and surveillance plans coupled with response protocols.

- 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

SUMMARY OF AQUATIC INVASIVE SPECIES MANAGEMENT HAWAII

AIS Management Plan

Aquatic Invasive Species Management Plan (2003). The plan was developed by the Hawaii Invasive Species Council (HISC) and the Department of Land and Natural Resources (DLNR) - Division of Aquatic Resources (DAR). The purpose of the plan is to develop a comprehensive statewide invasive species prevention and control program. Five working groups have been established under the HISC: (1) Interagency Working Group; (2) Working Group on Pests Not Present in Hawaii; (3) Working Group on Established Pests; (4) Resources Working Group; and (5) Public Outreach Working Group. The management plan highlights three incipient invasive species projects: (1) addressing alien algae in Oahu Harbor; (2) removing small isolated groups of mushroom anemone; and (3) eradicating snowflake coral on commercial piers in Kauai. Research and control activities are taking place through a partnership between The Nature Conservancy, the University of Hawaii, and DNLR to use a super sucker vacuum to remove algae biomasses in Kaneohe Bay (Oahu), to implement a vacuum technique and hand removal methods at Koloa Honokohau Historical Park to remove prickly seaweed, and develop a project to remove an invasive sponge from Kaneohe Bay (and other major harbors).

AIS Programs & Activities

- **Aquatic Invasive Species Response Team, DLNR– DAR.** The Team conducts the following activities (often in partnership with other agencies, universities, and organizations): surveys on Lake Wilson for *Salvinia molesta*; control of Gorilla Ogo Algae; snowflake coral control, *Actinodiscus sp.* control, mapping the distribution of invasive algae statewide; participating in hull fouling surveys of vessels traveling to the Northwest Hawaiian Islands Marine Sanctuary.
- **Coordinating Group for Alien Pest Species (CGAPS), multi-agency partnership.** This coordinating body facilitates communication among agencies, conducts public outreach, and increases awareness through various media campaigns. A marine outreach specialist has coordinated eight public clean-up events to manually remove the invasive algae *Gracilaria salicornia* on Waikiki Beach.
- **Invasive Species Committees (ISCs) for island-based rapid response.** The ISCs are voluntary partnerships of private groups, government agencies, non-profit organizations, and concerned individuals working to protect each island from the negative impacts caused by invasive species. The overall goal of the ISCs is to prevent, eradicate or control priority incipient invasive plant and animal species that threaten Hawaii’s most intact federal, state, and private conservation lands. ISCs are almost exclusively terrestrial based and are not involved in most AIS programs.
- **Plant Quarantine Branch, Department of Agriculture – Plant Industry Division.** This Division works with community groups who help to police the Central Oahu Lake by manually removing plants, or by spot spraying using Aquamaster.
- **Hawaiian Ecosystems at Risk (HEAR), Hawaii Cooperative Studies Unit (HCSU), U.S. Geological Survey (USGS).** This project provides internet technology, methods, and information to decision-makers, resource managers, and the general public to help support effective science-based management of harmful non-native species in Hawaii and the Pacific. Currently funded by the National Biological Information Infrastructure/Pacific Basin Information Node through USGS/Pacific Islands Ecosystem Research Center.
- **Aquatic Invasive Species Advisory Group.** Works with the DLNR/ DAR AIS Coordinator to help set priorities in AIS management. It is composed of members of federal, state and other organizations involved in AIS issues.

Climate Change Concerns

- Climate change is linked to the increase in mosquito populations (which have an aquatic life stage), which reduces the population of local forest birds.
- Increased levels of greenhouse gases may negatively impact corals. A recent study conducted by a coral reef biologist from the Hawaii Institute of Marine Biology found that coral does not produce as much calcium carbonate under increased levels of carbon dioxide.

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 **SUMMARY OF AQUATIC INVASIVE SPECIES MANAGEMENT**
2 **IDAHO**

3
4 **AIS Management Plan**

5 Plan under development. (Idaho's Invasive Species Council is currently developing a state plan.)
6

7 **AIS Programs & Activities**

- 8 • **Noxious Weeds Program, Idaho State Department of Agriculture (ISDA) – Cooperative Weed**
9 **Management Area.** A Cooperative Weed Management Area (CWMA) is a distinguishable hydrologic,
10 vegetative, or geographic zone based upon geography, weed infestations, climatic or human-use patterns.
11 CWMA's are formed when the landowners and land managers of a given area come together and agree to work
12 cooperatively to control weeds. Idaho has 40 CWMA's, which are part of the ISDA cost-share program (the
13 majority of the funding comes from federal sources). There are currently several cost-share participants that are
14 working to deal with aquatic species in Idaho. The ISDA is responsible for administering the CWMA program
15 in Idaho.
- 16 • **Eurasian Watermilfoil Control Program, ISDA.** In response to the continuing economic and environmental
17 crises created by Eurasian watermilfoil in Idaho's waters, the Idaho State Legislature appropriated \$4 million to
18 the ISDA for eradication and control of the aquatic weed. The Legislature directed these funds to be expended
19 over a two-year period beginning July 1, 2006, and ending June 30, 2008.
- 20 • **Invasive Species Council, Governor's Office.** The Idaho Invasive Species Council was established by a
21 Governor's Executive Order in 2001. This Council is completing an inventory of Eurasian watermilfoil and
22 conducting a public awareness campaign for boaters. The Invasive Species Coordinator is housed within ISDA.
- 23 • **Eurasian Watermilfoil Task Force, Invasive Species Council.** The Eurasian Watermilfoil Task Force was
24 formed in 2002 to assist the Council in surveys and other Eurasian Watermilfoil activities. The major activities
25 of the Task Force include: (1) physically surveying all waters in the state; (2) developing a survey for all
26 counties to prioritize actions and activities based on susceptibility factors; (3) engaging in multiple research
27 projects with the University of Idaho (including research on control technologies; and (4) researching different
28 herbicide combinations and exploring the use of new products.
- 29 • **Purple Loosestrife Control Efforts, University of Idaho.** This effort uses biological control for purple
30 loosestrife. Also, outreach programs both distribute insects (~40,000 distributed) and educate land managers on
31 how to use them.

32
33 **Climate Change Concerns**

- 34 • There are some programs that have discussed climate change.
35 • In conducting the initial assessment for the Aquatic Invasive Species Action Plan, officials considered latitude,
36 longitude, temperature bands, elevation, and rainfall.
37

38 **Climate Change Actions**

39 (None reported.)
40

41 **Research Activities & Information Used**

- 42 • Genetic analysis of *Myriophyllum* species and potential hybrids in Idaho.
43 • Physical surveys and mapping.
44 • Northern Idaho lake surveys to determine the densest areas of Eurasian watermilfoil. These are then targeted
45 with appropriate control methods. The less-dense areas are targeted by divers using hand-pulling techniques
46 (removal of plants by the roots followed by vacuuming).
47

48 **Research Needs**

- 49 • Information on biological control methods is needed. This may require visits to the country of origin to
50 examine the species under consideration.
51 • Reliable and continual funding.
52 • Effective controls based on population size and the presence of other species.

- 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 **SUMMARY OF AQUATIC INVASIVE SPECIES MANAGEMENT**
2 **ILLINOIS**

3
4 *AIS Management Plan*

5 State Comprehensive Management Plan for Aquatic Nuisance Species (1999).
6

7 *AIS Programs & Activities*

- 8 • **Permanent Electric Dispersal Barrier, Illinois Department of Natural Resources (IDNR).** This barrier was
9 initially designed to stop the round goby, but is now being used to target other fish such as the big head silver
10 carp.
11 • **Evaluation of Barriers, IDNR - Illinois Natural History Survey (INHS).** This effort involves an evaluation
12 of barriers to prevent the spread of bighead carp into the Great Lakes. Assessment of multiple barrier
13 components, including sonic technology, bubble arrays, and hydro-acoustic generators. INHS is also
14 conducting field monitoring for the potential impacts of steel-hulled barges on movement of fish across an
15 electric barrier to prevent entry of invasive carp into Lake Michigan.
16 • **Field Assessment of Electric Barrier in Chicago Sanitary and Ship Canal, IDNR-Fisheries.** IDNR is
17 conducting monitoring of the existing electric demonstration barrier, including stocking and subsequent
18 monitoring of radio and acoustic tagged fish (common carp) near the electric dispersal barrier in order to
19 determine if they can move back and forth across the barrier.
20 • **Early Detection/Rapid Response Planning, IDNR-Fisheries.** IDNR is developing rapid response strategies
21 for control of Asian carp in various situations at critical control points and has educated their biologists and law
22 enforcement officers on identifying various aquatic invasive species. If they find a species that is either new to
23 the state or new to a particular waterway/area, they are to fill out a standardized form and report it. This option
24 is also available for the public in northern Illinois to track the Asian carp. If a species is detected, IDNR
25 follows up with a rapid assessment.
26 • **Bighead Carp Competition Studies, IDNR-INHS.** This effort involves field monitoring, including examining
27 bighead carp competition with native filter feeding fish to assess the potential threat for Great Lakes fish
28 (salmon and trout). IDNR is also examining bighead carp feeding on alewife and gizzard shad (food sources for
29 salmon and trout).
30 • **Intensified Field Monitoring for Asian carp, IDNR-Fisheries.** This intensified field monitoring examines
31 bighead and silver carp near Lockport and Brandon Road Pools at confluence of Des Plaines River.
32 • **Upper Illinois River habitat mapping, IDNR – INHS.** INHS is conducting field monitoring to evaluate
33 Asian carp habitat.
34 • **Technical assistance for market development, IDNR-Fisheries and Illinois Department of Economic**
35 **Opportunity (DCEO).** The harvest program provides technical assistance for required analytical data to
36 establish markets for Asian carp. Illinois’ DCEO has provided implementation costs for start-up and phase 1 of
37 an intensified harvesting program.
38 • **Contaminant analysis for market development, IDNR - INHS and University of Illinois.** The effort
39 provides additional contaminant analysis for market development.
40 • **Goby round-up/Carp Corral, a joint program with IDNR, U.S. Army Corps of Engineers, U.S. Fish and**
41 **Wildlife Service, and the Metropolitan Water Reclamation District.** The program monitors the spread and
42 expansion of round goby and bighead/silver carp populations in the Illinois River System toward Lake
43 Michigan.
44 • **Eradication, IDNR.** IDNR conducts eradication of Eurasian milfoil using Chemical- 2-4 D and sonar. The
45 agency is also experimenting with treatment timing and dosage for better long-term effects. A new project will
46 target curly-leaved pondweed.
47 • **Permanent Electric Dispersal Barrier, IDNR.** An electric barrier has been implemented in the Chicago
48 Sanitary and Ship Canal to deter the inter-basin transfer of invasive fish between the Great Lakes and
49 Mississippi River. It will be operated and funded by the IDNR upon completion; in the interim, U.S. Army
50 Corps of Engineers maintains management of the barrier.
51
52
53

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).

15
16 **Climate Change Actions**

17 (None reported.)

18
19 **Research Activities & Information Used**

20 (None reported.)

21
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.

SUMMARY OF AQUATIC INVASIVE SPECIES MANAGEMENT INDIANA

AIS Management Plan

Indiana Aquatic Nuisance Species Management Plan (2004). The plan identifies feasible, cost-effective management practices and measures to be conducted by state and local programs over a five-year period to prevent and control aquatic nuisance species (ANS) infestations in a manner that is environmentally sound. Development of the plan was mandated by the state's Non-indigenous Aquatic Nuisance Prevention and Control Act of 1990 (P.L. 101-646). Universities, industries, non-governmental organizations, and citizens interested in aquatic nuisance species control contributed ideas toward development of the statewide plan. The ANS Task Force approved the plan on November 5, 2004, allowing for federal cost-share support for implementation of the plan.

AIS Programs & Activities

- **Early Detection & Rapid Response, Indiana Department of Natural Resources - Division of Fish and Wildlife (IDNR - DFW).** The Division is conducting treatment of Brazilian elodea in Griffy Lake, as well as a survey and development of an aquatic vegetation management plan. Whole-lake herbicide treatment began in 2006 and will continue in 2007. Access restrictions were implemented in the spring of 2006 to prevent the movement of Brazilian elodea to other waters. The Division is also conducting rapid response for hydrilla, first discovered in 2006 at Lake Manitou. Response included an herbicide treatment and access restrictions in the fall of 2006. Large scale aquatic herbicide treatments are planned for the spring of 2007.
- **Lake and River Enhancement Program, IDNR-DFW.** The Program provides grants to lake associations for the control of aquatic invasive plants.
- **Yellow Perch Research, IDNR-DFW and Ball State University.** Research examines the impacts of AIS such as zebra mussels and round goby on yellow perch and other native species in Lake Michigan.
- **Management of sport fisheries, IDNR – DFW.** The Division is responding to aquatic invasive species' threats to sport fisheries through the following actions: (1) eradicating fishery altogether; (2) stocking predators; and (3) manipulating habitat (e.g. lake drawdowns to reduce aquatic invasive fish and plants).
- **Emergent aquatic plant control, IDNR – Division of Nature Preserves.** The Division is controlling purple loosestrife, *Phragmites*, and reed canary grass on Indiana's nature preserves. A purple loosestrife biological control program has been implemented using beetles on Nature Preserve properties as well as other areas that contain large areas of purple loosestrife. *Phragmites* and reed canary grass have been sprayed with glyphosate-based herbicides, though the Division uses some plant specific herbicides for reed canary grass. The Division has also performed some herbicide control for the narrowleaf cattail and hybrid cattail, though there is some debate about whether narrowleaf cattail is native to North America.

Climate Change Concerns

(None reported.)

Climate Change Actions

(None reported.)

Research Activities & Information Used

(None reported.)

Research Needs

- Development of effective ballast water treatment technologies for the Great Lakes.
- Research on biocontrol for *Phragmites* or reed canary grass. There is an active research program to develop biocontrol for *Phragmites* at Cornell University, but more research should be devoted to developing herbicides that are highly selective for these plants to reduce damage to non-target wetland plants.
- Further investigation of biological controls for Eurasian watermilfoil, curlyleaf pondweed, hydrilla, and Brazilian elodea.
- Continued refinement of herbicides and timing of applications to reduce non-target plant damage.

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SUMMARY OF AQUATIC INVASIVE SPECIES MANAGEMENT
IOWA

AIS Management Plan

Plan for the Management of Aquatic Nuisance Species (ANS) in Iowa. Iowa’s plan addresses prevention, management, control, public education, laws, and funding both for ANS already established in the state, as well as those with invasive potential. Species of primary concern are Eurasian water milfoil, Asian carp, purple loosestrife, and zebra mussels.

AIS Programs & Activities

- **Iowa Invasive Species Working Group.** This group of federal, state, county, and University staff hold regular meetings to discuss invasive species issues and plans.

Climate Change Concerns

(None reported.)

Climate Change Actions

(None reported.)

Research Activities & Information Used

(None reported.)

Research Needs

- More information on zebra mussels, including a way to control them in the environment.
- More information on Asian carp, including control methods, biological information about the species, and documentation of their impacts.
- Information on aquatic invasive species not yet found in northern climates that are capable of surviving in colder climates or may expand their ranges due to climate changes.
- Faster rapid response systems and funding mechanisms to implement them.
- Increased public awareness about invasive species.

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

3
4 **AIS Management Plan**

5 **Kansas Aquatic Nuisance Species Management Plan (April 2005).**

6
7 **AIS Programs & Activities**

- 8 • **Plant Protection and Weed Control Program, Kansas Department of Agriculture.** The agency has
9 regulatory authority to deal with aquatic invasive weeds and conducts quarantines on purple loosestrife,
10 tamarisk, and all federal noxious weeds, including the 19 aquatic species.
11 • **Aquatic Nuisance Species (ANS) Program, Kansas Department of Wildlife and Parks.** The program is
12 designed to protect residents of Kansas and aquatic resources from the effects of ANS. The program focuses on
13 preventing the accidental introduction of new ANS, limiting the spread of existing ANS, and controlling or
14 eradicating ANS where environmentally and economically feasible. The intentional introduction of non-
15 indigenous species for aquaculture, commercial, or recreational purposes are managed to insure that these
16 beneficial introductions do not result in accidental ANS introductions. The program also seeks to improve
17 information sharing among those agencies responsible for regulation of intentional introductions.
18

19 **Climate Change Concerns**

- 20 • New invasive species threats to Kansas' aquatic resources may emerge as a result of a shift in the climate.
21

22 **Climate Change Actions**

- 23 • State officials consider climate change by communicating with colleagues to the north and south about species
24 that are moving into the state and comparing response activities.
25

26 **Research Activities & Information Used**

- 27 • Boater movement surveys.
28 • Risk assessments.
29 • Research on zebra mussels: movement via live-wells and bilges (veliger stage) and population dynamics.
30

31 **Research Needs**

- 32 • Research on the effects of AIS on water quality.
33 • Research on Asian tapeworm presence.
34 • Research on zebra mussel eradication techniques.
35 • Identification of AIS vectors and exclusion techniques.
36 • Research on effective public outreach tools and rapid response.

SUMMARY OF AQUATIC INVASIVE SPECIES MANAGEMENT KENTUCKY

AIS Management Plan

Plan under development.

AIS Programs & Activities

- **Integrated Roadside Vegetation Management (IRVM) Program, Kentucky Department of Highway - Roadside Branch.** The program controls noxious weed species along highway rights-of-way through herbicides and mowing. Fertilization is also conducted to encourage rapid root growth of other plants.
- **Control Program, Kentucky State Nature Preserves Commission (KSNPC), The Nature Conservancy and Northern Kentucky University.** KNSPC works to systematically control and contain invasive plants on the nature preserve system statewide. Control mechanisms include cutting and removal, as well as herbicide applications. Fire is also being tested as a tool to control the plants.
- **Control Program, University of Kentucky/Lexington-Fayette Urban County Government (grant funds from the Columbus Advisory Board).** The program removes invasive plants from Arboretum Park.
- **Control Program, Kentucky Department of Fish and Wildlife Resources (KDFWR).** The Department controls populations of big head and silver carp by allowing a commercial fisherman to harvest the fish.
- **Monitoring and research program, KDFWR.** The Department is conducting research on cormorants to understand how they live, what they eat, and the impacts they have on habitats.
- **University of Kentucky Invasive Species Initiative.** The program, initiated in 2006, is using an interdisciplinary approach to monitor, model, prevent, mitigate, and eradicate aquatic and terrestrial invasive species in Kentucky.
- **Tracy Farmer Center for the Environment at University of Kentucky.** Using a hands-on approach, this youth outreach program teaches students about invasive species. They work to incorporate invasive species awareness into secondary school science curriculums across the state.

Climate Change Concerns

(None reported.)

Climate Change Actions

(None reported.)

Research Activities & Information Used

- Research on how to limit fish populations, including bighead and silver carp.

Research Needs

- More information on the commercial value/uses of big head and silver carp. Because fishermen only receive 10-20 cents per pound of fish, it is not profitable to sell the meat. More research on other uses for the species, including cat food and oil would be useful.
- General research on the Cormorant.
- Development of a Kentucky aquatic biodiversity database to track distribution of aquatic organisms (native and invasive) across the state.
- Assessment of AIS impacts on endangered and threatened flora and fauna (especially mussels) and on fisheries.
- Assessment of potential biological controls on native flora and fauna.

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

3
4 **AIS Management Plan**

5 **State Management Plan for Aquatic Invasive Species in Louisiana (completed in July 2005, adopted by the**
6 **ANSTF in May 2006).**

7
8 **AIS Programs & Activities**

- 9 • **The Louisiana Aquatic Invasive Species Task Force, chaired by the Louisiana Department of Wildlife**
10 **and Fisheries (LDWF) and composed of state and federal agencies, stakeholders, and industry groups.**
11 The Task Force completed a draft aquatic invasive species plan in 2005 and advises the Louisiana Aquatic
12 Invasive Species Council, a permanent working partnership charged with implementation of the state AIS
13 management plan.
- 14 • **Aquatic Plant Control Fund.** The fund was created by the state legislature for the control of nuisance aquatic
15 vegetation. At present, the fund is derived solely from an increase in boat trailer registration fees.
- 16 • **Aquatic Plant Management Program, LDWF.** This program maintains boating and fishing access through
17 herbicide applications to nuisance aquatic vegetation.
- 18 • **Aquatic Animals Management Program LDWF.** LDWF has posted a bounty on the tails of nutria. The goal
19 is to obtain 600,000 tails per year. The department is also monitoring to see if marshes are recovering.
- 20 • **Outreach activities, conducted by many organizations that use some state funds in addition to other**
21 **funds, including Louisiana Sea Grant College Program, Barataria-Terrebonne Estuary Program, and**
22 **The Nature Conservancy, among others.** Outreach is focused on target audiences (i.e. recreational fishers,
23 water gardeners, and aquaculture groups) and elementary school children.

24
25 **Climate Change Concerns**

- 26 • Climate change will make conditions more suitable for some species and less suitable for other species.
27 • Land being lost to rising sea levels in the state.

28
29 **Climate Change Actions**

30 (None reported.)

31
32 **Research Activities & Information Used**

33 (None reported.)

34
35 **Research Needs**

- 36 • Satellite technology to determine the location of invasive species.

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

3
 4 **AIS Management Plan**

5 **State of Maine Action Plan For Managing Invasive Aquatic Species: A Report to the Land and Water**
 6 **Resources Council From the Interagency Task Force On Invasive Aquatic Plants and Nuisance Species**
 7 **(October 10, 2002).**

8
 9 **AIS Programs & Activities**

- 10 • **Invasive Aquatic Plant Prevention Program, Maine Department of Environmental Protection (MDEP).**
 11 This program inspects watercraft, trailers, and outboard motors at or near the state borders and at boat launching
 12 sites for the presence of invasive aquatic plants. The program also provides educational materials to the public
 13 and to watercraft owners on invasive aquatic plants and funds control work by some private lake associations.
 14 The Department is also conducting plant control work on three small lakes (one with populations of Eurasian
 15 water milfoil, one with hydrilla, and one with curly-leaved pondweed) to try to prevent the spread of these
 16 plants to other water bodies. Finally, the agency is also undertaking plant removal on lakes with variable
 17 milfoil located close to boat ramps in order to reduce spread.
- 18 • **Invasive Aquatic Plant Prevention Program, Maine Department of Inland Fisheries & Wildlife**
 19 **(MDIFW).** MDIFW has a warden service to patrol waters and roads and enforce violations like launching a
 20 boat or transporting a vehicle on public roads with plants attached.
- 21 • **Lake and River Protection Sticker, MDEP and MDIFW.** As of 2002, all motorized watercraft on inland
 22 waters in Maine are required to display the Lake and River Protection Sticker (“Preserve Maine Waters”). No
 23 sticker is required for operating a boat in tidal waters. Motorized watercraft includes any boat with any type of
 24 motor, including canoes with electric motors and personal watercraft. Dedicated funds raised through this
 25 program are used to support Maine’s prevention and early detection/rapid response efforts. The state raises
 26 approximately \$1 million a year through this program.
- 27 • **Courtesy Boat Inspection Program, MDEP.** The program involves voluntary boat inspections, focusing on
 28 boat ramp inspections in particular. Last year, there were 30,000 inspections (10,000 more than in 2003).
- 29 • **Early Detection - Invasive Plant Patrol Program, MDEP.** MDEP contracts with the Volunteer Lake
 30 Monitoring Program (VLMP), which, through the Maine Center for Invasive Aquatic Plants (MCIAP), conducts
 31 training programs for volunteers, state agency personnel, professionals, teachers, students and others. Since the
 32 program began in 2001, nearly 1,400 individuals have been trained. The basic workshop teaches participants
 33 how to recognize the invasive plants on Maine’s “eleven most unwanted” list and how to distinguish these
 34 invaders from the native species they resemble. A variety of advanced training opportunities are also offered.
 35 The number of Maine waterbodies being screened for the presence of invasive aquatic plants has increased
 36 several hundredfold since MCIAP began its training effort. Surveys conducted by volunteers now account for
 37 more than half of all surveys being conducted in the state. Maine inspects watercraft, trailers, and outboard
 38 motors and provides educational materials to the public. In order to decide which ramps to target, MDEP
 39 conducts a rough risk assessment to determine which ramps are used most often. The Department uses paid
 40 inspectors for the high-use hours, to keep any invasive plants from spreading. Officials have completed a
 41 vulnerability assessment (remotely, using GIS) to assist the analysis, examining the distance from infested
 42 waterbodies to highways and whether they are hydrologically connected to other waterbodies.
- 43 • **Draft Rapid Response Plan, MDEP and MDIFW.** The Commissioners of the MDEP and the MDIFW have
 44 agreed to direct their respective agencies’ response to new infestations of invasive aquatic species under the
 45 auspices of a single, coordinated rapid response plan. Species covered by the 172-page plan include invasive
 46 plants and fish already in some Maine waters and other exotic organisms not yet established in Maine such as
 47 zebra mussels.
- 48 • **Integrated Pest Management Strategy (for purple loosestrife), Maine Department of Agriculture.** This
 49 program works to avoid water drawdown and site disturbance during the growing season to avoid exposing
 50 mudflats where seeds can germinate. The program surveys all wetlands at least every three years to pinpoint
 51 infestations and every year, stems at “active” wetland sites are sprayed with the herbicide glyphosate and
 52 counted at selected sampling sites. Park authorities are beginning to work with landowners on sites adjacent to
 53 park boundaries to enact similar preventative strategies.

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.
21

22 **Research Needs**

- 23 • Research to find a native organism that can function as a safe, effective biological control for variable water
24 milfoil.
25

1 SUMMARY OF AQUATIC INVASIVE SPECIES MANAGEMENT
2 MARYLAND
3

4 **AIS Management Plan**

5 No plan available.
6

7 **AIS Programs & Activities**

- 8 • **Maryland Marsh Restoration/Nutria Project Partnership, led by Maryland Department of Natural
9 Resources (MDNR) and U.S. Fish and Wildlife Service in partnership with 24 additional federal, state,
10 and private organizations.** The project involves behavioral/population research, reproductive research, testing
11 of trapping methods, population control strategies, and marsh restoration.
- 12 • **Mute Swan Management, MDNR – Wildlife and Heritage Service.** MDNR manages the mute swan
13 population through: (1) public outreach and education; (2) population management and resource protection
14 (e.g., reducing recruitment by egg oiling, humane removal of adult swans, establishment of Swan-Free Areas);
15 (3) regulating the possession of mute swans; (4) relief of human safety and nuisance conflicts; and (5)
16 population monitoring and research.
- 17 • **Zebra Mussel Prevention, MDNR.** This program educates boaters and divers about zebra mussels. The goal
18 is to prevent mussels from becoming established in the state.
- 19 • **Water Chestnut Harvesting, MDNR – Division of Tidewater Ecosystem Assessment.** Water chestnut,
20 recently rediscovered in the Upper Chesapeake Bay, is pulled by hand by officials during Submerged Aquatic
21 Vegetation surveys.
- 22 • **Snakehead Prevention, MDNR – Fisheries Service.** The service seeks to prevent the spread of snakeheads by
23 conducting the following activities: circulating posters that ask anglers to kill and report all snakeheads;
24 compile regional data (database is maintained by VDGIF) for captures in the Potomoc River (these include
25 MDNR, VDGIF, USFWS and public captures); and annual monitoring that includes seine, electrofishing, and
26 gillnet surveys.
- 27 • **Snakehead Control and Management Plan, U.S. Fish and Wildlife Service.** The creation of the Snakehead
28 Control and Management Plan is a collaborative effort among industry, non-governmental organizations
29 (NGOs), state and federal agencies, and citizens. The goal is to create a management plan that identifies action
30 items to guide agency activities and funding priorities, in addition to goals for industry, citizens, and NGOs.
31 The plan will focus on control priorities for the Potomac/Northeast U.S. region, as well as general prevention,
32 early detection/rapid response, research and outreach/education priorities in other regions the snakehead could
33 potentially invade.
- 34 • **Purple Loosestrife Control, MDNR.** State biologists will pull purple loosestrife out by hand if encountered in
35 the field. The state has also used biological controls for several years.
- 36 • **Cooperative Giant Hogweed Eradication, MDNR and Maryland Department of Agriculture (MDA).**
37 MDNR works to eradicate giant hogweed by using a combination of hand-pulling, herbicide application,
38 burning, and bagging techniques each summer.
- 39 • **Plant Pest Survey and Detection, MDA, Plant Protection & Weed Management Section.**
- 40 • **Phragmites Control Cost-Share Program, MDNR and private citizens.** This program supplies private
41 landowners with herbicides for *Phragmites* control, and private landowners incur remaining costs. MDNR or
42 MDA can apply the herbicides and bill landowners, or the landowner can use a private applicator.
- 43 • **Aquatic Weed Control with Herbicides, MDA – Plant Protection and Weed Management Section.** MDA
44 staff consider timing, permitting, organism's effect on ecosystem, expense and level of effort required for
45 control in deciding which herbicides to use and when to use them.
46

47 **Climate Change Concerns**

- 48 • Climate change may affect the nutria problem.
49 • A rise in sea level may place additional stress on marshes, which are highly sensitive to changes in water level.
50 Marsh resources, if any remain, will migrate landward. Marsh loss is caused by a combination of nutria and sea
51 level rise and subsidence of the general terrain in the area.
52 • Significant warming may result in habitat changes, causing species such as the Bulls-Eye Snakehead in Florida
53 to become an issue in Maryland.

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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 **SUMMARY OF AQUATIC INVASIVE SPECIES MANAGEMENT**
2 **MASSACHUSETTS**
3

4 **AIS Management Plan**

5 **Massachusetts Aquatic Invasive Species Management Plan (2002).** The five-year plan, created by the
6 Massachusetts AIS Working Group, is a comprehensive set of management strategies intended to minimize the
7 impacts of AIS in Massachusetts waters.
8

9 **AIS Programs & Activities**

- 10 • **Boat Ramp Monitor Program, Massachusetts Department of Conservation and Recreation (MDCR) –**
11 **Office of Water Resources (OWR) – Lakes and Ponds Program (LPP).** Boat ramp monitors are positioned
12 at lakes and ponds statewide to inspect boats and ensure that no plant fragments are attached to the boat, trailer
13 or gear. Boaters are given informational brochures and asked to participate in a voluntary boat inspection and
14 complete a survey. LPP posts AIS posters in kiosks and metal reflective boat ramps at public access points to
15 remind boaters to check their boats and trailers before entering or leaving a water body.
- 16 • **Weed Watchers Program, MDCR – OWR – LPP.** LPP schedules weed watcher training for any interested
17 lake groups or associations. This program teaches groups how to check key areas such as inlets, outlets, and
18 shallow areas. The training also teaches volunteers how to eradicate species. This program is modeled after
19 New Hampshire’s weed watcher program.
- 20 • **Multi-lingual Education, MDCR – OWR – LPP and Massachusetts Office of Coastal Zone Management**
21 **(MOCZM).** Lead by MOCZM with participation from LPP, this outreach effort developed multi-lingual
22 brochures to distribute to specific groups (e.g. participants in the seafood trade who are Chinese).
- 23 • **Rapid Response Protocols, MDCR – OWR – LPP.** MDCR paid a contractor to develop rapid response
24 protocols for new and unknown aquatic invasive species.
- 25 • **Aquatic Invasive Species Program, MOCZM.** Recent projects by MOCZM include developing resources for
26 early detection/rapid response to new invasions in Massachusetts, developing a website to provide a single
27 outlet for AIS information and resources in the state, and developing a marine invasive species monitoring
28 network. The monitoring network uses a standardized protocol and identification resources developed with
29 funding by MOCZM. The Office partnered with Massachusetts Institute of Technology (MIT) Sea Grant to
30 develop a centralized marine invasive species data management system, as well as Massachusetts Bays National
31 Estuary Program in an effort to train citizens to monitor along the coast. MOCZM has also taken steps to
32 establish memoranda of understanding with state agencies to coordinate management and launched efforts to
33 engage the seafood and pet store industry.
- 34 • **Massachusetts Bays National Estuaries Program.** The Program coordinated the 2003 rapid assessment
35 survey of non-native and native marine species of floating dock communities with MIT Sea Grant. Another
36 rapid assessment is scheduled for summer 2007. This program has also sponsored research and developed
37 publications related to AIS.
- 38 • **MIT Sea Grant Program.** This program is leading the development of a centralized marine invasive species
39 data management system. The database includes information from many groups, including volunteer monitors
40 and divers. MIT Sea Grant also develops informational publications to help minimize new introductions
41 through several vectors.
- 42 • **Water Chestnut Eradication, U.S. Fish and Wildlife Service (USFWS), Silvio O. Conte National Fish and**
43 **Wildlife Refuge, in partnership with a number of other groups.** This program’s control component consists
44 of mechanical harvesting and some herbicide application around the edges of the water body. Participants hand
45 pull the plant at six sites including Holyoke, Hadley, East Hampton, South Hadley, as well as a few sites in
46 Connecticut. The plant is almost completely eradicated from sites where hand-pulling has been employed for
47 the past four years.
- 48 • **Giant Hogweed control, Massachusetts Department of Agricultural Resources – Division of Regulatory**
49 **Services.**

50
51 **Climate Change Concerns**

- 52 • As the climate warms, certain plants that pose problems in the south could move into Massachusetts. For
53 example, water hyacinth, which is being sold in nurseries for people with water gardens, is not considered a

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.)

6

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 **SUMMARY OF AQUATIC INVASIVE SPECIES MANAGEMENT**
2 **MINNESOTA**

3
4 **AIS Management Plan**

5 Plan under development.
6

7 **AIS Programs & Activities**

- 8 • **Invasive Species Program, Minnesota Department of Agriculture.** The Department issues an annual report
9 aimed at aquatic plants and all wild animals and funds AIS activities through watercraft surcharges and a water
10 recreation account. The Department also has educational requirements for terrestrial species. The three
11 primary goals of the program are to: (1) prevent introductions, (2) prevent spread, and (3) reduce impacts.
12 • **Eurasian Watermilfoil Management Program, Minnesota Department of Natural Resources (MN DNR).**
13 This program: monitors milfoil growth; coordinates with government agencies, special purpose districts, and
14 lakeshore associations to prevent spread; and coordinates with the University of Minnesota and other facilities
15 to study the use of biocontrols and herbicides. It also provides grants to potential partners working on lakes
16 with public water access and funds research on biocontrol. The program focuses on unintentional transport of
17 milfoil on boat equipment and better cleaning of such equipment.
18 • **Purple Loosestrife Management Program, MN DNR.** This program seeks to reduce the environmental
19 effects of purple loosestrife by integrating chemical and biological control and cooperating with local, state and
20 federal groups.
21 • **Watercraft Inspection Internships, MN DNR.** Between April and October watercraft inspections are
22 conducted at public water access sites on lakes and rivers infested with aquatic invasive species.
23

24 **Climate Change Concerns**

- 25 • Species requiring warmer climates, which cannot currently survive in Minnesota, will eventually be able to
26 survive in the state.
27 • Warming could produce cooler and wetter springs, which would limit the growth of Eurasian watermilfoil.
28 Historically, drought conditions caused the initial growth of watermilfoil.
29 • As temperatures warm over time, conifers may be replaced by oaks, followed by prairie grassland. However,
30 with invasive species, such as buckthorn, oaks may never gain a chance to grab a foothold for growth, which
31 will throw off the natural cycle.
32

33 **Climate Change Actions**

34 (None reported.)
35

36 **Research Activities & Information Used**

- 37 • Technology to deter the spread of Asian carp.
38 • Funding for construction of dispersal barriers for Asian carp.
39 • Weekly copper sulfate treatments to kill zebra mussels.
40 • Public awareness and watercraft inspection
41 • Technical assistance for curly-leaved management projects.
42

43 **Research Needs**

- 44 • Habitat recovery issues after eradication of an invasive species.
45 • A national framework or law on invasive species to deal with intrastate transportation, transportation on public
46 roads, and interstate transportation (Lacey Act is not sufficient).
47 • Current state actions with regard to risk assessments (states should be sharing more information on this issue).
48 • Information on effective herbicide and biological control methods.
49 • Lists—a stronger noxious weed list and injurious wildlife list, as well as a list of federal experts that states can
50 contact if they have questions on a particular issue.
51 • More expertise in ecology, including more studies on the effects of Eurasian watermilfoil.
52 • More information on long-term impacts of invasive species on adjacent wildlife communities.

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

3
4 **AIS Management Plan**

5 Plan under development.

6
7 **AIS Programs & Activities**

- 8 • **Control, Mississippi Department of Wildlife, Fisheries, and Parks (MDWFP).** The Department chemically
9 treats water hyacinth and common salvinia in state park waters and fishing lakes and stocks grass carp and
10 salvinia beetles.
11 • **Monitoring and control, Mississippi Department of Agriculture and Commerce (MDAC) – Bureau of**
12 **Plant Industry and USDA Animal and Plant Health Inspection Service (APHIS) – Plant Protection and**
13 **Quarantine (PPQ).** MDAC is assisting APPHIS-PPQ to monitor and control an infestation of giant salvinia in
14 a private lake. Officials check the lake every three months and release salvinia weevils when necessary.
15 • **Coastal Preserve Program (giant salvinia), Mississippi Department of Marine Resources (MDMR).**
16 Officials are assessing the possible use of the salvinia weevil to control giant salvinia, which has recently
17 emerged as an AIS in the area. Officials are also addressing tallow tree and cogongrass through active surveys
18 for the species and the use of herbicides and mechanical removal for control.
19 • **Alabama-Mississippi Rapid Assessment Team (AMRAT).** State scientists conduct a 3-5 day survey of all
20 aquatic invasive species present in the coastal waters of Alabama and Mississippi to establish a baseline for
21 further analysis.
22

23 **Climate Change Concerns**

- 24 • A recent document from MDMR (Dale A. Diaz & Jeff Clark, *Mississippi Department Of Marine Resources*
25 *Efforts Related To Aquatic Invasive Species*, PROCEEDINGS OF THE 14TH BIENNIAL COASTAL ZONE
26 CONFERENCE, New Orleans, Louisiana, July 2005), states that aquatic invasive species “[are] a problem because
27 there are many elements in place that make the state susceptible to aquatic invasions,” including: abundant
28 pathways, including commercial shipping, heavy recreational watercraft usage, aquaculture and the ornamental
29 plant trade industry; a subtropical climate with abundant aquatic habitat that is naturally hospitable to
30 nonindigenous aquatic species; increased coastal development, which can enhance the establishment of invasive
31 species in areas where habitat has been altered.
32

33 **Climate Change Actions**

- 34 • The MDMR document (see above) also states: “[the plan will] include sections on the pathways of introduction,
35 education/outreach, prevention, control, eradication, restoration, early detection and rapid response for aquatic
36 invasive species;” the state will work with a regional panel to coordinate its activities; and the state will be
37 involved in AMRAT 3.
38

39 **Research Activities & Information Used**

40 (Nothing reported.)

41
42 **Research Needs**

- 43 • Database of taxonomists who can identify invasive species.
44 • Assessing the use of salvinia weevil and potentially negative impacts of its introduction.
45 • More information on the potential long-term negative effects of control methods.
46 • More information/expertise on esoteric species.

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

3
4 **AIS Management Plan**

5 **Aquatic Nuisance Species Management Plan (August 2005).**

6
7 **AIS Programs & Activities**

- 8 • **Invasive Species Program, Missouri Department of Conservation (MDC) – Fisheries Program.** The
9 program provides public information and officials are currently enacting the 2005 AIS Plan. In addition,
10 regulations have been enacted recently that prohibit the use of live bighead and silver carp as bait, create a
11 prohibited species list, and require registration for all sellers of live fish or crayfish as bait. The program is also
12 in the process of developing regulations related to invasive species management (not yet approved).
- 13 • **Protect Our Waters Project, MDC – Resource Science Division.** This project, outlined in the state AIS Plan,
14 involves joint work among inter-agency experts on invasive species.
- 15 • **Alternate use of redear sunfish for control of snails in aquaculture, MDC – Resource Science Division.**
16 The division is evaluating the use of redear sunfish to control snails in aquaculture ponds as a substitute for
17 Asian black carp.
- 18 • **Asian carp heuristic modeling, MDC – Resource Science Division and University of New Orleans.** The
19 project is evaluating a modeling technique to predict the expansion of Asian carp in the Middle Mississippi
20 River system and associated tributary streams.
- 21 • **Reeds Canarygrass Management, MDC – Resource Science Division.** The division is evaluating control of
22 Reeds Canarygrass in wetlands that uses a combination of mechanical and herbicide treatments.
- 23 • **Statewide Crayfish Conservation and Management Program, MDC – Resource Science Division.** This
24 program has several components, including: *Systematic Monitoring Project* – monitors invasions and is seeking
25 to set up a long-term monitoring project; *Consulting* – encourages the public to use native species for sale food
26 or bait, advocates for the addition of the Australian and Rusty Crayfish to the prohibited species list, works with
27 law enforcement officers to track invasive crayfish, particularly their transport to and from other states; *Stream*
28 *resource management* – researches inter-species breeding, competition for resources, takeovers of breeding
29 grounds, etc.; *Education* – produces videos, brochures, and articles, gives presentations to school groups, and
30 operates a booth at Earth Day; *Working with the bait industry* – built a database of every bait shop in the state
31 (about 400 shops) and found that 90 of these sell crayfish, and working on a brochure for the bait and culture
32 industry that shows shops how to identify the five legal crayfish species; *Permits for species collection* – issues
33 permits, usually to teachers, with a requirement that species be released at the same location from which they
34 were obtained.
- 35 • **Zebra Mussel Educational Outreach and Monitoring, MDC – Policy Division.** As part of the 100th
36 Meridian Initiative, MDC conducts statewide outreach, including assistance to marine operators who inspect
37 boats for zebra mussels, publication of articles about zebra mussels, supply of information at fairs, outdoor
38 events, and hometown festivals.
- 39 • **Missouri Stream Team, MDC, Missouri Department of Natural Resources (MDNR), and Conservation**
40 **Federation of Missouri.** The stream team’s volunteer water quality monitoring class teaches a chapter on
41 zebra mussels.
- 42 • **Invasive Species Management Program, MDNR - Division of State Parks.**

43
44 **Climate Change Concerns**

- 45 • Effects of climate change on invasive species in general.
- 46 • Increased movement of AIS through interstate commerce and recreation.

47
48 **Climate Change Actions**

- 49 • Traveler Information Stations (TIS), boat ramp signs, and public-private partnerships address pathways.

50
51 **Research Activities & Information Used**

- 52 • Monitoring efforts to track zebra mussels.
- 53 • Discussion of markets for Asian carp as pet food, oil, consumption, and private use.

- 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 **SUMMARY OF AQUATIC INVASIVE SPECIES MANAGEMENT**
2 **MONTANA**
3

4 **AIS Management Plan**

5 **Montana Aquatic Nuisance Species (ANS) Management Plan (2002).** The plan identifies six objectives to
6 achieve an overall goal to “minimize harmful ecological, economic, and social impacts of [aquatic nuisance species]
7 through prevention and management of introduction, population growth, and dispersal into, within, and from
8 Montana.” The six objectives are: (1) Coordinate and implement a comprehensive management plan; (2) Prevent
9 the introduction of ANS into Montana; (3) Detect, monitor, and eradicate pioneering ANS; (4) Control and eradicate
10 established ANS that have significant impacts, where feasible; (5) Inform the public, policy makers, natural resource
11 workers, industry, and other groups about the risks and impacts of ANS; and (6) Increase and disseminate
12 knowledge of ANS in Montana through compiling data and conducting research.
13

14 **AIS Programs & Activities**

- 15 • **Montana ANS Program, Montana Department of Fish, Wildlife, and Parks.** The Program consists of five
16 key areas: coordination, education, prevention and control, monitoring, and rapid response. A primary goal of
17 the program is collaboration and coordination with other agencies and other states. Within the program areas,
18 various activities are being implemented:
 - 19 ○ *Education.* The program conducts education in schools, colleges and universities, with specialized groups
20 such as Trout Unlimited, and through fishing tournaments, radio stations, and boat launches. The Program
21 also has an education program for professionals. For example, firefighters are a targeted because much of
22 the state’s fire equipment is brought in from other states and can spread ANS.
 - 23 ○ *Prevention and Control.* The program operates a boat inspection program. This began in 2004, by targeting
24 fishing tournaments on high use waters. In 2005, efforts expanded state-wide, with inspections at more
25 high-use water areas and times. Officials set up angler check stations at major tournaments and water
26 bodies, where anglers must fill out a questionnaire about where they are launching their boats. Cleaning
27 equipment is available to remove debris and sediment, if necessary, before launching. The program also
28 checks for live bait from outside the state and has a hatchery inspection program.
 - 29 ○ *Monitoring.* The monitoring program has inspected all major water bodies for invasive invertebrates and
30 plants. Additionally, a whirling disease distribution study has been underway for several years. Officials
31 also test fish for diseases and map its spread. There is also an ongoing distribution study of New Zealand
32 Mud Snails, with plans to test all fishing access sites. The resulting information is entered into a national
33 internet database.
 - 34 ○ *Rapid Response.* Officials have a rapid response plan in place for zebra mussels upon detection, with
35 different plans based on general scenarios. They are also mapping national statistics to identify and
36 monitor the most likely areas where mussels might be introduced.

37
38 **Climate Change Concerns**

39 (None reported.)
40

41 **Climate Change Actions**

42 (None reported.)
43

44 **Research Activities & Information Used**

- 45 • ANS Program researched the effectiveness of ANS Program outreach tools.
- 46 • ANS Program completed a specific study in 2006 to examine the effectiveness of Traveler Information Systems
47 on public outreach.
- 48 • ANS Program conducts surveys annually to identify transport patterns within the state to help identify bodies of
49 water at highest risk of introduction.

50
51 **Research Needs**

- 52 • Risk assessments for the establishment of other aquatic invasives in Montana (which bodies of water are at
53 highest risk of establishment and which species are most likely to become established).

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

3
4 **AIS Management Plan**

5 No plan available.

6
7 **AIS Programs & Activities**

- 8 • **Coordination, Nebraska Game and Parks Commission (NGPC) – Fisheries Division.** The division
9 conducts education and outreach, as well as some control for the common carp.
- 10 • **Noxious Weed Program, Nebraska Department of Agriculture (NDA)– Bureau of Plant Industry.** This
11 program conducts several activities, including: oversight of weed control superintendents around the state;
12 training and education of personnel on the Nebraska Noxious Control Act, infestations, and control methods;
13 dissemination of information and educational campaigns; designation of noxious weeds and their control
14 measures; collection of information from counties regarding presence of noxious weeds; and cooperation with
15 federal and state agencies.
- 16 • **Douglas County Noxious Weed Control Authority, Douglas County Environmental Services.**
- 17 • **Lancaster County Weed Control Program, Lancaster County Weed Control Authority.**
- 18 • **Lower Platte Weed Management Area, a partnership among the county weed control boards (Butler,**
19 **Cass, Colfax, Dodge, Douglas, Lancaster, Platte, Sarpy, Saunders, Seward, and Washington), NGPC, and**
20 **NDA.** This program conducts surveys, control, and monitoring of purple loosestrife in the Platte River
21 Drainage. Officials have surveyed nearly 100 miles of the Platte River and treated nearly 75% of the
22 infestations by chemical or insects releases. Continued monitoring and control is planned.
- 23 • **Twin Valley Weed Management Area (TVWMA), a partnership among the county weed control boards**
24 **(Adams, Clay, Fillmore, Franklin, Furnas, Harlan, Kearney, Nuckolls, Thayer, and Webster counties),**
25 **NDA, University of Nebraska Extension, and Board of Educational Lands and Funds.** TVWMA
26 facilitates coordination among land managers and landowners to identify and manage noxious and invasive
27 plant problems and conducts outreach and education.
- 28 • **Nebraska Weed Control Association.** This is a forum where superintendents can exchange information about
29 noxious weeds.
- 30 • **Adopt-A-Stream program, Nebraska Wildlife Federation.** This program teaches local volunteers how to
31 conduct chemical and biological monitoring.

32
33 **Climate Change Concerns**

- 34 • Increased drought caused by changes in climate may causes purple loosestrife and *Phragmites* populations to
35 increase drastically.
- 36 • Warmer temperatures may affect some species, but not others.

37
38 **Climate Change Actions**

39 (None reported.)

40
41 **Research Activities & Information Used**

- 42 • Officials are developing a strategy to eliminate or reduce purple loosestrife through mechanical (digging),
43 chemical (herbicides), or biological (insect) controls.
- 44 • Officials are conducting chemical experiments on *Phragmites* by spraying Habitat (via helicopter) over 80 acres
45 along the river. Grazing cows and goats are also being used as a trial method to control *Phragmites*.

46
47 **Research Needs**

- 48 • Information about Asian carp.
- 49 • Identification of native and non-native species.
- 50 • New techniques for more effective or selective control and herbicides.
- 51 • An understanding of where will purple loosestrife seeds will be disseminated and where it may reappear.
- 52 • More knowledge about the anatomy and botany of invasive plants.

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.
37

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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 Climate Change Concerns

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

36 Climate Change Actions

37 (None reported.)

38 Research Activities & Information Used

- 39
- 40 • Comparing the dynamics of decomposition for invasive weeds (*Phragmites*) and native cattails (*Typha*) to
- 41 determine the benefit of restoration efforts.
- 42 • Examining how nutrient level changes and exotic mussels affect the Lake Erie food web and fish community.
- 43 • Developing a genetic probing technique to quickly screen water samples for zebra mussel veligers.
- 44 • Studying role of embayments and inshore areas as nursery grounds for alewife and other species.
- 45 • Assessing the role of zebra mussels in influencing metal cycling in freshwater ecosystems and evaluating
- 46 whether zebra mussels may serve as bioindicators for the presence of toxic metals in freshwater systems.
- 47 • Studying the effects of zebra mussels on the spawning shoals of walleye and lake trout.
- 48 • Japanese knotweed study of treatment and monitoring plots to test 3 control methods: (1) repeated cutting; (2)
- 49 herbicide injections; and (3) limited excavation with replanting.
- 50 • Researching aquatic vegetation, biocontrol of Eurasian watermilfoil, and alewife.
- 51 • Identifying a non-herbicide approach for treatment of knotweed.
- 52
- 53

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

1

2 **Research Activities & Information Used**

3 (None reported.)

4

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.

