

1 **Appendix A**

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

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4
5 ***Methods***

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

1 **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.

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

3
4 **AIS Management Plan**

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

14
15 Alaska also has a Statewide Invasive Pike Plan. This plan will be updated during fiscal year (FY) '07 or FY '08.

16
17 **AIS Programs & Activities**

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

47
48 **Climate Change Concerns**

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

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

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

27 28 Climate Change Concerns

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

38 39 Climate Change Actions

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

42 43 Research Activities & Information Used

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

46 47 Research Needs

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

1 **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 **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**
9 **Division, Fisheries Management.** The department responds to problematic invasive species with monitoring,
10 containment, and removal. Giant salvinia, a primary problem, is being controlled with chemical treatments.
11 Apple snail control and management includes surveys, destroying egg masses, and initiation of a apple snail
12 task force in December 2005.
- 13 • **Rice eels management, DNR - Wildlife Resources Division, Fisheries Management; University of**
14 **Georgia; U.S. Fish and Wildlife Service; and National Park Service.** Officials have been periodically
15 surveying for the eel since its discovery in the late 1980s in artificial ponds at a nature center. The surveys in
16 these ponds have occurred once a month since 2004. The next step will be to develop control
17 recommendations.
- 18 • **Flathead catfish control program.** In 2006 the Georgia legislature allocated funding to control and manage
19 invasive flathead catfish in Georgia. The increase in funding allowed for a fisheries biologist and two fisheries
20 technicians to be hired to work on eradication and control methodologies.
- 21 • **Survey of lakes and reservoirs, Georgia Power (a regional utility) and DNR - Wildlife Resources Division,**
22 **Fisheries Management.** Georgia Power surveys its lakes and reservoirs three to four times a year for aquatic
23 invasive plants and applies spot treatments of herbicides when they are found. DNR assists with these
24 activities.

25
26 **Climate Change Concerns**

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

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,
44 sticking or relocation and unintentional actions such as escapes of water garden species or use of invasives in
45 landscaping and ornamental projects).
- 46 • Evaluation of the effectiveness of ANS outreach and education efforts as a means of modifying behavior (i.e.
47 decreased releases and increased reporting).
- 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

1 **Climate Change Actions**

2 (None reported.)

4 **Research Activities & Information Used**

5 (None reported.)

7 **Research Needs**

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

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

1 **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.

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

4 **AIS Management Plan**

5 Plan under development.
6

7 **AIS Programs & Activities**

- 8
- 9 • **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.
 - 10 • **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.
 - 11 • **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.
 - 12 • **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.
 - 13 • **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.
 - 14 • **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.
 - 15 • **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.
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28 **Climate Change Concerns**

29 (None reported.)
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31 **Climate Change Actions**

32 (None reported.)
33

34 **Research Activities & Information Used**

- 35 • Research on how to limit fish populations, including bighead and silver carp.
- 36

37 **Research Needs**

- 38 • More information on the commercial value/uses of big head and silver carp. Because fishermen only receive 39 10-20 cents per pound of fish, it is not profitable to sell the meat. More research on other uses for the species, 40 including cat food and oil would be useful.
- 41 • General research on the Cormorant.
- 42 • Development of a Kentucky aquatic biodiversity database to track distribution of aquatic organisms (native and 43 invasive) across the state.
- 44 • Assessment of AIS impacts on endangered and threatened flora and fauna (especially mussels) and on fisheries.
- 45 • 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 **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 Resources (MDNR) and U.S. Fish and Wildlife Service in partnership with 24 additional federal, state, and private organizations.** The project involves behavioral/population research, reproductive research, testing of trapping methods, population control strategies, and marsh restoration.
- 9 • **Mute Swan Management, MDNR – Wildlife and Heritage Service.** MDNR manages the mute swan population through: (1) public outreach and education; (2) population management and resource protection (e.g., reducing recruitment by egg oiling, humane removal of adult swans, establishment of Swan-Free Areas); (3) regulating the possession of mute swans; (4) relief of human safety and nuisance conflicts; and (5) population monitoring and research.
- 10 • **Zebra Mussel Prevention, MDNR.** This program educates boaters and divers about zebra mussels. The goal is to prevent mussels from becoming established in the state.
- 11 • **Water Chestnut Harvesting, MDNR – Division of Tidewater Ecosystem Assessment.** Water chestnut, recently rediscovered in the Upper Chesapeake Bay, is pulled by hand by officials during Submerged Aquatic Vegetation surveys.
- 12 • **Snakehead Prevention, MDNR – Fisheries Service.** The service seeks to prevent the spread of snakeheads by conducting the following activities: circulating posters that ask anglers to kill and report all snakeheads; compile regional data (database is maintained by VDGIF) for captures in the Potomac River (these include MDNR, VDGIF, USFWS and public captures); and annual monitoring that includes seine, electrofishing, and gillnet surveys.
- 13 • **Snakehead Control and Management Plan, U.S. Fish and Wildlife Service.** The creation of the Snakehead Control and Management Plan is a collaborative effort among industry, non-governmental organizations (NGOs), state and federal agencies, and citizens. The goal is to create a management plan that identifies action items to guide agency activities and funding priorities, in addition to goals for industry, citizens, and NGOs. The plan will focus on control priorities for the Potomac/Northeast U.S. region, as well as general prevention, early detection/rapid response, research and outreach/education priorities in other regions the snakehead could potentially invade.
- 14 • **Purple Loosestrife Control, MDNR.** State biologists will pull purple loosestrife out by hand if encountered in the field. The state has also used biological controls for several years.
- 15 • **Cooperative Giant Hogweed Eradication, MDNR and Maryland Department of Agriculture (MDA).** MDNR works to eradicate giant hogweed by using a combination of hand-pulling, herbicide application, burning, and bagging techniques each summer.
- 16 • **Plant Pest Survey and Detection, MDA, Plant Protection & Weed Management Section.**
- 17 • **Phragmites Control Cost-Share Program, MDNR and private citizens.** This program supplies private landowners with herbicides for *Phragmites* control, and private landowners incur remaining costs. MDNR or MDA can apply the herbicides and bill landowners, or the landowner can use a private applicator.
- 18 • **Aquatic Weed Control with Herbicides, MDA – Plant Protection and Weed Management Section.** MDA staff consider timing, permitting, organism’s effect on ecosystem, expense and level of effort required for control in deciding which herbicides to use and when to use them.

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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. Marsh resources, if any remain, will migrate landward. Marsh loss is caused by a combination of nutria and sea level rise and subsidence of the general terrain in the area.
- 50 • Significant warming may result in habitat changes, causing species such as the Bulls-Eye Snakehead in Florida 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 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 **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 **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

1 **SUMMARY OF AQUATIC INVASIVE SPECIES MANAGEMENT**
2 **NEW MEXICO**

3
4 **AIS Management Plan**

5 **Aquatic Nuisance Species Management Plan** (currently under review by the New Mexico Department of
6 **Game and Fish; once internal review is complete, the plan will be circulated for stakeholder input in 2007).**

7
8 **AIS Programs & Activities**

- 9 • **Lower Rio Grande Salt Cedar Control Project, New Mexico Association of Conservation Districts.** The
10 project includes: eradication efforts; development of management and native vegetation restoration plans;
11 hearings to receive public input on the plans; aerial spraying by helicopter or ground application with prior
12 public notice; and monitoring and evaluation of the effects of control on wildlife, water quality, vegetation and
13 soil health.
- 14 • **Salt Cedar Task Force, New Mexico Environment Department.**
- 15 • **Strategy for Long-Term Management of Exotic Trees in Riparian Areas for New Mexico's Five River**
16 **Systems, New Mexico Interagency Weed Action Group (IWAG).** Efforts include prevention, early detection
17 and mapping, timely control, and adaptive management. Control includes manual removal, selective
18 mechanical grubbing, low-volume basal bark herbicide application, cut-stump herbicide application, foliar
19 herbicide application, and aerial herbicide applications for Russian olive, salt cedar, and Siberian elm. This
20 strategy considers ecosystem impacts, including stream bank stabilization, increased evapotranspiration, altered
21 fire regimes, salt uptake, and decreased native biodiversity.
- 22 • **Native Trout Management, New Mexico Department of Game and Fish (NMDGF), USDA Forest Service,**
23 **National Park Service, U.S. Fish and Wildlife Service (USFWS), New Mexico Interstate Stream**
24 **Commission, and private groups.** The organizations together seek to halt and/or reverse the invasion of non-
25 native trout and its effects on native cutthroat trout. Most work involves managing non-native trout populations
26 through electrofishing or by physical removal. NMDGF also installs migration barriers to prevent the invasion
27 of currently un-invaded streams. They also conduct chemical treatment and restoration of the gila trout, which
28 is protected under both state and federal law.
- 29 • **Whirling Disease Program, NMDGF and USFWS.** The NMDGF has implemented a statewide monitoring
30 program to track the status of whirling disease in infested and negative salmonid populations using GIS-based
31 mapping. The program also tests for presence of whirling disease in hatchery stock and in native and managed
32 trout populations.
- 33 • **Golden Algae Monitoring Program, NMDGF.** The NMDGF is conducting statewide monitoring of the
34 golden algae to determine the effects of algal blooms on zooplankton, fish communities, and aquatic
35 macroinvertebrates. The measurement of physicochemical parameters will serve to develop predictors for
36 blooms and toxic events and to prescribe management actions to maintain sport fisheries, native fish
37 communities, and aquatic macroinvertebrates.
- 38 • **San Juan River Non-native Fish Removal Program, NMDGF, USFWS, Bureau of Reclamation, and Utah**
39 **Division of Wildlife Resources.** The program, a collaborative efforts since 2001, restores the native fish of the
40 San Juan River, including physical removal of non-native piscivores and common carp.
- 41 • **Non-native Crayfish Survey, NMDGF.** Since 1991, the NMDGF has been actively documenting the
42 statewide occurrence of non-native crayfish.
- 43 • **Zebra Mussel Monitoring, USFWS, U.S. Army Corps of Engineers, and New Mexico State Parks.** Zebra
44 mussel monitoring was initiated in 2005 at three state parks (Conchas Lake, Heron Lake, Elephant Butte) and
45 two sites on the Rio Chama.
- 46 • **Chytrid Fungus Monitoring, NMDGF, Western New Mexico State University, and Pisces Molecular**
47 **(Boulder, CO).** Chytrid fungus infections, implicated in the decline of amphibians worldwide, are known to
48 occur in four species of anurans and one salamander in New Mexico. Using molecular genetic techniques,
49 collaborative efforts are ongoing to survey the state for incidence of occurrence in other amphibian taxa.

50
51 **Climate Change Concerns**

- 52 • **Climate change could have significant effects on native fish.** An increase of even a few degrees in water
53 temperature would lead to loss of habitat and species. Non-native trout with higher tolerance to warmer water
54 temperatures and degraded water quality would be at an advantage.

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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 **SUMMARY OF AQUATIC INVASIVE SPECIES MANAGEMENT**
2 **NEW YORK**
3

4 **AIS Management Plan**

5 **Nonindigenous Aquatic Species Comprehensive Management Plan (1993).** The plan has several objectives: (1)
6 Reduce the potential for future introductions of nonindigenous aquatic species into New York waters; (2) Reduce
7 the potential for nonindigenous aquatic species that have been introduced into New York waters to spread into
8 uncolonized waters; (3) Minimize harmful ecological, economic, and social impacts resulting from nonindigenous
9 aquatic organisms that have already been introduced or are proposed for introduction into the waters of New York
10 State; (4) Educate the public on the importance of preventing nonindigenous aquatic species introductions, and how
11 the harmful impacts of nonindigenous aquatic species can be reduced or mitigated.
12

13 **AIS Programs & Activities**

- 14 • **New York State Invasive Species Task Force.** The task force is composed of multiple state agencies and
15 nongovernmental organizations and is jointly chaired by the New York Department of Environmental
16 Conservation and the New York Department of Agriculture and Markets. The original function of the task
17 force was to evaluate the spectrum of invasive species issues and to make recommendations to the legislature
18 and Governor as to how the state should address the issue. The task force has completed this report and now
19 works to implement the proposed recommendations.
- 20 • **Purple Loosestrife Biocontrol Program, Cornell University – Ecology and Management of Invasive**
21 **Plants Program.** The program releases biocontrol insects at over 4,000 sites across the country. It is trying to
22 determine why treatment has succeeded in some areas and not others.
- 23 • **Phragmites, water chestnut, Japanese knotweed biocontrol research, Cornell University – Ecology and**
24 **Management of Invasive Plants Program.** Scientists are researching biocontrol options.
- 25 • **Lake Services Section, New York Department of Environmental Conservation (NYSDEC) - Division of**
26 **Water.** The Division provides local assistance grants for aquatic plant control. It operates a volunteer program
27 to teach plant identification and how to collect and submit samples, conducts plant research and surveys in Lake
28 George, and engages in public outreach through conferences, lake association meetings, site visits, and
29 management activities.
- 30 • **NYSDEC - Division of Fish, Wildlife, and Marine Resources.** The division undertakes local management, of
31 AIS and is modifying regulations to prevent introduction of Chinese mitten crab. It also has a program for
32 hand-harvesting water chestnuts, monitors ANS such as round goby, spiny water fleas, and zebra mussels,
33 including the ecological effects of zebra mussels in 8 Finger Lakes. Finally, the division administers a \$1
34 million grant program for aquatic invasive species eradication projects. (Thirty-two grants were funded in
35 FY2005. The program will continued in FY 2006, but the funding will be shared with a terrestrial invasive
36 species eradication grant program that is currently under development.)
- 37 • **Sea Lamprey Control, NYSDEC – Bureau of Fisheries.** The bureau undertakes sea lamprey control using
38 chemicals and migration barriers.
- 39 • **Monitoring Program: zebra mussels, quagga mussels, and round goby NYSDEC – Bureau of Fisheries.**
40 The bureau monitors for Type E botulism and collects dead bodies. Control is not feasible.
- 41 • **NYSDEC – Division of Fish, Wildlife, and Marine Resources, Region 5 and Region 6.** The Division
42 protects ponds that are habitat for unique strains of native Adirondack brook trout from species such as yellow
43 perch.
- 44 • **Aquatic Plant Harvesting, Finger Lakes-Lake Ontario Watershed Protection Alliance (FL-LOWPA).**
45 The Alliance conducts mechanical harvesting in multiple counties at multiple sites for aquatic plants including
46 Eurasian watermilfoil, muskgrass, and water chestnut. Some county programs have volunteer training and
47 opportunities.
- 48 • **Invasive Species Initiative, FL-LOWPA - Hamilton County Soil and Water Conservation District.** The
49 District distributes educational materials, including fact sheets, brochures and signs, and is developing and
50 encouraging volunteer monitoring for invasive aquatic plants, providing assistance to several lake associations.
- 51 • **Evaluating Alternative Control Strategies for Invasive Aquatic Plants, FL-LOWPA - Madison County**
52 **Planning Department, in conjunction with SUNY Oneonta and Cornell University.** With the goal of
53 formulating a control strategy, the group is examining the impact of fish communities on Eurasian watermilfoil
54 herbivores.

- 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.**

29 Climate Change Concerns

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

37 Climate Change Actions

38 (None reported.)

40 Research Activities & Information Used

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

1 **Research Needs**

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

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 **SUMMARY OF AQUATIC INVASIVE SPECIES MANAGEMENT**
2 **NORTH DAKOTA**

3
4 **AIS Management Plan**

5 **North Dakota Aquatic Nuisance Species (ANS) Management Plan (2005).** The plan’s goal is to “prevent the
6 harmful ecological, economic, and social impacts from ANS being introduced into North Dakota.” Seven objectives
7 address this goal: (1) Coordination of ANS activities and preparing/implementing a comprehensive management
8 plan; (2) Prevention of ANS introductions in North Dakota; (3) Detection of pioneering ANS and monitoring of
9 existing populations of ANS; (4) Education to prevent the spread of ANS; (5) Where feasible, control and
10 eradication of pioneering or established ANS that have significant impacts on native or desirable species; (6)
11 Informing of policy makers about the risks and impacts of ANS; and (7) Increasing the ANS knowledge base in
12 North Dakota by compiling data, conducting research, and publishing information.

13
14 **AIS Programs & Activities**

- 15 • **Lake Oahe Salt Cedar Task Force and Lake Sakakawea Salt cedar Task Force.** These Task Forces are
16 federal, state, and local partnerships that conduct surveys along Yellowstone River and Lake Sakakawea.
17 Thousands of acres have been surveyed and hundreds of acres have been treated. Early detection/rapid
18 response is the policy of all agencies and organizations for combating salt cedar in the state. Because of this,
19 infested acres have remained low due to the herbicide treatments.
- 20 • **Western North Dakota Weed Management Group (encompasses the Little Missouri River from the South**
21 **Dakota border to Lake Sakakawea, the Lake Sakakawea Saltcedar Task Force, and the recently formed**
22 **Lake Oahe Saltcedar Task Force).**
- 23 • **Purple Loosestrife Weed Management Groups, county/ state/ federal agencies and private individuals**
24 **and organizations.** The Lower Sheyenne Purple Loosestrife Project has surveyed and treated the species in the
25 Sheyenne River, from the Bald Hill Dam to the Red River through Fargo. The project has also conducted plant
26 exchanges (garden purple loosestrife for Liatrus), as well as developing, printing, and distributing table place
27 mats, table tents, and invasive ornamentals brochures. These items have been shared and distributed statewide
28 in an effort to control and prevent the spread of purple loosestrife and other ornamental invasives. The Souris
29 River Purple Loosestrife Weed Management Group has surveyed and treated the species from Minot, ND to the
30 Canadian Border. They have also had exchange programs. Both working groups have also utilized biocontrol
31 insects and actively surveyed for salt cedar while surveying and treating purple loosestrife.

32
33 **Climate Change Concerns**

34 (None reported.)

35
36 **Climate Change Actions**

37 (None reported.)

38
39 **Research Activities & Information Used**

40 (None reported.)

41
42 **Research Needs**

- 43 • Research on the length of seed viability of salt cedar at northern latitudes and climates. This information would
44 be invaluable in making salt cedar management plans. Field observations by weed managers show that seed is
45 viable much longer in our colder climates than where prior seed viability research was conducted.
- 46 • Research on the mechanism of spread of salt cedar. Anecdotal evidence points towards waterfowl and wind as
47 being primary means of salt cedar spread. This research data would assist weed managers in concentrating their
48 survey efforts and dollars in those areas most likely to be infested.
- 49 • Research on ability of ANS to be transported to North Dakota and the likelihood that they will become
50 established in state waters. The study should include a risk assessment based on pathways information,
51 frequency of movement into the state, and suitable habitat availability.

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

3
4 **AIS Management Plan**

5 **Oregon Aquatic Nuisance Species (ANS) Management Plan (2001).** The plan has six main objectives: (1)
6 Coordinate and implement a comprehensive management plan; (2) Prevent the introduction of ANS into Oregon; (3)
7 Detect, monitor, and eradicate pioneering aquatic invasive species; (4) Where feasible, control established
8 nonindigenous species that have significant impacts; (5) Inform the public, policy makers, natural resource workers,
9 private industry, and user groups about the risks and impacts of ANS; and (6) Increase and disseminate knowledge
10 of ANS in Oregon through the compilation of data and by conducting research.

11
12 **AIS Programs & Activities**

- 13 • **Invasive Species Council.** The Council focuses on preventing the new introductions of species, outreach and
14 education programs, and coordinating all agencies involved in aquatic species management.
- 15 • **Oregon Clean Safe Boating Program, Oregon Marine Board (OMB).** The Oregon Marine Board (OMB)
16 conducts a clean boating and invasive species awareness campaign. It develops brochures, illustrated panels,
17 and demos of specimens for trade show exhibits. It maintains a website and produces a newsletter that goes to
18 every registered boater in the state. As of December 2006, OMB is working on a Clean Marina Program that
19 will develop an incentive to encourage good housekeeping, conduct training for law enforcement, and create
20 best management practices for facilities development.
- 21 • **Lake Lytle Milfoil Control Project, Oregon State Weed Board (OSWB).** The OSWB developed the
22 *Integrated Aquatic Vegetation Management Plan for Lake Lytle*. The plan's first year included application of
23 aquatic herbicide Sonar, as well as pre- and post-treatment vegetation sampling, quality sampling, and an
24 information/education component.
- 25 • **Noxious Weed Program, Oregon Department of Agriculture.**

26
27 **Climate Change Concerns**

- 28 • Climate change raises the question of whether working on aquatic invasive species is fruitless. Species will
29 move because of changes in climate, which may be part of a natural cycle. Certain species in Oregon are more
30 prevalent or less prevalent with El Niño and La Nina patterns, for example.

31
32 **Climate Change Actions**

33 (None reported.)
34

35 **Research Activities & Information Used**

36 (None reported.)
37

38 **Research Needs**

- 39 • Demographic information, e.g., the 100th Meridian Program is doing surveys on the mobility of boaters to
40 determine where to put out signs.
- 41 • Scientific information on how to best sanitize boats.

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

3
4 **AIS Management Plan**

5 **Aquatic Invasive Species Management Plan (October 2006).** (Plan completed, signed by Governor, and pending
6 ANSTF approval as of December 2006.)

7
8 **AIS Programs & Activities**

- 9 • **Stream ReLeaf Program, PA DEP.** PA DEP holds riparian plant identification classes for staff from regional
10 offices, county conservation districts, and watershed groups. The classes cover the importance of riparian
11 buffers and restoration projects, as well as biodiversity and native and invasive plants.
- 12 • **Delaware River Invasive Plant Partnership, States of Delaware, New Jersey, New York, and**
13 **Pennsylvania.**
- 14 • **Zebra Mussel Control, private water suppliers.** The water suppliers apply chemicals, like chlorine, to intake
15 screens on public water supplies to control zebra mussels.
- 16 • **Pennsylvania Sea Grant.** Sea Grant has conducted Hazard Analysis and Critical Control Point Trainings
17 (HACCP) for state and federal agencies and developed outreach materials on specific AIS, including materials
18 for AIS prevention among boaters.
- 19 • **Zebra Mussel Monitoring, PA DEP.** PA DEP is tracking the distribution and spread of zebra mussels in the
20 Great Lakes region. The agency originally set up ~170 monitoring stations across the state and alerts contacts
21 for adjacent water bodies when there is a new discovery.
- 22 • **Invasive plant species control, Pennsylvania Department of Conservation and Natural Resources (PA**
23 **DCNR).** PA DCNR controls invasive plant species on the lands and in the associated waters it manages with
24 systemic herbicides, mechanical and biological controls.
- 25 • **Pennsylvania Invasive Species Council.** The council, established by executive order in 2004, advises the
26 Governor on invasive species issues in Pennsylvania. The council is also charged with developing and
27 implementing a comprehensive invasive species management plan for the state, providing guidance on the
28 prevention and control of nonnative invasive species and rapid response to new infestations, and facilitating
29 coordination among federal, regional, state, and local initiatives and organizations engaged in the management
30 of nonnative invasive species. The council is comprised of seven state agencies and ten at-large members.

31
32 **Climate Change Concerns**

33 (None reported.)

34
35 **Climate Change Actions**

36 (None reported.)

37
38 **Research Activities & Information Used**

- 39 • Pennsylvania Sea Grant has funded the following AIS research projects (more information available at
40 <http://pserie.psu.edu/seagrant/research/ais.htm>):
- 41 • Round Goby (*Neogobius melanostomus*) Diet, Habitat Preference, and Reproductive Strategies in Presque
42 Isle Bay
- 43 • Population Assessment of Rudd (*Scardinius erythrophthalmus*) in Presque Isle Bay, Lake Erie
- 44 • Distribution of the Invasive Red-Eared Slider Turtle (*Trachemys scripta elegans*) in the Lower Delaware
45 River Basin
- 46 • A Benthic Survey of the Natural Lakes of Northwestern Pennsylvania
- 47 • Effect of Non-Native Mollusk Species on Common Map Turtles, *Graptemys geographica*
- 48 • Impact of the Round Goby (*Neogobius melanostomus*) on Tributary Streams of Lake Erie
- 49 • A Sampling of Presque Isle Bay for the Exotic Cladoceran: *Bythotrephes cederstroemi*
- 50 • Characterization of the Microplanktonic and Microbenthic Communities of Near-Shore Lake Erie
- 51 • Monitoring Zebra Mussel Invasion of Edinboro Lake, Conneauttee Creek, and French Creek

- 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

SUMMARY OF AQUATIC INVASIVE SPECIES MANAGEMENT TENNESSEE

AIS Management Plan

No plan available.

AIS Programs & Activities

- **Aquatic plant management, Nickajack Reservoir, The Tennessee Valley Authority (TVA) and Marion County.** Aquatic plants are managed in near-shore areas along developed shorelines and to maintain access lanes to open water. Management is primarily for hydrilla and in accordance with a stakeholder-developed plan that prescribes the use of herbicides in near-shore areas (with a state permit), mechanical and manual harvesting.
- **Aquatic plant management, Chickamauga Reservoir, The Tennessee Valley Authority (TVA) and private homeowners.** Aquatic plants (spinyleaf naiad and other species) are managed in near-shore areas along developed shorelines and to maintain access lanes in accordance with a stakeholder-developed plan that prescribes private shoreline property owners to use herbicides in near-shore areas (with a state permit) and TVA to mechanically harvest aquatic invasive plants.
- **Monitoring and eradication, Obed Wild and Scenic River.** Authorities monitor for purple loosestrife and eradicate (harvesting, chemical) as needed. They also monitor for exotic mussels, including zebra mussels.
- **Fish monitoring, University of Tennessee.** The University is collecting fish for a project that involves mapping species communities in rivers and streams across the state, including all non-native or invasive species.
- **Eradication and restoration, Warner Parks (Metro Park System), Tennessee Department of Agriculture, Cumberland River Compact Association, Harpeth River Watershed Association, Natural Resources Conservation Service, Friends of Warner Park, and the Eagle Scouts.** The group is conducting in a restoration project along Harpers River, where heavy traffic causes riparian buffer damage. Activities include: rebuilding the buffer, stopping mowing, fencing off the area, removing invasives, and transplanting native species. Monitoring, removal, and replanting will likely continue as needed.
- **Monitoring and control, Metro Park System, Belmont University.** Monitoring and manual removal of garlic mustard plant is being conducted around the Shelby Bottoms section of the Cumberland River.
- **Species removal and restoration, Great Smoky Mountains National Park, National Park Service, U.S. Environmental Protection Agency, Tennessee Wildlife Resources Agency, North Carolina Wildlife Resources Commission, Tennessee Department of Wildlife and Conservation, Trout Unlimited National, Federation of Fly Fishermen, and others.** Rainbow trout populations in select stream segments above natural barriers are being removed with the fish toxicant antimycin or using backpack electrofishing. Monitoring continues for 1-2 years and then, if rainbow trout have not returned, brook trout (native) are reintroduced.
- **Eradication, Big South Fork National Recreation Area.** Riparian invasive plants are treated chemically.
- **Eradication Program, Oak Ridge National Laboratory (ORNL).** The ORNL manages non-native invasive plants in the riparian zones of streams within the Oak Ridge Reservation. Control methods include application of various herbicides, cutting, and mowing. Target species include privet, autumn olive, kudzu, lespedeza, princess tree, mimosa, and tree of heaven. ORNL also monitors fish and aquatic invertebrates in the streams, recording abundance and distribution of native and non-native species. The National Park Service and The Nature Conservancy conducted a complete vascular plant inventory at the park, which formed the basis of which species should be targeted for removal. The Tennessee Exotic Pest Plant Management Manual was also consulted.

Climate Change Concerns

- Barrens Top Minnows usually live in springs, but the mosquito fish is invading. This mostly concerns the effects of altered habitat as springs have been opened up to sunlight and other waterways as a result of humans.

Climate Change Actions

(None reported.)

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

3
4 **AIS Management Plan**

5 No plan available. (The state has adopted a memorandum of understanding with objectives to “[d]evelop a strategic
6 plan to prevent the introduction and spread of ANS within Utah Waters;...[i]mplement the approved action
7 plan;...[coordinate] a cooperative program of long-term ecological monitoring, assessment, and control of ANS in
8 water bodies under the jurisdiction of the individual Cooperators;...[and] [m]eet annually and provide a forum.”)
9

10 **AIS Programs & Activities**

- 11 • **Monitoring Program, Utah Department of Natural Resources – Division of Parks and Recreation and**
12 **Division of Wildlife Resources.** The program inventories 15-20 waters annually for zebra mussels, educates
13 drivers of vehicles from areas of known zebra mussel infestations, encourages boat washing at the Division’s
14 expense, and inspects ten percent of boats for infestations. The program also posts public alert signs at major
15 recreational waters, includes aquatic nuisance (ANS) information inserts in boat re-licensing packets, and prints
16 and distributes ANS brochures to major boating information centers, boat dealers, and sporting goods outlets.
17 New Zealand mud snail brochures have also been printed. The Program also surveys docks and buoys at the
18 end of each summer season for signs of mussels, snails, and Eurasian watermilfoil. Finally, the program
19 maintains kiosks and posts information about anglers’ responsibilities in keeping boats clean.
- 20 • **Recovery Program, State of Colorado, State of Utah, U.S. Fish and Wildlife Service, and Colorado State**
21 **University.** The Program conducts research, removal and relocation to area fishing ponds wherever appropriate
22 and practical, as well as euthanization of invasive fish.
- 23 • **Biosecurity Measures, Utah Division of Wildlife Resources.** Biosecurity measures have been standardized
24 for all aquatic personnel conducting surveys and sampling within Division in order to prevent the movement of
25 aquatic nuisance species between habitats.
- 26 • **Hatchery Monitoring, Utah Division of Wildlife Resources.** In addition to monitoring public and private
27 waters for ANS, the Division has been actively engaged in monitoring state-owned hatcheries for ANS.
28 Whirling disease is a particular concern as there have been three infected hatcheries. Mammoth Creek Hatchery
29 has been reconstructed and disinfected. Reconstruction on Midway Hatchery will begin in the winter of 2007.
30 The Division also has submitted a proposal to construct sand filtration and UV exposure systems for water
31 sources that feed into the Springville Hatchery.
- 32 • **New Zealand Mud Snails Cooperative Studies, Utah State University.** An on-going study at Utah State
33 University is focusing on interactions between the New Zealand mud snail and trout in the Green River.
34 Recent reports indicate that trout may help spread the snail.
- 35

36 **Climate Change Concerns**

37 (None reported.)

38
39 **Climate Change Actions**

40 (None reported.)

41
42 **Research Activities & Information Used**

43 (None reported.)

44
45 **Research Needs**

- 46 • Research on the New Zealand mud snail.
47 • Research on ways to prevent the spread of the zebra mussel.
48

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

3
4 **AIS Management Plan**

5 **Wisconsin's Comprehensive Management Plan To Prevent Further Introductions and Control Existing**
6 **Populations of Nonindigenous Aquatic Nuisance Species (2003).** The plan focuses on the following priority
7 species: purple loosestrife, Eurasian water milfoil, curly leaf pondweed, zebra mussels, ruffe, rainbow smelt,
8 common carp, rusty crayfish, round goby, reed canary grass, and *Cylindrospermopsis raciborski* (a blue green
9 algae). The plan has three major goals: (1) Implement procedures and practices to prevent new introductions of
10 aquatic invasive species into Lakes Michigan and Superior, Wisconsin's boundary waters (the Mississippi and St.
11 Croix Rivers), and the inland waters of the state; (2) Establish management strategies to limit the spread of
12 established populations of aquatic invasive species into un-infested waters of the state; and (3) Abate harmful
13 ecological, economic, social and public health impacts resulting from infestation of aquatic invasive species, and
14 where possible, eliminate those impacts.
15

16 **AIS Programs & Activities**

- 17 • **Aquatic Plant Management Program, Wisconsin Department of Natural Resources (WDNR).** The
18 program seeks to control efforts for Eurasian watermilfoil and curlyleaf pondweed through weed harvesting or
19 spot chemical treatment, as well as some biological control for Eurasian watermilfoil.
- 20 • **Aquatic Invasive Species Program, WDNR.** The program conducts the following activities: (1) *Watercraft*
21 *Inspection*, including the dissemination of information to anglers and boaters that identifies aquatic invasive
22 species and what precautions to take, visual inspection and demonstration of the proper steps to clean boats and
23 equipment, and the installation of signs informing boaters of infestation status, state law, and steps to prevent
24 spreading aquatic invasives; (2) *Monitoring* for zebra mussels (including collection of samples for veliger
25 analyses and deployment of substrate samples), Eurasian watermilfoil (including inspection of watercraft or
26 shorelines for invasive plants), spiny waterfleas, rusty crayfish, and curlyleaf pondweed; (3) *Clean Boats, Clean*
27 *Waters Volunteer Program* (in cooperation with the University of Wisconsin-Extension and the Wisconsin
28 Association of Lakes), which offers training on how to organize a watercraft inspection program, how to inspect
29 boats and equipment, and how to interact with the public and encourages volunteers to help monitor for aquatic
30 invasives; *Purple Loosestrife Biological Control* (in cooperation with the University of Wisconsin-Extension),
31 which is a citizen-based project that emphasizes the use of two beetle species for biocontrol, in combination
32 with traditional methods, and conducts some mechanical harvesting and monitoring of impact; and (4)
33 *Information and Education* (in cooperation with the University of Wisconsin-Extension and Wisconsin Sea
34 Grant), with a focus on working with resource professionals and citizens statewide to teach water users the steps
35 to prevent transporting aquatic invasives, as well as addressing aquarium pet release and water gardening
36 (educational tools include brochures and publications, watch cards and wild cards, public service
37 announcements, and displays at parks, sport shows, state fair, conventions and symposiums).
- 38 • **Invasive Species Awareness Month (June), WDNR in cooperation with various nongovernmental**
39 **organizations.** Workshops, field trips, lectures, and work parties are held statewide in June as part of Invasive
40 Species Awareness Month for Wisconsin. Activities include AIS displays with handouts and experts on site.
- 41 • **Citizen Lake Monitoring Network (formerly Self-Help Citizen Lake Monitoring), WDNR, University of**
42 **Wisconsin- Extension and Wisconsin Lakes Partnership.** With over 1,200 trained citizen volunteers
43 statewide, project goals are to collect high quality data, to educate and empower volunteers, and to share data
44 and knowledge. Volunteers learn to identify exotics and are the eyes for water biologists in helping to monitor
45 the state's 15,081 lakes. Volunteers monitor for Eurasian water-milfoil, curly-leaf pondweed, purple
46 loosestrife, rusty crayfish, zebra mussels, and waterfleas.
- 47 • **Wisconsin Invasive Plants Reporting & Prevention Project, WDNR, University of Wisconsin, Wisconsin**
48 **State Herbarium, and others.** The initiative focuses on early detection/rapid response. Special public
49 recognition is given to those who are among the first to find new invasive species in Wisconsin. In addition,
50 collected specimens become part of the permanent collection of the Wisconsin State Herbarium.
- 51 • **Aquatic Invasive Species Grants, WDNR.** This program awards grants to local municipalities, on a 50
52 percent cost-share basis, for AIS control, including prevention, eradication of pioneer populations, planning and
53 education, and restoration.
54

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.

