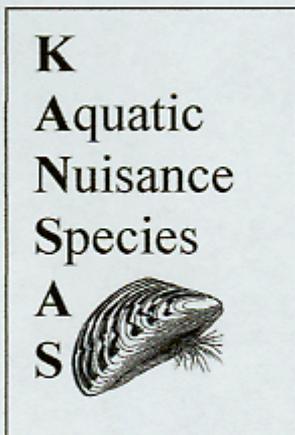


KANSAS AQUATIC NUISANCE SPECIES MANAGEMENT PLAN



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EXECUTIVE SUMMARY

Aquatic Nuisance Species (ANS) are a source of significant ecological and socio-economic problems throughout North America. Kansas's aquatic ecosystems have already been invaded by ANS such as zebra mussels, white perch, and purple loosestrife. While their initial impacts have been limited and localized, there is little doubt that these and other ANS pose a serious threat to Kansas water resources. The importance of Kansas's aquatic resources requires a coherent response to the threat posed by ANS. Using guidance from the National ANS Task Force and other accepted state agency plans, this management plan was developed to establish management actions to address the prevention, control, and effects of non-indigenous aquatic nuisance species that have invaded or may invade Kansas waters. The Kansas non-indigenous aquatic nuisance species management plan serves as the initial step in establishing a program to specifically address ANS issues in Kansas.

The development of a state ANS management plan, as called for in Section 1204 of the Non-indigenous Aquatic Nuisance Prevention and Control Act (NANPCA) of 1990, provides an opportunity for federal cost-share support for implementation of the plan. NANPCA, reauthorized in 1996 as the National Invasive Species Act (NISA), specifies that state plans identify feasible, cost-effective management practices and measures that can be implemented by the state to prevent and control ANS infestations in an environmentally sound manner.

The goals of this ANS management plan are:

1. To prevent new introductions of ANS to Kansas.
2. To prevent dispersal of established populations of ANS into uninfested waters in Kansas.
3. To eradicate or control to minimize the adverse ecological, economic, social, and public health effects of ANS in an environmentally sound manner.
4. To educate all aquatic users of ANS risks and how to reduce the harmful impacts.
5. To support research on ANS in Kansas, and develop systems to disseminate information.

Included in this plan are discussions of existing problems; a summary of federal, regional, and state policy; a list of non-indigenous species known to exist in Kansas; identification of existing priority ANS; and a discussion of regional ANS that pose a threat to Kansas aquatic ecosystems.

To ensure that the goals of this plan are being effectively addressed, a procedure for monitoring and evaluating the implementation of strategies and tasks will be initiated. This evaluation will focus on the feasibility and cost-effectiveness of management activities. The plan is a working document and will be periodically updated and expanded based upon the experience gained from implementation, scientific research, and new tools as they become available.

The effort to develop a state ANS management plan for Kansas was led by the Department of Wildlife and Parks in conjunction with personnel from other government agencies and private organizations (Appendix D). Public comments were solicited from local governments, regional entities, public and private organizations, and resource user groups that have expertise and interest in the control of ANS. Comments were considered, and revisions have been made to the plan.

INTRODUCTION

Non-indigenous aquatic nuisance species (ANS) are the cause of significant ecological and socio-economic problems for water users in North America. ANS have spread beyond historic ranges and have adversely affected infested waters by threatening the integrity of the water resources. Since non-indigenous ANS have few natural controls in their new habitats, they spread rapidly, destroying native plant and animal habitat, threaten the diversity and abundance of native species, and damage industrial, agricultural, and recreational activities dependent on surface waters.

A number of these ANS have become established in the United States and represent a threat to the nation's aquatic resources. As the introduction and spread of ANS continues, the associated problems intensify and create a wide variety of ecological and socio-economic problems for water users. In 1990, the Non-indigenous Aquatic Nuisance Prevention and Control Act (NANPCA) was passed to address ANS problems in the United States. This legislation provided an opportunity for federal cost-share support for implementation of state plans. While programs created by this legislation were initially aimed at problems in the Great Lakes region, reauthorization of NANPCA in 1996 as the National Invasive Species Act (NISA) established a national goal of preventing new ANS introductions and limiting the dispersal of existing ANS in all of the states. NISA specifies that state plans identify feasible, cost-effective management practices and measures that can be implemented by the state to prevent and control ANS infestations in a manner that is environmentally sound. Approval of a state ANS management plan by the Federal Aquatic Nuisance Species Task Force is required for Kansas to be eligible for federal cost-share support.

According to Rendall (1997), the following points must be considered in addressing ANS issues and establishing ANS management programs. These points have provided guidance in the development of this ANS long-term management plan.

- There are many pathways of introduction and spread for ANS, most of which are related to human activities, both accidental and intentional. New species continue to be introduced and spread within North America through these pathways.
- Introductions have many costs associated with them: control and management costs; long-term ecosystem changes; and loss of recreational opportunities.
- Often there are few, if any, acceptable controls available for use in natural water bodies once ANS become established.

- Once species are successfully introduced, any control efforts will be very expensive and eradication very unlikely.
- Prevention is the best course of action. Management plans, education programs, and regulations are strategies that can help prevent the spread of ANS.

The coordinated efforts contained within this plan are designed to protect residents of Kansas and the state's aquatic resources from the multitude of potential losses associated with ANS plants and animals. This management plan focuses on preventing the accidental introductions of new ANS, limiting the spread of existing ANS, and controlling or eradicating ANS where environmentally and economically feasible. The intentional introduction of non-indigenous species for aquaculture, commercial, or recreational purposes is addressed to insure that these beneficial introductions do not result in accidental ANS introductions, and to improve information sharing among those agencies responsible for regulation of intentional introductions.

It is the intent of the State of Kansas to prepare for the introduction of destructive ANS currently found in regional waters and take measures to prevent their infestation of state water bodies. With the recent introduction of one of the most destructive ANS, the zebra mussel *Dreissena polymorpha*, it is realized that a coordinated and effective effort to address this and other ANS introductions is necessary. Kansas has the opportunity to develop a program to allow the state to quickly and effectively deal with both existing and potential ANS threats before they cause significant environmental and economic damage.

In the United States, control of the zebra mussel cost municipalities and industries almost \$70 million a year between 1989 and 1995 (U.S. General Accounting Office 2001). Over the next 10 years, the zebra mussel invasion will cost an estimated \$3.1 billion including cost to industry, recreation, and fisheries (Preliminary Report of the U.S. Commission on Ocean Policy, governors' draft 2004). The costs and effects of exotics in Kansas have not been determined precisely; however costs are incurred in two main categories. First is the loss in potential economic output, such as reductions in aquaculture, fisheries, and crop production. Second is the direct cost of combating and mitigating the impacts of invasion, including all forms of quarantine, control, and eradication (Mack et al. 2000).

The Aquatic Nuisance Species committee was responsible for developing the Kansas ANS management plan. Members of the committee assumed an active role in preparation for the plan by reviewing draft plans and providing guidance. A list of the committee members is provided in Appendix D. The Kansas Department of Wildlife and Parks (KDWP) was the lead agency assigned to coordinate the drafting of the plan. Public comments were solicited from local governments, regional entities, public and private organizations, and resource user groups that have expertise and interest in the control of ANS. Comments were considered and revisions have been made to the plan.

This ANS management plan was developed primarily to serve as an essential guide to state agencies, local governments, public and private organizations, and aquatic resource user groups in developing management strategies, designing public awareness/educational materials, and prioritizing activities related to ANS issues. While the Department of Wildlife and Parks will be

the state agency responsible for administration of this plan, it is expected that there will be broad participation in ANS programs and activities by various state and local entities. The ANS plan for Kansas will provide guidance in coordinating these programs and activities.

The Kansas ANS management plan will be reviewed and revised annually or more frequently if needed to address the unexpected arrival of new ANS. Advances in knowledge of ANS management techniques could warrant alterations in proposed management strategies. The specific tasks employed to accomplish the goals and objectives of the plan must remain flexible to assure efficiency and effectiveness. While this version of the plan is a good starting point for identifying and integrating existing ANS programs, and implementing new programs, future editions will be necessary to achieve Kansas's ANS management goals.

ANS AUTHORITITES AND PROGRAMS

STATE

The State of Kansas currently has a limited number of statutory and regulatory authorities to addresses or potentially address the issue of prevention and control of ANS. Those that exist were developed in response to individual target species and specific concerns as they arose. Kansas does not have a comprehensive, coordinated, and vigorously enforced policy framework to deal with ANS and their affects. For this reason, one objective of Kansas's ANS management plan is to identify gaps within state policies and statutes and develop recommendations for improvements. Such improvements may entail developing new legislation and regulations, revising existing authorities, and developing methods for improving enforcement, coordination, and information dissemination regarding new or existing authorities.

Department of Wildlife & Parks

The mission of the Kansas Department of Wildlife and Parks is to conserve and enhance Kansas' natural heritage, its wildlife, and its habitats. KDWP's underlying philosophy is to manage natural systems properly by striking a balance between natural resource integrity and human benefits.

The following existing policies have been administered by the Department of Wildlife and Parks and identified relative to Kansas's management of ANS are:

1. Prohibited species list, permit requirement, and restrictions (KAR 115-18-10)

Prohibits the importation, possession, or release of the following species:

- a. walking catfish *Clarias batrachus*
- b. silver carp *Hypophthalmichthys molitrix*
- c. bighead carp *Aristichthys nobilis*
- d. black carp *Mylopharyngodon piceus*
- e. snakehead fish Channidae family
- f. zebra mussel *Dreissena polymorpha*
- g. quagga mussel *Dreissena bugensis*

- h. round goby *Neogobius melanostomus*
- i. New Zealand mudsnail *Potamopyrgus antipodarum*

2. Prohibited release of exotics (KAR 115-20-3)

Prohibits the release of all exotic wildlife onto the lands or into the waters of the state.

3. Prohibited stocking (KAR 115-8-12)

Prohibits stocking or releasing of wildlife on department lands or waters and specifies authorization structure.

4. Prohibited transfer of baitfish (KAR 115-8-6)

Fishing bait may be used only in the water where taken.

Department of Agriculture

The Kansas Department of Agriculture (KDA) is a regulatory agency established to ensure a safe meat, milk and egg supply; responsible and judicious use of pesticides and nutrients; the protection of Kansas' natural and cultivated plants; integrity of weighing and measuring devices in commerce; and that the state's waters are put to beneficial use. In 2002 the KDA issued the first ANS plant quarantine in Kansas by levying quarantine on purple loosestrife *Lythrum salicaria* (KSA 2-2113). In January 2004, the KDA enacted a quarantine for all federally listed noxious weeds including 19 aquatic plants, representing the first large scale effort to control ANS plants into and within the State of Kansas.

Department of Health and Environment

The mission of the Kansas Department of Health and Environment (KDHE) is to optimize the promotion and protection of the health of Kansans through efficient and effective public health programs and services and through preservation, protection, and remediation of natural resources of the environment. KDHE has not officially addressed ANS and has historically only documented presence of ANS in field notes that are maintained in a searchable computer database. The Chemical Control Act identifies that KDHE has regulatory control over toxins that potentially may be used to control ANS.

Kansas Water Office

The Kansas Water Office develops the Kansas Water Plan, which is revised annually and approved by the Kansas Water Authority. The Kansas Water Plan is the tool used in Kansas to address current water issues and to plan for future water quality and quantity needs. The State Water Resource Planning Act (KSA 82a-901a) declares that “the state can best achieve the proper utilization and control of the water resources of the state through comprehensive planning which coordinates and provides guidance for the management, conservation, and development of the state’s water resources.” This is accomplished through development of the Kansas Water

Plan. The Kansas Water Plan is based upon a comprehensive, watershed oriented approach to planning. The planning process is designed to be comprehensive, coordinated, and continuous.

The Kansas Water Office has no specific statutory authority to address ANS. However, because the Kansas Water Plan is watershed based, basin specific ANS issues can be included in the Plan. A basin plan can include a management strategy for addressing an ANS including technical information and public education.

FEDERAL

The current federal effort regarding the management of ANS is a patchwork of laws, regulations, policies, and programs. At least 20 agencies currently work at researching and controlling non-indigenous species. Federal laws that apply directly to the introduction of non-indigenous species include the Lacey Act, the Federal Noxious Weed Act, the Federal Seed Act, the Federal Plant Protection Act of 2000, the Non-indigenous Aquatic Nuisance Prevention and Control Act of 1990, and the National Invasive Species Act of 1996. The Endangered Species Act could also have indirect application if an ANS was shown to threaten the survival of a federally listed species, such as the neosho mucket *Lampsilis rafinesqueana* or the Topeka shiner *Notropis topeka*. A description of federal agencies with programs specific to Kansas ANS follows.

U.S. Fish and Wildlife Service

The U.S. Fish and Wildlife Service (USFWS) provides federal funding for implementation of state and regional ANS management plans that have been approved by the Aquatic Nuisance Species Task Force (ANSTF). One of the major USFWS efforts on ANS is the 100th Meridian Initiative. The goals of this Initiative are to 1) prevent the spread of zebra mussels and other ANS in the 100th meridian jurisdictions and west and 2) monitor and control zebra mussels and other ANS if detected in these areas. These goals will be attained through the implementation of the following six components: 1) information and education, 2) voluntary boat inspections and boater surveys, 3) involvement of those who haul boats for commercial purposes, 4) monitoring, 5) rapid response, and 6) evaluation. This initiative represents the first large-scale focused and coordinated effort, working with federal, state, provincial and tribal entities, potentially affected industries, and other interested parties to begin addressing the pathway to prevent the spread of zebra mussels. The success of this Initiative depends on the commitment of these groups to combat the spread of this destructive invader.

U.S. Corps of Engineers

It is the policy of the Corps of Engineers to develop, control, maintain, and conserve the nation's water resources in accordance with the laws and policies established by Congress and the Administration. The Corps' Zebra Mussel Research Program (ZMRP) was authorized by the Non-indigenous Aquatic Nuisance Prevention and Control Act of 1990, Public Law 101-646, and is the only federally authorized research program for the development of technology to control zebra mussels. The Corps ANS programs were integrated into the ANS Task Force to ensure total coordination and leveraging to address all ANS issues.

U.S. Coast Guard

The U.S. Coast Guard gets its authority to regulate ballast water and ANS from NANPCA and NISA. NANPCA directed the Coast Guard to issue regulations and guidelines to control the introduction and spread of ANS in the Great Lakes ecosystem. It also required an assessment of ballast water management practices in all U.S. ports. NISA tasked the Coast Guard with establishing a voluntary ballast water management (BWM) program for virtually all U.S. ports. The Coast Guard's BWM program is the primary emphasis related to ANS in the inland river system. Current Coast Guard efforts include establishing mandatory BWM standards and practices, establishing a program to approve ballast water treatment technologies, establishing penalties for failure to submit required reports, and increasing the applicability to all ships with ballast water tanks bound for all ports or places in U.S. waters.

REGIONAL

The Western Regional Panel

The Western Regional Panel (WRP) on ANS was formed under a provision of NISA. The WRP was formed to help limit the introduction, spread, and impacts of ANS into western North America. This panel includes representatives from federal, state, tribal, Canadian provincial, local agencies, and from private environmental and commercial interests.

The Mississippi River Basin Regional Panel

The Mississippi River Basin Regional Panel (MRBP) on ANS was formed under a provision of NISA to identify priorities for activities, develop and submit recommendations to the national ANSTF, coordinate aquatic nuisance species program activities, advise public and private interests on control efforts, and submit an annual report to the ANSTF describing prevention, research, and control activities in the Mississippi River Basin. This panel includes representatives from federal, state, tribal, and local agencies and from private environmental and commercial interests.

Western Governors Association

The Western Governors Association (WGA) is developing a new program to address undesirable non-indigenous aquatic and terrestrial species in the West because of the significant economic and ecological harm they cause. WGA has formed a working group of state and federal agencies, industry, non-governmental organizations and academia to develop Western strategies to limit the spread of these species.

PROBLEMS AND CONCERNS

Several ANS have already been introduced and dispersed in Kansas by various pathways. The environmental and socio-economic costs resulting from ANS infestations will only continue to rise with further introductions. Although an awareness of the problems caused by ANS is emerging, the solutions are often not readily available. This comprehensive state plan for the

management of ANS provides guidance for preparing management actions to address the prevention, control and impacts of ANS that have or may invade and alter the aquatic resources of Kansas.

A newly introduced species can disrupt the natural ecosystems by altering the composition, density, and interactions of native species. A lack of natural controls may allow a new population to increase at an exponential rate and disrupt native species as the introduced species may prey upon, out compete, or transmit disease to the native species. This disruption can cause significant alterations to food webs, nutrient dynamics, and biodiversity. Changes in the ecology of lakes and rivers, degraded habitat value in infested waters, and stunted fish populations may also result from the disruption caused by a newly introduced species.

ANS not only represent a potential threat to the environment; they threaten industry and the economy. These negative impacts include:

- decreased property values
- decreased recreational opportunities
- decreased water quality
- fouled water intakes
- frequently burned-out irrigation and water pumps
- impacts on power generation
- impeded water flow and decreased efficiency of water delivery systems
- increased risk of flooding due to increased biomass in water or clogging lake outlets

The number of new ANS introductions in Kansas will continue to grow as new and existing ANS become established in Midwestern states, especially those that border Kansas. There are several major pathways through which ANS are introduced, but most are the result of human activities both intentional and unintentional. Pathways of introduction into water bodies include aquaculture, aquarium trade, commercial navigation, transport via vessel fouling, recreational boating and fishing, sale of bait fish, research activities, and distribution through interconnected waterways. In Kansas, there is limited regulation of these pathways.

Non-indigenous Aquatic Animals

A draft list of non-indigenous aquatic animals in Kansas is included in Appendix A and is based on existing data. As such, the list is undoubtedly incomplete as information on non-indigenous aquatic animals in Kansas is limited. The following ANS species are considered of special concern in Kansas; bighead carp, black carp, exotic waterflea, New Zealand mudsnail, round goby, rudd, ruffe, rusty crayfish, silver carp, spiny waterflea, white perch, and zebra mussel. Currently, the zebra mussel, white perch, bighead carp, silver carp, black carp, and New Zealand mudsnail are considered priority species. A discussion of each species follows.

Bighead carp *Hypophthalmichthys nobilis*. The bighead carp is a large-bodied planktivore endemic to eastern China. In 1973, an aquaculturist introduced bighead carp into Arkansas in an attempt to improve water quality in production ponds (Freeze and Henderson 1982). In 1974, regulations were mandated to restrict bighead carp stocking into Arkansas public waters to reduce the probability of accidental introductions. Despite these regulations, bighead carp escaped from aquaculture facilities and subsequently dispersed upstream into the Mississippi and

Missouri River systems. Currently, bighead carp are present in 19 states (Benson et al. 2001; Fuller et al. 1999). While no data are presently available concerning the effects of this species on river ecosystems and their fisheries, observed habitat preferences suggest that bighead carp may directly affect populations of paddlefish *Polyodon spathula*, and other commercially valuable filter feeders (Tucker et al. 1998). Bighead carp are currently found in Kansas waters but do not appear to be causing any severe problems at this point. This situation may change as bighead carp become more widespread in Kansas. Monitoring of this species will be needed.

Black carp *Mylopharyngodon piceus*. The black carp is a large river fish native to Pacific drainages in eastern Asia. Black carp entered the United States in the early 1970s as a contaminant in imported grass carp *Ctenopharyngodon idella* and are currently being maintained in research and fish production facilities in seven states including two that border Kansas (U.S. Fish and Wildlife Service 2002). Approximately 30 black carp escaped from a fish farm in Missouri into the Osage River, Missouri River basin, in April 1994. The first specimen reported from the wild was captured in March 2003 from Horseshoe Lake, Illinois. A second specimen was captured from the wild in the lower Red River, Louisiana in April 2004 (Nico and Fuller 2004). Black carp are likely to survive in the wild and spread throughout the Mississippi drainage. Black carp are molluscivores but also feed on freshwater shrimp, crayfish, and insects thus competing for food with native fish and wildlife species (Nico and Williams 1996). If black carp become established in North American ecosystems, their feeding habits could drastically modify the ecological balance and forever change the native aquatic system's aesthetic, recreational, and economical values. This species would also be especially harmful to native unionid mussels, a taxonomic group that is already imperiled throughout its native range. The potential ecological harm posed by black carp and their current proximity to Kansas make it a significant threat that warrants attention.

Exotic waterflea *Daphnia lumholtzi*. Native to Africa, Australia, and India, this species was first discovered in 1990 in Texas. It has since been found in several Midwestern states including Kansas. The continuing discovery of *D. lumholtzi* in new locations could be due to contaminated stockings of fish through international commercial trade. At the same time, the close proximity of affected reservoirs might lead to the conclusion that *D. lumholtzi* may have spread by recreational boating from the initially infested reservoirs (Benson et al. 2005). Analyses of pre-invasion zooplankton communities indicate that *D. lumholtzi* may be invading reservoirs in which native *Daphnia* species are rare. While the long-term effects of the invasion of *D. lumholtzi* are unknown, it has the potential to dominate late summer zooplankton communities in eastern Kansas reservoirs (Dzialowski et al. 2000). The presence of *D. lumholtzi* in some Kansas reservoirs indicates a need to monitor invaded reservoirs to document the range expansion and determine the long-term implications of the introduction of this invader.

New Zealand mudsnail *Potamopyrgus antipodarum*. Native to New Zealand, this species was discovered in North America in 1987 and has rapidly spread throughout the western United States. It is a parthenogenetic livebearer with a high reproductive potential. Mature New Zealand mudsnails (NZMS) average 5 mm in length; juveniles are much smaller, making them difficult to notice on gear. NZMS populations can reach densities greater than 100,000/m² in suitable habitat. The highest recorded densities reported are 800,000/m² in Lake Zurich, Switzerland, where this species colonized the entire lake in less than seven years (Richards

2002). To date, few data have been reported or research conducted on the impacts of the New Zealand mudsnail on native macroinvertebrate populations or aquatic ecosystems. Concern about the potential impacts of the NZMS on native species, fisheries and aquatic ecosystems in the western United States has been generated by the rapid spread of this species. NZMS degrade habitat with their high reproductive capacity and the subsequent impacts on invertebrate food sources. Its spread into new systems is considered to be primarily human-caused and unintentional transport by people is probably the primary vector for the spread of NZMS. The New Zealand mudsnail has not been reported in Kansas, but is considered a priority species because of the late 2004 introduction into Colorado.

Round goby *Neogobius melanostomus*. The round goby was introduced via ballast water into the St. Clair River, near Detroit in 1990 and has spread into Lake Erie and Lake Michigan where the largest populations are found. The primary concern with the round goby is the tremendous range expansion exhibited since its introduction in 1990. It is an aggressive fish and feeds voraciously upon bottom-feeding fishes (e.g., darters and logperch) (Corkum et al. 1998), snails, mussels, and aquatic insects. The Great Lakes fisheries, particularly those in Lake Michigan and Lake Erie, are threatened by this ANS due to its robust characteristics and ability to displace native species from prime habitat and spawning areas (MacInnis et al. 2000). While the round goby has not been reported in Kansas waters, the rapid spread of this species in the Great Lakes and the Illinois River suggests that it possesses a significant threat to all Midwestern states.

Rudd *Scardinius erythrophthalmus*. Introduced into the United States in the early 1900s as baitfish, this Eurasian native is found in 20 states, including Kansas (Nico and Fuller 2003). Similar in appearance to the golden shiner *Notemigonus crysoleucas*, the rudd is capable of growing to 20 inches in length. Currently, the rudd is one of the most rapidly spreading non-indigenous fishes in the United States. The greatest threat posed by the rudd is its ability to hybridize with the golden shiner which may endanger that species' genetic integrity (Burkhead and Williams 1991). While little is known about the threat posed by rudd, its occurrence in several Kansas reservoirs suggests the need to monitor this ANS.

Ruffe *Gymnocephalus cernuus*. The ruffe was introduced to North America in the 1980s in ballast water of a seagoing vessel. Since its introduction, the ruffe has become established in the nearshore waters of western Lake Superior, with an estimated average rate of range expansion of 18 shoreline miles per year. By the fall of 1994, ruffe populations were found in Michigan waters of Lake Superior and in August of 1995, three ruffe were discovered in a commercial harbor in northern Lake Huron, more than 300 miles east of the previously known range. The ruffe matures quickly, has a high reproductive capacity, and adapts to a wide variety of environments. It is considered a serious threat to commercial and sport fishing. It also has the potential to seriously disrupt the delicate predator-prey balance vital to sustaining a healthy fishery (McLean et al. 1995). While there are no reports of ruffe in Kansas, this highly adaptable species poses a threat similar to that of the round goby.

Rusty crayfish *Orconectes rusticus*. The native range of the rusty crayfish is Illinois, Indiana, and Ohio. However, in recent years its distribution has expanded because of the use of live crayfish as bait by anglers. When introduced into new habitats, it quickly displaces native crayfish and becomes over-abundant. As a result of its voracious appetite, it competes with other

aquatic organisms for food. The rusty crayfish's feeding behavior includes consumption of submerged aquatic vegetation. Large populations can adversely impact native plant populations (Lodge et al. 2000). The rusty crayfish has not been found in Kansas, but it has been transplanted to new waters in neighboring states where self-sustaining populations have become established. The species warrants attention.

Silver carp *Hypophthalmichthys molitrix*. Silver carp were imported and stocked for phytoplankton control in eutrophic water bodies and also as a food fish. It was first brought into the United States in 1973 when a private fish farmer imported silver carp into Arkansas. By 1980 the species was discovered in natural waters, probably a result of escapes from fish hatcheries and other types of aquaculture facilities (Freeze and Henderson 1982). In numbers, the silver carp has the potential to cause enormous damage to native species because it feeds on plankton required by larval fish and native mussels. Presently, silver carp have been recorded in 12 states including Kansas (Benson et al. 2001). Although they have been found in Kansas, silver carp do not appear to be causing any severe problems at this point. This situation could change as silver carp become more widespread. Monitoring of this species will be needed.

Spiny waterflea *Bythotrephes cederstroemi*. The spiny waterflea, likely a ballast water introduction, is a tiny crustacean with a sharply barbed tail spine. The northern European native was first found in Lake Huron in 1984. The spiny waterflea is now found throughout the Great Lakes and in some inland lakes (Parker et al. 2001). Although scientists do not know exactly what effect this invader will have on aquatic ecosystems, resource managers suspect that the spiny waterflea will compete directly with other zooplankton or larval fish for food (Lehman 1991). The spiny waterflea has not been reported in Kansas but warrants continued attention to determine the significance of this threat.

White perch *Morone americana*. A native to the Atlantic coast region of North America, the white perch invaded the Great Lakes in the 1950s through the Welland and Erie canals (Boileau 1985). Since its arrival, it has been associated with declines in both walleye *Sander vitreus* and white bass *Morone chrysops* populations in those areas where it has become well-established due to predation on the eggs of both species. White perch also feed heavily on baitfish utilized by other game species. It is known to hybridize with white bass, resulting in the dilution of the gene pools of both species (Madenjian et al. 2000). White perch have established populations in Wilson and Cheney Reservoirs in Kansas thus as a priority species, demand immediate attention and management.

Zebra mussel *Dreissena polymorpha*. The zebra mussel is one of the best known invaders of the Great Lakes region and other areas of the country where it has spread. Since introduction into the United States, this aquatic nuisance species has caused serious economic and ecosystem impacts and prompted passage of federal ANS legislation. The zebra mussel, a highly opportunistic mollusk, reproduces rapidly, and consumes large quantities of microscopic aquatic plants and animals from the water column (Trometer et al. 1999). The potential impact on fisheries can be profound. Reductions in density and biomass of the zooplankton community may result in reduced growth or abundance of age-0 fish. The first year of a fishes' life is a time when it is most vulnerable to predation; reduced growth rates at this age may extend this period of vulnerability (Wu and Culver 1991). Economic impacts are as pervasive as the ecosystem

impacts. Due to zebra mussels in intake/discharge pipes, Great Lakes municipalities, utilities, and industries have incurred significant costs associated with monitoring, cleaning, and controlling infestations. According to a recent economic impact study, each of 84 Great Lakes water users reported average total expenditures of \$513,600 over the five-year period from 1989 to 1994 (Hushak et al. 1995). Nationwide expenditures to control zebra mussels in water intake pipes, water filtration equipment, and electric generating plants are estimated at \$3.1 billion over 10 years (U.S. Congress Office of Technology Assessment 1993). Commercial and recreational vessels and beach areas also are vulnerable to the negative impacts of the zebra mussel. Zebra mussels are currently found in El Dorado Reservoir, the Walnut River below El Dorado Reservoir, and have been reported in Cheney Reservoir in Kansas. Currently, there is no evidence that they have expanded their range into other water bodies within Kansas. Considered a priority species, zebra mussels represent a serious threat to Kansas's aquatic resources and deserve immediate management action.

Non-indigenous Aquatic Plants

A draft list of non-indigenous aquatic plants in Kansas is included in Appendix B. Species listed have a wetland indicator status of “facultative wetland” or “obligate” in USFWS Region 5. This list is incomplete as information on non-indigenous aquatic plants in Kansas is limited. The following ANS species are considered of special concern in Kansas; purple loosestrife, curly-leaf pondweed, Eurasian watermilfoil, hydrilla, and saltcedar. Currently, Eurasian watermilfoil, purple loosestrife, and saltcedar are considered priority species. A discussion of each species follows.

Curly-leaf pondweed *Potamogeton crispus*. Curly-leaf pondweed, a perennial, rooted, submerged aquatic vascular plant is a native to Eurasia, Africa, and Australia. By 1950, curly-leaf pondweed had infested most of the United States. In the spring, it forms dense mats that interfere with recreation and limit the growth of native aquatic plants. The reproductive ecology of this species is poorly known. By the end of the growing season, curly-leaf pondweed senesces and forms vegetative propagules called turions. Turions are dispersed by water movement throughout a water body and may also be transferred to uninfested waters. The turions germinate in the fall, beginning a new life cycle. (Sastroutomo 1981). Although not widespread, curly-leaf pondweed has been reported in Kansas waters and may pose a significant threat to native vegetation.

Eurasian watermilfoil *Myriophyllum spicatum*. Eurasian watermilfoil, a submerged aquatic plant from Europe, Asia, and northern Africa, is spreading rapidly throughout the United States. It has been reported in 33 states including Kansas. Eurasian watermilfoil is capable of growing under a wide range of environmental conditions and on a variety of bottom substrates. It typically grows in shallow water, but in clear water conditions it can inhabit water up to 30 feet deep. Eurasian watermilfoil's surface canopy can out-compete and eliminate native aquatic vegetation, as well as threaten native fish and wildlife populations (Smith and Barko 1990; Valley and Bremigan 2002). The plant disperses primarily by vegetative propagation through stem fragmentation. Boat propellers and trailers are a major source of long-distance spread of Eurasian watermilfoil (Westbrooks 1998).

Hydrilla *Hydrilla verticillata*. Hydrilla, a submerged, perennial plant is native to Asia, but has spread into Europe, Australia, New Zealand, the Pacific Islands, Africa, South America and North America. This plant was first introduced into Florida waters in the early 1960s and now occurs in almost all of the Gulf and Atlantic coast states and on the west coast in California and Washington (Westbrooks 1998). A highly prolific aquatic plant, hydrilla can out-compete native vegetation by photosynthesizing under low light conditions and can form a thick free-floating mat (Tate et al. 2003). Hydrilla causes major problems with water use. In drainage and irrigation canals, it greatly reduces flow and causes clogging, which can result in flooding and damage to canal banks, structures, and pumps. Hydrilla also has negative effects on fish populations in addition to a decreased recreational opportunity. Excessive vegetation decreases growth and condition of adult fish (Colle and Shireman 1980), and extremely high amounts of hydrilla (>80% coverage) may decrease angler harvest and effort (Colle et al. 1987). Hydrilla is most likely to spread when plant fragments are carried along with recreational boats into new habitat. Hydrilla has not been detected in Kansas, surveillance efforts have been limited.

Purple loosestrife *Lythrum salicaria*. Purple loosestrife is an invasive wetland perennial from Europe and Asia. It became established in North America in the early 1800s via ship ballast, as a medicinal herb, and ornamental plant (Westbrooks 1998). When growing conditions are optimal, initial loosestrife infestations are followed by dramatic population increases. In one growing season, an individual plant may produce over one million seeds, which can remain viable for several years (Welling and Becker 1990). The seeds appear to be moved easily by water, vehicles, and wildlife, and germination can occur under a wide range of temperatures, pH, nutrient levels, and soil types (Shamsi and Whitehead 1974; Keddy and Constabel 1986; Mitich 1999). Once established, purple loosestrife often readily spreads to additional wetland sites. Seed germination occurs in such high densities that seedlings of native plants are frequently suppressed, resulting in eventual creation of a purple loosestrife monoculture (Gardner et al. 2001). While currently present in Kansas, purple loosestrife has yet to cause the level of ecological disruption that other states have experienced.

Saltcedar *Tamarix spp.* Saltcedar is a small tree or large shrub that was introduced into the United States in the early 1800s as an ornamental, for use in wind breaks, or to stabilize eroding stream banks. One mature plant can produce one-half million seeds each year. After summer rains, saltcedar seedlings quickly colonize moist areas due to the constant availability of seeds. The plant's ability to exploit suitable germinating conditions over a long time period gives saltcedar a considerable advantage over native riparian species. Mature plants can sprout vegetatively after fire, flood, or treatment with herbicides and can adapt to wide variations in soil and mineral gradients (Westbrooks 1998). Large saltcedar plants can use up to 200 gallons of water a day, reducing and even eliminating water flow in streams and rivers. Saltcedar is capable of forming dense monocultures and dramatically changing vegetation structure, animal species diversity, soil salinity, and hydrology of sites where it has become dominant (Sher et al. 2002). Saltcedar has been reported in Kansas, and is a severe threat to the structure and stability of native plant communities. It warrants control; eradication techniques need to be investigated.

STATUS OF AQUATIC NUISANCE SPECIES IN KANSAS

All non-indigenous species affect native species and habitat in some manner, but not all of them pose a significant threat, and some provide an economic and recreational benefit in certain areas. It is a difficult task to predict the effects that species will have once they are introduced.

Although ANS problems are relatively new to Kansas, four (purple loosestrife, saltcedar, white perch, and zebra mussel) of the special concern species mentioned in the previous text have become established and are beginning to pose threats to aquatic ecosystems. Other ANS that have been reported in Kansas that have not yet become serious problems include bighead carp, curly-leaf pondweed, rudd, and silver carp. These species are currently considered priority ANS in Kansas. Additional ANS exist in bordering states and pose additional threats to Kansas's water resources.

Priorities for Action

Often many efforts to address ANS problems are implemented after the species has arrived and become widely distributed. As a result, these efforts are often reactive and ineffective. The purpose of this management plan is to expand the scope of efforts in Kansas to deal with the threats posed by all ANS. The goal of this management plan is to implement a coordinated strategy designed to minimize the risk of further ANS introductions into Kansas through all known pathways, develop funding mechanisms to implement and staff a Kansas ANS management program, where practical, stop the spread of ANS already present and eradicate or control ANS to a minimal level of impact. By forming this management plan, it is expected that the problems other states have experienced can be minimized or completely avoided. Initially, this plan will focus on the priority species listed below. As this program evolves, the focus will shift to the development and implementation of new programs designed to prevent or control the introduction of new ANS to Kansas.

Priority Species

The management actions outlined in this plan focus on the following priority species. By addressing pathways of introduction for priority species, the introduction of other lower priority or perhaps unidentified ANS may also be prevented since they may share common pathways of introduction.

- bighead carp *Hypophthalmichthys nobilis*
- black carp *Mylopharyngodon piceus*
- Eurasian watermilfoil *Myriophyllum spicatum*
- New Zealand mudsnail *Potamopyrgus antipodarum*
- purple loosestrife *Lythrum salicaria*
- saltcedar *Tamarix* spp.
- silver carp *Hypophthalmichthys molitrix*
- white perch *Morone americana*
- zebra mussel *Dreissena polymorpha*

MANAGEMENT ACTIONS

The goal of the Kansas ANS management plan is to minimize the harmful ecological, economic, and social affect of ANS through prevention and management of introduction, population growth, and dispersal of ANS into, within, and from Kansas. The goal will be achieved through

implementation of a plan that will emphasize prevention of introductions while effectively addressing established ANS populations. The introduction of ANS into state waters may cause environmental, socio-economic, and possible public health effects. Several damaging ANS already have been introduced into Kansas, and new introductions are highly likely. An effective management plan must:

- require an impact assessment and review for all aquatic non-indigenous species prior to their importation, transport, or use in Kansas;
- allow for early detection;
- include development of contingency plans;
- permit appropriate and timely management response to new and existing populations;
- protect and restore native plant and animal communities;
- provide for easy access to accurate and up to date species distribution and management information;
- incorporate education and research elements;
- recommend funding levels adequate for effective implementation;
- produce agency collaboration through an invasive species council;
- facilitate inter-jurisdictional coordination with state and federal agencies; and
- seek cooperative solutions with the private sector and user groups.

It is impossible to address all potential invaders, their impacts, and the constraints and contingencies that may develop. Consequently, this plan is intended to be adaptable to changing circumstances to avoid a delayed response approach that often limits the vision and opportunity for the prevention of new introductions, leaving the state with ANS management problems that are economically costly, technically challenging, and possibly unfeasible to solve. To effectively address ANS problems in Kansas, prevention of new ANS introductions and control of existing ANS populations is essential.

Management Objectives

OBJECTIVE 1: Coordinate and implement a comprehensive management plan.

1A. Problem: There is no clear authority or agency in Kansas charged with limiting and managing ANS. Kansas needs an organized and centralized approach to ANS management to prevent duplication of effort and eliminate gaps in coverage of ANS issues. State ANS management efforts need to be coordinated with regional and national efforts. Currently, most management activities are focused on isolated problems and not concerned with addressing the

issue of ANS comprehensively. The lack of coordination, oversight, and funding has allowed ANS to become established in Kansas and continues to allow for new introductions. Gaps in ANS management include: unclear authorities, uncoordinated state activities, and staffing and funding shortages.

1A1. Strategic Action: Implement a Kansas ANS management program and coordinate activities.

Task 1A1a: Receive approval of the ANS management plan for Kansas from the Natural Resources Sub-Cabinet.

Task 1A1b: Receive approval of the ANS management plan for Kansas from the governor.

Task 1A1c: Receive approval of the ANS management plan for Kansas from the Kansas Wildlife and Parks Commission.

Task 1A1d: Receive approval for the ANS management plan for Kansas from the Federal Aquatic Nuisance Species Task Force.

Task 1A1e: Implement the Kansas ANS management plan.

Strategic Action 1A2: Create and fund an ANS coordinator position using ANS Task Force monies and matching funds.

Task 1A2a: Hire a coordinator (1.0 FTE) for the Kansas Aquatic Nuisance Species Program. This position will coordinate and direct the Kansas Aquatic Nuisance Species Program out of the KDWP Emporia Research and Survey Office.

Strategic Action 1A3: Coordinate all ANS management programs and activities within Kansas and collaborate with regional and national ANS programs.

Task 1A3a: The Kansas Aquatic Nuisance Species Program coordinator will identify key personnel in state and federal government and private entities for ANS responsibilities.

Task 1A3b: Work to ensure that the ANS strategy is coherent and consistent throughout Kansas.

Task 1A3c: Establish working partnerships with ANS management programs in regional states to facilitate the sharing of data and coordination of management activities.

Task 1A3d: Participate in regional and national forums to ensure that ANS efforts in Kansas remain current and are coordinated with regional and national programs.

Task 1A3e: Conduct an annual forum focused on ANS in Kansas and potential management alternatives.

Strategic Action 1A4: Develop a permanent funding mechanism for ANS management in Kansas.

Task 1A4a: Explore ideas for permanent funding of ANS management activities.

Task 1A4b: Work with the Kansas legislature to establish a permanent funding mechanism for ANS management activities in Kansas.

OBJECTIVE 2: Prevent the introduction of new ANS into Kansas waters.

2A. Problem: There are several pathways by which new species can arrive in Kansas.

Implementation of a program that reviews and regulates which species are intentionally allowed

into Kansas, and monitors the pathways by which species can be unintentionally transported into the state, is necessary to slow the rate at which new species become established. Understanding how various pathways function as conduits for ANS into Kansas is critical for intercepting species and preventing introductions. Prevention is the most cost effective and environmentally sound method of addressing this problem. Kansas has no comprehensive program to prevent new ANS introductions or address new species if one should arrive.

Strategic Action 2A1: Identify ANS that have the greatest potential to infest Kansas aquatic resources and identify existing and potential pathways that facilitate new ANS introductions.

Task 2A1a: Generate a regional list of ANS and evaluate the potential threat posed to Kansas by each.

Task 2A1b: Compile movement information of ANS on a regional level and predict the potential for possible invasion into Kansas waters.

Task 2A1c: Identify existing and potential transport pathways that would facilitate the introduction of these ANS into Kansas.

Strategic Action 2A2: Establish approaches to facilitate legislative, regulatory, and other actions needed to prevent new ANS introductions in Kansas and promote rules that establish the state's authority to control these introductions.

Task 2A2a: Determine statutory authority for ANS issues.

Task 2A2b: Prohibit the importation of non-indigenous aquatic species based upon their invasive potential.

Task 2A2c: Develop a list of approved species that may be imported into Kansas.

Task 2A2d: Examine existing ANS regulations and determine their effectiveness and revise when necessary.

Task 2A2e: Establish penalties for illegal introductions of ANS into Kansas waters.

Task 2A2f: Participate in regional and national forums to ensure coordinated efforts to prevent the introduction of new ANS into Kansas.

OBJECTIVE 3: Detect, monitor, and eradicate ANS.

3A. Problem: Kansas must be able to rapidly detect new ANS invasions and the spread of established ANS so emergency response plans can be implemented while there is potential to eradicate the problem species. Once invasive species have arrived, a brief window of opportunity exists to eradicate small pioneering populations exists. By initiating detection and monitoring programs, Kansas will be able to discover and manage pioneering infestations at a point when the species can possibly be eradicated in a cost effective manner.

Strategic Action 3A1: Implement a surveillance program.

Task 3A1a: Conduct annual surveys on state waters to determine the occurrence and distribution of ANS.

Task 3A1b: Encourage and train citizen-monitoring networks to work in cooperation with state agencies.

Task 3A1c: Develop and distribute a complete listing of ANS existing in Kansas based on survey data.

Strategic Action 3A2: Develop an early response device for detected and potential invasive species.

Task 3A2a: Prioritize regional species that merit ANS management if introduced into Kansas.

Task 3A2b: Develop a rapid response plan for all ANS detected or those ANS that immediately pose a threat to Kansas.

Task 3A2c: Identify funding sources for implementing rapid response plan actions.

Strategic Action 3A3: Eradicate pioneering populations of ANS.

Task 3A3a: Develop and implement an eradication and management program for pioneering ANS.

Task 3A3b: Establish cooperative policies with states sharing watersheds for eradication and to limit the spread of regional ANS populations.

OBJECTIVE 4: Control and eradicate established ANS that have significant impacts.

4A. Problem: Established ANS populations can spread to uninfested waters, thereby increasing their potential for economic and ecological damage. Management activities are most effective when they are directed at limiting the affects of a population or stopping that population from spreading to new waterbodies.

Strategic Action 4A1: Limit the dispersal of established ANS to new waterbodies or to new areas of a waterbody.

Task 4A1a: Establish protocols that will provide guidance in designing and implementing control and eradication strategies.

Task 4A1b: Support scientific research between state and federal agencies and academic institutions that investigate potential control strategies and associated environmental impacts.

Task 4A1c: Ensure that the control strategies developed and implemented by the state are done in coordination with federal agencies, local governments, interjurisdictional organizations and other appropriate entities.

Task 4A1d: Ensure that control strategies are based on the best available scientific information and conducted in an environmentally sound manner.

Task 4A1e: Develop guidelines to ensure the cleaning of water-based equipment that may accidentally spread ANS when moved from infested to uninfested waters.

Strategic Action 4A2: Develop means of adapting human activities to accommodate infestations of ANS.

Task 4A2a: Support scientific research between state and federal agencies and academic institutions that investigate potential means of adapting human activities to accommodate infestations of ANS where eradication or control is not feasible.

OBJECTIVE 5: Educate resource user groups about the risks and impacts of ANS and how to reduce the harmful impacts.

5A. Problem: New ANS introductions occur through a variety of pathways, most of which are closely related to human activities. Although some education programs include ANS information, public awareness of these issues and threats in Kansas are inadequate.

Strategic Action 5A1: Develop and distribute ANS educational materials to increase awareness of the ANS problem.

Task 5A1a: Develop and distribute educational materials to educate what ANS are, the problems they cause, and the avenues available for the public to help address the issue.

Task 5A1b: Develop and distribute ANS fact sheets and ID cards describing the methods to prevent their spread. Materials will include a contact number of where to report potential sightings.

Task 5A1c: Incorporate ANS information into boater safety classes.

Task 5A1d: Produce periodic press releases and public service announcements on specific ANS threats.

Task 5A1e: Create web-based media concerning ANS.

Task 5A1f: Develop ANS curriculum materials to be tied to existing Kansas Wildlife and Parks environmental science curriculum.

Task 5A1g: Make presentations on ANS issues to aquatic resource user groups.

Task 5A1h: Maintain and upgrade ANS information on the Kansas Wildlife and Parks agency website

Task 5A1i: Continue to include information on ANS in state hunting, fishing, and boating regulations.

Strategic Action 5A2: Develop and distribute ANS educational materials targeted at specific, public pathways of introductions.

Task 5A2a: Install appropriate signage at all infested waterbodies along with buoys to encourage public awareness of ANS.

Task 5A2b: Create a pamphlet about the spread of ANS via the release of aquarium animals and aquatic ornamental plants. The brochure will identify ANS, the laws regulating them, and their harmful effects in natural systems. Distribute the brochure to pet stores, garden centers, and bait dealers for distribution to customers.

Task 5A2c: Distribute ANS educational materials to the recreational boating industry (i.e. marinas and boat dealers), and include materials with special event permits.

Task 5A2d: Distribute ANS educational materials to aquaculture industry.

Task 5A2e: Distribute ANS educational materials to aquatic user groups (i.e. dive clubs, angling clubs, sailing clubs, etc.).

Strategic Action 5A3: Develop and distribute ANS identification and management information to resource agency staff.

Task 5A3a: Distribute ANS educational materials to all Kansas resource agency field staff, municipalities using surface water supplies, city park departments, county conservation boards, Coast Guard Auxiliary groups, and other entities with aquatic resource management responsibilities.

Task 5A3b: Organize and facilitate ANS identification workshops for state aquatic resource managers.

Task 5A3c: Develop and maintain a list of experts to whom ANS samples can be sent for identification. This list will be published on state agency websites for easy access.

OBJECTIVE 6: Support research on ANS in Kansas, and develop efficient systems to disseminate information to research and management communities.

6A. Problem: Little is known about the effects of ANS in Kansas. Research questions relevant to the ANS problem include determining the risks associated with each pathway of ANS introductions, the environmental conditions which must be necessary for certain ANS to become established in Kansas waters, the likely interactions between ANS and native species, and which management options will provide the best results in controlling or eradicating ANS populations. Research is needed to quantify and clarify the effect ANS poses to Kansas water resources.

Strategic Action 6A1: Support research that identifies, predicts, and prioritizes potential ANS introductions.

Task 6A1a: Identify life histories and impacts of introduced aquatic plants and animals.

Task 6A1b: Identify critical data needed to prevent the introduction of new ANS.

Task 6A1c: Attend scientific and technical conferences addressing the mechanisms by which new ANS spread.

Task 6A1d: Monitor ongoing research efforts attempting to develop control mechanisms for new ANS.

Strategic Action 6A2: Support research management alternatives for their effect on ANS and native species.

Task 6A2a: Investigate the relationship between human-induced disturbance of aquatic and riparian systems and ANS invasion, establishment, and impacts.

Task 6A2b: Investigate new and innovative methods of managing ANS.

Strategic Action 6A3: Facilitate the collection and dispersal of information, research, and data on ANS in Kansas.

Task 6A3a: Utilize existing field personnel to document the distribution and abundance of ANS.

Task 6A3b: Create a database of interested parties to receive annual ANS updates.

Task 6A3c: Utilize the internet to distribute information and research findings via an agency website.

IMPLEMENTATION TABLE

Strategic Actions/Tasks		Funds Source	Lead Agency	Cooperative Agency	Recent (\$000/FTE's)		Planned (\$000/FTE's)		
Plan #	Description				FY03	FY04	FY05	FY06	FY07
Objective 1: Coordinate and implement a comprehensive management plan									
1A1	Implement a state ANS management program								
1A1a	Receive plan approval by Natural Resources Sub-Cabinet	State	KDWP	KDHE, KDA					
1A1b	Receive plan approval by Kansas Governor	State	KDWP	KDHE, KDA					
1A1c	Receive plan approval by KDWP commission	State	KDWP						
1A1d	Receive plan approval by Federal ANSTF	State	KDWP	FWS					
1A1e	Implement the Kansas ANS management plan	State & Fed	KDWP	various		128/1	140/1	140/1	140/1
1A2	Create and Fund ANS coordinator position								
1A2a	Hire a program coordinator	State	KDWP			55/1	55/1	55/1	55/1
1A3	Coordinate ANS activities with regional/national programs								
1A3a	Identify key personnel with ANS responsibilities	State	KDWP	various					
1A3b	Ensure coherent ANS strategy	State	KDWP	various					
1A3c	Establish partnerships for data sharing	State	KDWP	various					
1A3d	Participate in national and regional coordination forums	State	KDWP						
1A3e	Conduct annual ANS forum in KS	State	KDWP	various			5/1	5/1	5/1
1A4	Develop a permanent funding mechanism for ANS management in Kansas								
1A4a	Explore ideas for permanent funding	State	KDWP	various					
1A4b	Establish permanent funding with KS Legislature	State	KDWP	KDHE, KDA, KWO					
Objective 2: Prevent the introduction of new ANS into Kansas waters									
2A1	Identify ANS with greatest potential to infest Kansas								
2A1a	Generate regional listing of ANS	State	KDWP	KDHE, KDA, KBS					
2A1b	Compile data on regional scale movement of ANS	State	KDWP	KDHE, KDA, KBS					
2A1c	Identify ANS transport mechanisms	State	KDWP	various					
2A2	Establish approaches to prevent new ANS introductions								
2A2a	Determine statutory authority	State	KDWP	various					
2A2b	Prohibit transport of invasive ANS	State & Fed	KDWP	various					
2A2c	Develop list of approved species for import	State	KDWP	various					
2A2d	Examine ANS regulations and revise as needed	State	KDWP	KDHE, KDA					
2A2e	Establish penalties for illegal introductions of ANS	State	KDWP	KDHE, KDA					
2A2f	Participate in regional and national forums for prevention	various	KDWP	various					

Table Legend: COE-United States Army Corps of Engineers, FWS-United States Fish and Wildlife Service, KBS-Kansas Biological Survey, KDA-Kansas Department of Agriculture, KDHE-Kansas Department of Health & Environment, KDWP-Kansas Department of Wildlife & Parks, KWO-Kansas Water Office, MRBP-Mississippi River Basin Panel on Aquatic Nuisance Species, Various-includes numerous interested parties both public and private, WGA-Western Governors Association, WRP-Western Regional Panel

IMPLEMENTATION TABLE

Strategic Actions/Tasks		Funds Source	Lead Agency	Cooperative Agency	Recent (\$000/FTE's)		Planned (\$000/FTE's)		
Plan #	Description				FY03	FY04	FY05	FY06	FY07
OBJECTIVE 3: Detect, monitor, and eradicate ANS									
3A1	Implement a surveillance program								
3A1a	Conduct annual surveys for distribution data	State	KDWP	KDHE, KDA, KBS	4/0	15/0	15/0	15/0	15/0
3A1b	Encourage monitoring networks and coordination	State	KDWP	various					
3A1c	Distribute list of ANS in Kansas	State	KDWP						
3A2	Develop early response device								
3A2a	Prioritize regional ANS that merit management	State	KDWP	WRP, MRBP, WGA					
3A2b	Develop rapid response plan for priority species	State	KDWP	various					
3A2c	Identify funding sources for plan action implementation	State	KDWP	various	1/0	2/0			
3A3	Eradicate pioneering ANS populations								
3A3a	Develop eradication program for pioneering ANS	State	KDWP	KDHE, KDA					
3A3b	Establish policies for shared watersheds	State	KDWP	various					
OBJECTIVE 4: Control and eradicate established ANS that have significant impacts									
4A1	Limit dispersal of established ANS								
4A1a	Establish control protocol	State	KDWP	KDHE, KDA					
4A1b	Support research for control mechanisms	various	KDWP	various					
4A1c	Ensure coordinated control strategies	State	KDWP	various					
4A1d	Ensure environmentally sound control strategies	State	KDWP	various					
4A1e	Develop cleaning guidelines for equipment	State	KDWP	KDHE, KDA, KBS					
4A2	Develop means of adapting human activities								
4A2a	Support research to adapt human activities	various	KDWP	various					

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IMPLEMENTATION TABLE

Strategic Actions/Tasks		Funds Source	Lead Agency	Cooperative Agency	Recent (\$000/FTE's)		Planned (\$000/FTE's)		
Plan #	Description				FY03	FY04	FY05	FY06	FY07
OBJECTIVE 5: Educate users of risks and how to reduce the harmful impacts									
5A1	Develop and distribute ANS educational materials								
5A1a	Develop ANS educational materials to raise awareness	State	KDWP	various	1/0	10/0			
5A1b	Develop ANS prevention fact sheets and ID cards	State	KDWP	various		3/0			
5A1c	Incorporate ANS information into boater safety classes	State	KDWP						
5A1d	Produce PSA's and press releases	State	KDWP	various					
5A1e	Create web based media on ANS	State	KDWP	various					
5A1f	Develop ANS curriculum	State	KDWP	KDHE, KDA					
5A1g	Present ANS issues and information to interested groups	State	KDWP	various	1/0	1/0			
5A1h	Maintain ANS information database on KDWP website	State	KDWP						
5A1i	Include ANS information in regulation booklets	State	KDWP						
5A2	Develop and distribute ANS educational materials targeted at public pathways of introduction								
5A2a	Install appropriate signage at infested waterbodies	State	KDWP		1/0	5/0			
5A2b	Distribute ANS dispersal information to aquatic dealers	State	KDWP						
5A2c	Distribute ANS materials to recreational boat industry	State	KDWP						
5A2d	Distribute ANS materials to aquaculture industry	State	KDWP						
5A2e	Distribute ANS materials to aquatic user groups	State	KDWP	COE					
5A3	Develop and distribute ANS identification and management information to resource agency staff								
5A3a	Distribute ANS material to aquatic resource managers	State	KDWP	various					
5A3b	Facilitate ANS ID workshops for resource managers	State	KDWP	various					
5A3c	Develop list of ANS experts for ID	State	KDWP	various					

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Plan #	Description				FY03	FY04	FY05	FY06	FY07
OBJECTIVE 6: Support research on ANS in Kansas, and develop systems to disseminate information									
6A1	Support research that identifies, predicts, and prioritizes potential ANS introductions								
6A1a	Identify life histories and impacts of introduced ANS	State	KDWP	KDHE, KDA, KBS					
6A1b	Identify critical data to prevent the introduction of ANS	State	KDWP	KDHE, KDA, KBS, COE		30/0			
6A1c	Attend conferences on the mechanisms of ANS spread	various	KDWP	various	1/0	2/0			
6A1d	Monitor research efforts to develop ANS control methods	various	KDWP	various					
6A2	Support research management alternatives for their effect on ANS and native species								
6A2a	Investigate human-induced disturbance and ANS invasion	various	KDWP	various					
6A2b	Investigate new and innovative methods to manage ANS	various	KDWP	KDHE, KDA, KBS					
6A3	Facilitate the collection and dispersal of information, research, and data on ANS in Kansas								
6A3a	Utilize existing field personnel to document ANS	State	KDWP	various		5/0			
6A3b	Identify interested parties to receive annual ANS updates	State	KDWP	various					
6A3c	Utilize the internet to distribute research findings	State	KDWP	various					

Table Legend: COE-United States Army Corps of Engineers, FWS-United States Fish and Wildlife Service, KBS-Kansas Biological Survey, KDA-Kansas Department of Agriculture, KDHE-Kansas Department of Health & Environment, KDWP-Kansas Department of Wildlife & Parks, KWO-Kansas Water Office, MRBP-Mississippi River Basin Panel on Aquatic Nuisance Species, Various-includes numerous interested parties both public and private, WGA-Western Governors Association, WRP-Western Regional Panel.

GLOSSARY

Accidental introduction: An introduction of non-indigenous aquatic species that occurs as the result of activities other than the purposeful or intentional introduction of the species involved, such as the transport of non-indigenous species in ballast water or in water used to transport fish, mollusks, or crustaceans for aquaculture or other purposes.

Aquatic nuisance species (ANS): A non-indigenous species that threatens the diversity and abundance of native species or the ecological stability of infested waters, or commercial, agricultural, or recreational activities dependant on such waters.

Baitfish: Fish species commonly sold for use as bait for recreational fishing.

Ballast water: Any water or associated sediments used to manipulate the trim and stability of a vessel.

Control: Limiting the distribution and abundance of a species.

Ecological integrity: The extent to which an ecosystem has been altered by human behavior; an ecosystem with minimal impact from human activity has a high level of integrity; an ecosystem that has been substantially altered by human activity has a low level of integrity.

Environmentally sound: Methods, efforts, actions, or programs to prevent introductions or to control infestations of ANS that minimize adverse environmental impacts.

Eradicate: The act or process of eliminating an ANS.

Exotic: Any species or other biological material that enters an ecosystem beyond its historic range on the continent.

Great Lakes: Lake Ontario, Lake Erie, Lake Huron (including Lake St. Clair), Lake Michigan, Lake Superior, and the connecting channels (Saint Mary's River, Saint Clair River, Detroit River, Niagara River, and Saint Lawrence River to the Canadian Border), and includes all other bodies of water within the drainage basin of such lakes and connecting channels.

Infested: Any waterbody where an aquatic nuisance species is known to occur.

Intentional introduction: All or part of the process by which a non-indigenous species is purposefully introduced into a new area.

Native: A plant or animal species that naturally occurs in Kansas and has not been introduced from another state or continent.

Non-indigenous species: Any species or other variable biological material that enters an ecosystem beyond its historic range.

Pioneer infestation: A small ANS colony that has spread to a new area from an established colony.

Population: A group of individual plant or animal species occupying a particular area at the same time.

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APPENDIX A
Non-indigenous aquatic animals

Common Name	Scientific Name
Amphibians	
Dusky Salamander	<i>Desmognathus fuscus</i>
Green tree frog	<i>Hyla cinerea</i>
Wood Frog	<i>Rana sylvatica</i>
Fish	
Bighead carp*	<i>Hypophthalmichthys nobilis</i>
Black crappie	<i>Pomoxis nigromaculatus</i>
Blue tilapia	<i>Oreochromis aureus</i>
Brown bullhead	<i>Ameiurus nebulosus</i>
Common carp	<i>Cyprinus carpio</i>
Goldfish	<i>Carassius auratus</i>
Grass carp	<i>Ctenopharyngodon idella</i>
Mosquitofish	<i>Gambusia affinis</i>
Northern Pike	<i>Esox lucius</i>
Palmetto bass	<i>Morone hybrid</i>
Rainbow smelt	<i>Osmerus mordax</i>
Rainbow trout	<i>Oncorhynchus mykiss</i>
Redear sunfish	<i>Lepomis microlophus</i>
Red River Shiner	<i>Notropis bairdi</i>
Rock bass	<i>Ambloplites rupestris</i>
Rudd	<i>Scardinius erythrophthalmus</i>
Saugeye	<i>Sander hybrid</i>
Silver carp*	<i>Hypophthalmichthys molitrix</i>
Striped bass	<i>Morone saxatilis</i>
Threadfin shad	<i>Dorosoma petenense</i>
White perch*	<i>Morone americana</i>
Yellow bass	<i>Morone mississippiensis</i>
Yellow perch	<i>Perca flavescens</i>
Invertebrates	
Asian clam	<i>Corbicula fluminea</i>
Freshwater jellyfish	<i>Craspedacusta sowerbyii</i>
Exotic waterflea	<i>Daphnia lumholtzi</i>
Zebra mussel*	<i>Dreissena polymorpha</i>

* Denotes priority species.

APPENDIX B
Non-indigenous aquatic plants

Common name	Scientific name
American sloughgrass	<i>Beckmannia syzigachne</i>
American wisteria	<i>Wisteria frutescens</i>
Annual rabbit's-foot grass	<i>Polypogon monspeliensis</i>
Blue water speedwell	<i>Veronica anagallis-aquatica</i>
Brazilian waterweed	<i>Egeria densa</i>
Broadleaved peppergrass	<i>Lepidium latifolium</i>
Carolina fanwort	<i>Cabomba caroliniana</i>
Common barnyard grass	<i>Echinochloa crusgalli</i>
Common velvet grass	<i>Holcus lanatus</i>
Creeping bent grass	<i>Agrostis stolonifera</i>
Creeping yellowcress	<i>Rorippa sylvestris</i>
Curly dock	<i>Rumex crispus</i>
Curly pondweed	<i>Potamogeton crispus</i>
Eurasian watermilfoil*	<i>Myriophyllum spicatum</i>
Garden orache	<i>Atriplex hortensis</i>
Garlic mustard	<i>Alliaria petiolata</i>
Glinus	<i>Glinus lotoides</i>
Indian heliotrope	<i>Heliotropium indicum</i>
Jungle rice	<i>Echinochloa colona</i>
Lady's thumb smartweed	<i>Persicaria maculosa</i>
Meadow foxtail	<i>Alopecurus pratensis</i>
Moneywort	<i>Lysimachia nummularia</i>
Mouse foxtail	<i>Alopecurus myosuroides</i>
Narrow leaf cattail	<i>Typha angustifolia</i>
Narrowleaf dock	<i>Rumex stenophyllus</i>
Water lettuce	<i>Pistia stratiotes</i>
Oakleaf goosefoot	<i>Chenopodium glaucum</i>
Parrot's feather	<i>Myriophyllum aquaticum</i>
Prickly sowthistle	<i>Sonchus asper</i>
Prostrate knotweed	<i>Polygonum aviculare</i>
Purple loosestrife*	<i>Lythrum salicaria</i>
Ravennagrass	<i>Saccharum ravennae</i>
Red goosefoot	<i>Chenopodium rubrum</i>
Red orache	<i>Atriplex rosea</i>
Rough blue grass	<i>Poa trivialis</i>
Saltcedar*	<i>Tamarix spp.</i>

*Denotes priority species

APPENDIX B (continued)
Non-indigenous aquatic plants

Common name	Scientific name
Schreber's watershield	<i>Brasenia schreberi</i>
Seaside heliotrope	<i>Heliotropium curassavicum</i>
Tall buttercup	<i>Ranunculus acris</i>
Thymeleaf speedwell	<i>Veronica serpyllifolia</i>
Watercress	<i>Nasturtium officinale</i>
Water hyacinth	<i>Eichhornia crassipes</i>
Water pepper smartweed	<i>Persicaria hydropiper</i>
Weeping willow	<i>Salix babylonica</i>
Yellow iris	<i>Iris pseudacorus</i>

*Denotes priority species.

APPENDIX C
Acronyms Defined

Acronym	Definition
ANS	Aquatic Nuisance Species
ANSTF	Aquatic Nuisance Species Task Force
BWM	Ballast Water Management
FTE	Full Time Employee
KAR	Kansas Administrative Regulation
KDA	Kansas Department of Agriculture
KDWP	Kansas Department of Wildlife & Parks
KDHE	Kansas Department of Health & Environment
KSA	Kansas Statutory Authority
MRBP	Mississippi River Basin Regional Panel
NANPCA	Non-indigenous Aquatic Nuisance Prevention and Control Act
NISA	National Invasive Species Act
NZMS	New Zealand Mudsail
USFWS	U.S. Fish and Wildlife Service
WGA	Western Governors Association
WRP	Western Regional Panel
ZMRP	Zebra Mussel Research Program

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APPENDIX E
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