# Kentucky Aquatic Nuisance Species Management Plan

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**Steve Beshear, Governor**

**Kentucky Department of Fish and Wildlife Resources**
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Approved by Steve Beshear, Governor — 9/19/08 Date

# Table of Contents

## Acknowledgements

This plan could not have been completed without the hard work and valuable insights provided by the Kentucky Aquatic Nuisance Species Task Force (KYANSTF). The Commonwealth of Kentucky is particularly grateful to Ms. Marilyn Barrett-O'Leary, whose experience drafting state Aquatic Nuisance Species (ANS) management plans proved invaluable. The Kentucky Department of Fish and Wildlife Resources (KDFWR) also provided essential financing to draft this plan. We would also like to thank the Federal ANS Task Force for providing clear plan guidelines and all other states before us, who lead the way in the development of state ANS management plans.

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## Executive Summary

This management plan has been created to help Kentucky deal with the myriad of problems associated with aquatic nuisance species (ANS). The aim of the plan is to describe ANS problems within Kentucky and to provide specific management actions that can mitigate current situations and prevent future problems. Mandated by federal legislation and developed by the Kentucky ANS Task Force (KYANSTF), this document will guide our efforts to address ANS problems on a state, regional, and national level over the next 2-3 years.

Aquatic nuisance species are non-native, aquatic species that threaten the diversity or abundance of native species, the ecological stability of waters, or commercial, agricultural, aquacultural, or recreational activities dependent on such waters. Unfortunately, human activities can contribute to the adverse impacts of ANS by facilitating introductions and expediting their spread. In Kentucky, some of the major pathways by which humans contribute to ANS spread include:

- Physical transport between water bodies.
- Fragmentation and spread of existing populations within a habitat.
- Release (unintentional and intentional) into the wild.

Kentucky's abundant freshwater resources make it highly vulnerable to invasions of ANS. The Commonwealth shares a common border with seven other states (Missouri, Illinois, Indiana, Ohio, West Virginia, Virginia, and Tennessee), making their ANS problems our problems (and vice-versa). Some of Kentucky's state borders are defined by aquatic systems (the Mississippi and Ohio Rivers in the west, the Ohio River in the north, and the Big Sandy River to the east). The state's temperate climate and variety of ecosystems provide many opportunities for adaptable and tolerant ANS to thrive. Many ecosystems are fragile and include imperiled species (plants, fish, and mussels). Fragile ecosystems are more prone to disturbance, and an ANS introduction could threaten entire biotic communities. Furthermore, the costs of managing ANS once introduced can be staggering. These factors compel Kentucky to prevent and/or mitigate the negative impacts of ANS.

Once established, ANS have adverse biological, socio-economic, and aesthetic impacts. They can:

- Disrupt the balance of food webs.
- Degrade previously undisturbed habitats.
- Reduce abundance of native organisms by increasing competition (i.e., food resources, nesting areas).
- Decrease biodiversity.
- Deplete limited management (agencies, non-governmental organizations, etc.) funds and other resources.
- Disrupt industrial operations (i.e. hydroelectric plants) and damage drainage ditches.

- Spoil or diminish recreational experiences (swimming, boating, sportfishing, etc.).
- Reduce property values.
- Interfere with commercial fishing and aquaculture operations.
- Endanger public health.

Efforts to prevent and control ANS in Kentucky have been limited, and we are indebted to other states that have led the way in developing management plans. This plan aims to narrow that gap and allow Kentucky to become an important contributor at the state, regional, and national level in the fight against ANS. Specifically, this plan describes ANS problems in Kentucky and proposes management actions that can help mitigate and prevent current and future ANS problems.

This plan aims to identify and prioritize current and potential ANS within Kentucky. Unfortunately, due to global commerce, global mobility, and pathway utilization, new ANS can arrive at any time. To illustrate this sense of urgency, a new ANS *Didymo*, also known as rock snot, was discovered in Kentucky while this plan was being drafted. The following established and potential new ANS arrivals to Kentucky, are described herein:

Plants:

- Eurasian watermilfoil (*Myriophyllum spicatum*)
- Purple loosestrife (*Lythrum salicaria*)
- Brazilian watermilfoil (*Myriophyllum aquaticum*)
- Common reed (*Phragmities australis*)
- Curly pondweed (*Potamogeton crispus*)
- Japanese stiltgrass (*Microstegium vimineum*)
- Reed canarygrass (*Phalaris arundinacea*)
- Japanese knotweed (*Polygonum cuspidatum*)
- Alligator weed (*Alternathera philoxeroides*)
- Water hyacinth (*Eichhornia crassipes*)

Fish:

- Silver carp (*Hypophthalmichthys molitrix*)
- Bighead carp (*Hypophthalmichthys nobilis*)
- Black carp (*Mylopharyngodon piceus*)
- Snakehead (*Channa* sp. or *Parachanna* sp.)
- Round goby (*Neogobius melanostomus*)

Mollusks:

- Zebra mussel (*Dreissena polymorpha*)
- Asian clam (*Corbicula fluminea*)

Algae:

- Rock snot (*Didymosphenia geminata*)

Mammals:

- Nutria (*Myocastor coypus)*

To successfully implement Kentucky's ANS management plan, local, state, and federal officials hope to achieve the following **4 main goals**:

1. Stop new introductions of ANS to Kentucky.
2. Prevent the spread of ANS currently in Kentucky and neighboring states.
3. Limit damages from ANS that cannot be eradicated.
4. Educate the public and stakeholders so they do not facilitate introductions and/or dispersal of new or existing ANS.

The **4 objectives** necessary to meet these goals include:

1. Raise public and stakeholder awareness of ANS issues.
2. Provide programs to prevent introductions and transport of ANS.
3. Develop and utilize an ANS early detection and rapid response (EDRR) system.
4. Offer effective communication and coordination of ANS management activities.

The purpose of this plan is to outline an initial and cohesive approach to ANS management in Kentucky until a time when additional resources and knowledge (e.g., assimilation of baseline data) allow us to develop specific strategies for individual ANS. This plan will provide effective communication, coordination, leadership, and support for ANS control efforts through the creation of an ANS coordinator position. ANS management efforts are located under a central umbrella (the KYANSTF) in the hopes of increasing implementation efficiency and avoiding unnecessary duplication or gaps in efforts. Cooperation among all interested parties are key to developing this plan and even more so in the plan's execution.

## Introduction

The state of Kentucky is located in the east-central United States and contains numerous aquatic habitats, including lakes, rivers, streams, cave streams, springs, and wetlands. Residing in these habitats are diverse native flora and fauna, many of which are identified by federal agencies as threatened or endangered (U.S. Fish and Wildlife Service, 2007). Like many states, Kentucky is experiencing adverse biological, socio-economic, and aesthetic impacts from ANS that threaten freshwater ecosystems statewide.

Federal legislation introduced in 1990, and amended in 1996, deals specifically with problems associated with ANS. The Nonindigenous Aquatic Nuisance Prevention and Control Act (NANPCA) calls on states to develop ANS plans and provides federal funds to help states enact, maintain, and achieve the goals of their plans.

The legislation calls on coordinating local, state, and federal interests to ensure efficient implementation of the ANS management plan. The Federal ANS Task Force has provided state plan guidelines that have helped Kentucky develop our plan. Many organizations, agencies, and authorities have been involved in the process to help achieve the objectives and goals of the plan.

At the federal and national level, the KYANSTF has sought guidance and/or input from:

- **United States Fish and Wildlife Service**
- **United States Department of Agriculture Wildlife Services**
- **United States Army Corps of Engineers**
- **National Park Service**
- **United States Department of Agriculture Forest Service**
- **United States Department of Agriculture National Resources Conservation Service**

Involvement at the state and regional level has included:

- **The Governor's Office**
- **Kentucky Department of Fish and Wildlife Resources-Division of Fisheries**
- **Kentucky Department of Fish and Wildlife Resources-Division of Wildlife**
- **Kentucky Division of Water**
- **Kentucky State Nature Preserves Commission**
- **Kentucky Department of Agriculture**
- **Kentucky Division of Forestry**
- **Kentucky Transportation Cabinet-Division of Environmental Analysis**
- **Kentucky State University**
- **Eastern Kentucky University**
- **University of Kentucky**
- **University of Kentucky Extension Service**
- **Commercial Fishermen**

- **Bait Suppliers**
- **Fish Processors**
- **An Environmental Consulting Firm**
- **Kentucky Nursery and Landscape Association**
- **Southeast Aquatic Resources Partnership**
- **The Nature Conservancy**

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This plan will attempt to incorporate realistic and efficient objectives to achieve the desired goal of minimizing the adverse effects of ANS by using the most environmentally sound and effective methods available. The plan will be submitted to the Federal ANS Task Force and, when approved, provide 75:25 matching funds (as provided in NANPCA) to help implement the program.

An implementation table (page 41) is included detailing existing funds appropriated to ANS programs. As of 1/17/08, $0 and 0 full time equivalencies (FTE) are dedicated to current ANS programs, of which $0 will be carried forward and 1 FTE will be created over the next 2-3 years. The plan requests $121,750 to help the Kentucky Department of Fish and Wildlife Resources to effectively implement the plan.

## What are ANS?

Aquatic nuisance species are non-native, aquatic species that threaten the diversity or abundance of native species, the ecological stability of waters, or commercial, agricultural, aquacultural, or recreational activities dependent on such waters.

Of course, these species did not migrate here naturally. Since the arrival of the earliest European settlers, native ecosystems have accommodated non-native introductions. Settlers brought many agricultural (cows, pigs, etc.) and horticultural (wheat) species to

North America in an effort to ease hardship and reap benefits provided by these species. Many of these species continued to benefit human populations and never caused significant harm to native species, ecosystems, and human utilization of these natural resources. However, once introduced (intentionally or accidentally), a relatively small percentage (~15%) of these introduced organisms can cause a great deal of harm to the nation's native flora and fauna and the human use of them. These species are termed "nuisance species," and if not managed effectively can cause great biological, socio-economic, and aesthetic harm. This plan does not try to manage all nuisance species within Kentucky, only those species primarily inhabiting aquatic environments, hence the term "aquatic nuisance species."

**Why are ANS so successful?**

Unfortunately, once introduced, most ANS are equipped for a speedy and successful takeover of native ecosystems. They have numerous adaptations and advantages that allow them to quickly colonize and spread.

Some of these adaptations include:

- Reproductive characteristics that facilitate rapid dispersal and colonization and self-sustaining populations. Many of these organisms have high seed/egg counts, high survival, and rapid maturation.
- Wide tolerance of diverse and fluctuating environmental conditions. Kentucky has a temperate climate and variety of ecosystems that allow many opportunities for ANS to thrive. Some of these ecosystems, such as Mammoth Cave National Park, are extremely fragile, increasing the need for preventing ANS introductions.

Because native populations evolved in balanced systems, there are checks and balances that prevent a single organism from dominating a system. Aquatic nuisance species did not coevolve with the native organisms in their new environment and therefore lack natural controls resulting in competitive advantages.

Some of these advantages are:

- Lack of predators that limit a species in its native range.
- Ability to utilize and compete for limited food supplies.
- Tolerance of a wide range of environmental conditions.

These adaptations and advantages help ANS populations explode because they can quickly outcompete and overrun existing native species.

**Is Kentucky vulnerable?**

Make no mistake, Kentucky, with its abundance of freshwater resources, is vulnerable. Aquatic habitat within the state includes 89,431 miles of streams, 637,000 acres of wetlands, and 228,385 acres of publicly-owned lakes and reservoirs of which 18

reservoirs are 1000+ acres in size (Kentucky Division of Water, 2006). We share a common border with seven other states (Missouri, Illinois, Indiana, Ohio, West Virginia, Virginia, and Tennessee) making their problems our problems and vice-versa. The state's temperate climate and variety of aquatic ecosystems provide many opportunities for adaptable and tolerant ANS to thrive. Many ecosystems are fragile with numerous imperiled flora and fauna. Furthermore, the popularity of boating and fishing in the state assures the spread of ANS unless effective action is taken as soon as possible.

**What does Kentucky have to lose?**

Although all the impacts of existing ANS on Kentucky's aquatic habitats are currently unclear, our experiences, and the experiences of other states, warrant immediate action. Kentucky has one of the most diverse freshwater fish assemblages (242 native species) in North America (Kentucky Department of Fish & Wildlife Resources, 1993). There are 103 species of freshwater mussels within the state's waters, making it one of the most diverse mussel habitats in North America (Kentucky Department of Fish & Wildlife Resources, 2007). Twenty-three of these species are listed as endangered. There are also four fish and one shrimp species listed as endangered, and one fish is listed as threatened (U.S. Fish and Wildlife Service, 2007). Although there are other threatened or endangered species that spend part of their life cycle in aquatic habitat or depend on aquatic habitat, this plan will include only those species that spend the majority of their life cycle in aquatic habitat, with the exception of nutria due to their devastating negative impacts.

The Cumberland and Green River systems are two of the highest quality river systems in the U.S. With 151 species of freshwater fishes and 71 species of freshwater mussels, the Green River system is the fourth most important system in the country in terms of fish and mussel biodiversity (Nature Conservancy, 2007). These valuable and fragile ecosystems are more prone to disturbance, and an ANS introduction could threaten entire communities. Kentucky cannot afford to take chances and must resolve to be as proactive as possible. The single most important way to prevent biological, socio-economic, and aesthetic loss in this state is to prevent new introductions of ANS. Letting the "genie out of the bottle" is easy; coaxing the genie back in is not.

**What are the negative impacts associated with ANS?**

Once established, ANS have serious biological, socio-economic, and aesthetic impacts.

Biological impacts include:

- Disruption of balanced food webs.
- Degradation of previously undisturbed habitats.
- Reduced abundance of native organisms due to increased competition (i.e., food resources, nesting areas).
- Decreased biodiversity.

Approximately 42% of the 958 aquatic and terrestrial species listed as federally threatened or endangered are at risk primarily due to non-indigenous species (Wilcove *et. al.*, 1998).

Beyond the aquatic systems where ANS reside, their impacts are felt by local, state, and federal entities that must provide resources to prevent, contain, and limit the socio-economic impacts of ANS.

Socio-economic impacts include:

- Depletion of limited management resources.
- Disruption of industrial operations.
- Damage of drainage ditches resulting in increased risk of flooding.
- Lost tourism dollars when recreational experiences such as sportfishing, swimming, and boating are no longer possible or pleasant.
- Fouled rivers and lakes resulting in reduced property values of nearby homes.
- Hurt business groups when ANS interfere with commercial fishing and aquaculture operations.
- Compromised public health. For example, nutria, an ANS from South America, harbors a parasite that results in a severe and painful rash on its human host.

All of these problems must be mitigated, and the costs associated with managing ANS can soar. For example, damages associated with ANS and the control of ANS cost $9 billion annually in the United States (Pimentel *et. al.*, 2000). Kentucky simply cannot afford to act indecisively.

Finally, the loss of aesthetic value that is felt by every citizen and/or visitor to Kentucky due to ANS must be considered. For example, what dollar amount equals not being able to share a favorite childhood fishing spot with a child or grandchild? How many future memories will be lost because recreational swimming and boating activities have been degraded? Although biological and socio-economic loss can be quantified through losses of biodiversity and dollar amounts, aesthetic loss to current and future generations cannot.

## Problem Definition and Ranking

Kentucky is relatively fortunate. To date, the ecological and economic impacts of ANS on the state's wildlife and water resources have been limited to specific areas or types of ecological systems without inflicting severe damage on the entire state. Most ANS identified in this section have spread to Kentucky through a combination of natural and human forces. Recognition of those forces is the first step in limiting future impacts.

By developing this plan, agencies and citizens throughout Kentucky can work to prevent invasions that could inflict more severe impacts while limiting the spread of those ANS already in the state. Implementation depends upon federal agencies, state agencies and citizens recognizing the importance of the state's watersheds in relation to economic, social, and biological activities. All must have knowledge of the invaders, agree to contain them, and cooperate to prevent introductions of new ANS.

### Watershed and County Maps of Kentucky

To prevent and manage ANS in Kentucky, an understanding of the state's watersheds and their management is necessary. Kentucky watersheds are managed by the Kentucky Division of Water through the Watershed Management Initiative (WMI). The WMI focuses attention on selected watershed problems and priorities by providing a coordinated framework for public and private efforts. There are 12 drainage basins in Kentucky, which the WMI groups into 7 management units, primarily for administrative purposes. Each management unit is provided with a dedicated basin coordinator and staff. Because watersheds are naturally occurring, they are not limited by state or county boundary lines. Thus, regional and statewide coordination of ANS management efforts are essential because Kentucky shares river borders, lakes, and streams with neighboring states.

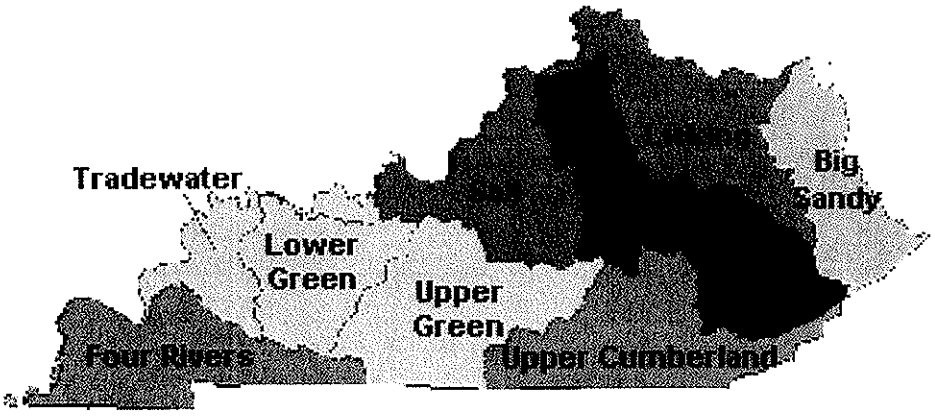


Figure 1. Map of the 7 watershed management units within Kentucky (http://www.water.ky.gov/watersheds/). The color scheme for each unit is as follows: Kentucky River Basin (Red), Licking River Basin and minor Ohio River tributaries (Green), Salt River Basin and minor Ohio River tributaries (Green), Green/Tradewater and Ohio River tributaries (Grey), Upper Cumberland River Basin (Blue), Four Rivers

(Cumberland, Tennessee, Ohio and Mississippi) (Blue), Big/Little Sandy and Tygarts River (Yellow).

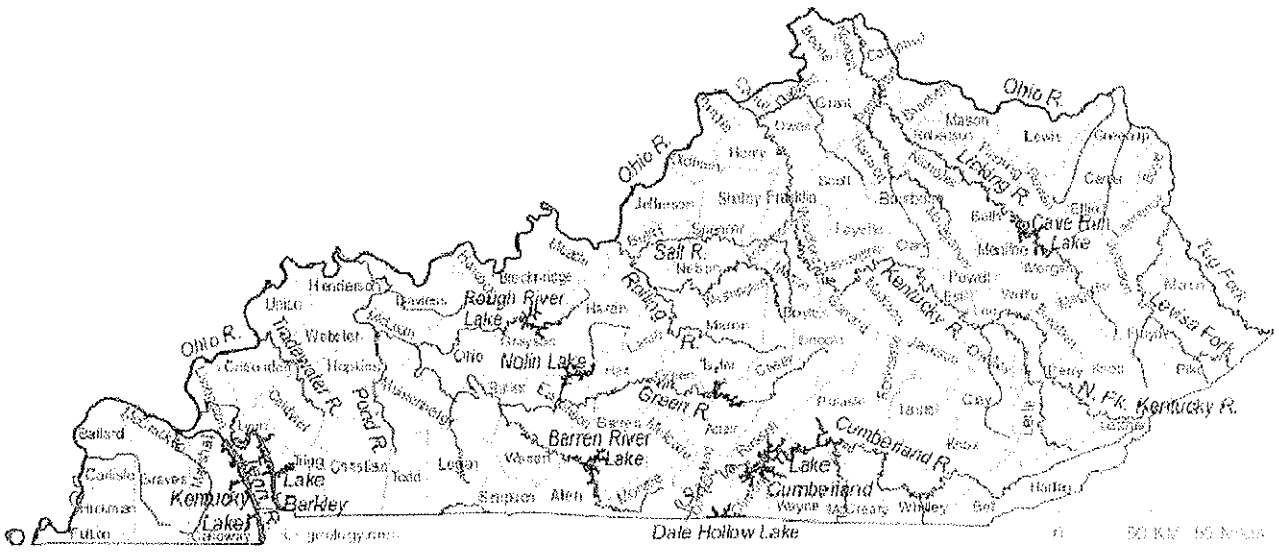


Figure 2. Map of Kentucky counties, major rivers, and lakes. A county map is provided because ANS distribution data in Kentucky are reported by county. Above is a map of Kentucky counties, major rivers, and lakes (http://geology.com/state-map/kentucky.shtml).

Many ANS have already invaded Kentucky, and more are poised to enter the state. Consequently, it is imperative to identify currently established and potential arrivals along with their associated pathways of introduction. The KYANSTF has worked to accomplish these tasks, and in the following section, Kentucky's pathways of concern are discussed and ANS most likely to cause significant harm described. These ANS are grouped by major taxa (i.e. plants, fish, etc.), and individual ANS are designated as "Established" or "Potential Arrival." Due to the immediate or potential threat of these ANS, they are considered candidates for active management. Additional established and potential arrival ANS identified by the KYANSTF, but deemed less of a threat, are listed in Appendix II. All ANS and their pathways will be reviewed annually and appropriate status changes made as necessary.

## Pathways: How do ANS get here, and how do people contribute to their spread?

An important component of preventing and managing ANS is understanding pathways. Pathways are natural and manmade connections that facilitate the introduction or spread of ANS or their reproductive materials. Understanding these avenues of spread is particularly important because preventing new introductions is the single most effective way Kentucky can avoid the much higher costs of managing existing ANS problems. Aquatic nuisance species can be introduced by both natural phenomena such as floods and animal transport as well as human actions. Once established, ANS can spread via natural pathways much like native organisms. In Kentucky, such spread can decrease the

health and usability of aquatic systems that facilitate their increases. These aquatic systems are important to many in Kentucky for recreation and commercial use.

Prevention depends upon controlling all pathways. However, this management plan focuses on introduction and spread facilitated by human activity. Below, are various ways in which humans contribute to the spread of ANS in Kentucky.

**Physical transport between water bodies**

Humans contribute to the spread of ANS by physically transporting them from one water body to another. Kentucky is the center of a waterway system utilized for commercial transport. With access to the Upper and Lower Mississippi, Ohio, and Tennessee-Tombigbee navigation corridors, Kentucky has a waterway link to the Great Lakes and Canada, to Mexican and South American markets, and to the ports of New Orleans, Louisiana and Mobile, Alabama. In addition to these major waterway corridors, barge traffic within the state is occurring on the Big Sandy, Cumberland, Green, and Licking Rivers (Kentucky Cabinet for Economic Development, 2006). Many initial introductions of ANS have occurred during bilge water exchange or after becoming detached from the hulls of vessels involved in commercial transport. Additionally, ANS can be moved from water body to water body attached to watercraft, trailers, water planes, and any equipment or gear associated with them. For example, investigations in Maine found that 3% of watercraft and trailers leaving boat launches have viable fragments of plants attached (Maine Interagency Task Force on Invasive Aquatic Plants and Nuisance Species, 2002). Many aquatic plants can reproduce asexually from fragments. Thus, fragments from an ANS could be easily spread. Further complicating the problem, Kentucky waters are used by many recreational boaters and anglers from neighboring and nearby states, increasing the chance of new ANS introductions into Kentucky from out-of-state sources. Proper rinsing and washing of boats and related equipment can prevent the spread of ANS through this pathway, but most boaters are currently unaware of this remedy or believe it unnecessary.

**Fragmentation and spread of existing populations within a habitat**

Existing ANS populations can be fragmented and spread to uninfested areas within the same habitat. This pathway usually spreads plant fragments that have been cut by an outboard motor then float or are carried to another part of the same lake or river, where the plant can begin to reproduce. Preventing movement of ANS through this pathway is especially important because small, localized populations of plant ANS are much easier to contain and/or eradicate. Once a population threshold is met, certain ANS plants can become nearly impossible to eradicate. Currently, exact areas infested with ANS plants in Kentucky are not known by all boaters, so unwitting spread of many existing ANS plants is possible, even probable.

**Release into the wild**

A source of ANS introductions in Kentucky has been through direct unintentional or intentional release into the wild. This can occur in several ways:

Angling

Some anglers may illegally release specific species of ANS such as alewife and crayfish in the belief that they may enhance a sport fishery. Other anglers may be unaware that dumping their unused live bait ("bait bucket release") may introduce ANS into the water body. Sometimes fingerlings caught and transferred from another water body may harbor diseases or parasites, which may then infect the target water body. In the juvenile stage, many species have a similar appearance. Thus, the young fishes being introduced may accidentally include invasive species along with desired species. These latter pathway problems may also characterize live bait.

Water gardens and aquariums

The sale of non-native aquatic plants and pets from nurseries or aquarium outlets is an economic asset to many communities, but inaccurate labeling plus lack of knowledge about native and non-native species provides a pathway for introducing and spreading ANS. Non-native species that have the ability to overwinter in Kentucky's aquatic habitats could be particularly problematic. Compounding the problem, many water garden and aquarium ANS species are available for purchase on the Internet. Spread occurs because these plants and animals do not remain contained by those who purchase them.

Water garden and aquarium enthusiasts may unintentionally or intentionally release ANS. ANS plants and fish can escape from water gardens during flooding and become established in Kentucky's aquatic ecosystems. Some aquarium owners may intentionally release ANS in the belief that they are acting humanely by "freeing" their no-longer wanted, perhaps too large pets. Nursery and pet wholesalers and retailers do not always ensure that species sold to the public are not ANS. Many do not know which species are problems. Some ANS available at nursery or pet stores may be mislabeled or confused with similar looking native plants or fish. Other non-invasive plants may have ANS "hitchhikers" attached to or mixed in with them.

Failure to maintain effective biosecurity

Aquaculture operations can introduce ANS pathogens, fish, and crustaceans if they improperly dispose untreated biological waste into uninfested waters. Also, operations that are not properly contained may allow ANS to escape into the wild. Researchers may release ANS when they fail to properly contain experiments and subjects or dispose of live material after a project has been completed. Furthermore, many ANS are readily available from biological supply houses and can be ordered through catalogues and the Internet.

Cultural

Ethnic or religious groups may intentionally release culturally familiar organisms for food, medicine, or religious reasons. The snakehead (*Channa* sp. or *Parachanna* sp.) may have been originally introduced into the U.S. as a food source through this pathway (Northern Snakehead Working Group, 2006). Although we are unaware of any ANS released into Kentucky through the cultural pathway, the pathway is problematic elsewhere, and therefore included here as a possible pathway.

## Which ANS are currently established and which may arrive soon?

### Dilemma of ANS definitions

As stated earlier, ANS are non-native, aquatic species that threaten the diversity or abundance of native species or the ecological stability of waters, or commercial, agricultural, aquacultural, or recreational activities dependent on such waters. Although this definition accurately describes most species deemed the biggest threats to Kentucky and those listed in Appendix I, further explanation is needed because much of the terminology used in ANS management plans are not rigorously defined scientific terms. For example, the definition states that ANS are non-native. Non-native is usually used to describe organisms that are from another region or country. In Kentucky's plan, the KYANSTF has included organisms that are native to a particular ecosystem in Kentucky but are problematic when introduced into another part of the state. For example, the rusty crayfish, listed in Appendix II, is native to ecosystems of north central Kentucky, but not native to eastern Kentucky and is problematic there.

The management plan uses an expanded version of the scientific term "aquatic." Aquatic is usually defined as "living in or on the water for all or a substantial part of an organism's life span" (Biology-Online.org, 2006). However, in Kentucky's plan, the KYANSTF has expanded this definition to include some "borderline" species that may not precisely fit this definition, but nonetheless negatively impact aquatic habitats and the human use of these habitats. For example, the KYANSTF decided to include several plant species (e.g., Japanese knotweed, white poplar) that do not live directly in aquatic ecosystems but can negatively impact native organisms that do. Another example is nutria. While nutria swim in the water and are usually found in close proximity to water, they do not live in the water. However, when present, nutria can decimate native aquatic ecosystems and the valuable human use of them. Usage of these expanded definitions and inclusion of associated exceptions in this management plan will strengthen this plan to protect Kentucky's native aquatic ecosystems and the valuable human uses of these ecosystems.

Lastly, the KYANSTF has decided not to include aquatic non-native human disease causing microbes such as West Nile virus in this management plan. While such organisms clearly fit our ANS definition, organizations such as the Kentucky Department for Public Health and the Center for Disease Control and Prevention are better equipped and prepared to deal with such problems. While the KYANSTF acknowledges their threat, issues related to these microbes will be addressed by the appropriate medical and public health entities.

### Problem-causing ANS in Kentucky

An important component of this plan is to identify ANS established in Kentucky and those that may potentially arrive. Potential arrivals may exist in neighboring states or have life histories conducive to surviving Kentucky's aquatic habitats, climate, and environment. In Kentucky, existing ANS and potential arrivals include plants, fish, mollusks, algae, and mammals. The KYANSTF has deemed the ANS described below

the biggest threats to Kentucky. All other identified ANS are listed in Appendix II. Species on both lists are candidates for active management.

## ANS Plants of Kentucky- Established

**Eurasian watermilfoil (*Myriophyllum spicatum*)**
Eurasian watermilfoil is a submerged aquatic plant native to Europe, Asia, and North Africa. This species is believed to have been initially introduced into the U. S. in 1942 around the Washington D. C. area via release into the wild, possibly as result of escaping from a water garden or dumped from an aquarium. In Kentucky, the plant occurs in some northern counties along the Ohio River and scattered throughout some western counties. Within our state, pathways for spread of Eurasian watermilfoil include physical transport between water bodies, fragmentation and spread of existing populations within infested waters, and release into the wild. The plant's preferred habitats are lakes, reservoirs, ponds, and low energy areas of streams and rivers. It is commonly found in water 1.6 – 8.2 ft deep and is able to tolerate a wide range of water temperatures, from frozen lakes in Canada to shallow bays in Florida (Global Invasive Species Database, 2006). Eurasian watermilfoil can form dense, vegetative mats that interfere with swimming, boating, and commercial/recreational fishing. These mats can also shade out and replace native aquatic plants as well as shade out phytoplankton, which can result in alterations to aquatic food webs. Decaying vegetative mats of the plant can reduce water column oxygen levels, possibly resulting in fish kills. Eurasian watermilfoil has less value as a food resource for native organisms, supports fewer aquatic insects, and reduces foraging space of large predatory fish (Aiken *et. al.*, 1979; Hoffman and Kearns, 1997).

**Purple loosestrife (*Lythrum salicaria*)**
Purple loosestrife is a wetland perennial native to Europe, Asia, and northern India. The plant was first introduced in the northeastern U. S. in the 1800s for ornamental and medicinal purposes and has since spread across the country. It most likely spread through release into the wild via water gardens or the cultural pathway. In Kentucky, the plant is mainly found in counties bordering the Ohio River, Fayette and Martin County, as well as along the Red River. Within the state, the plant continues to spread through physical transport between water bodies, fragmenting of existing populations in previously infested waters, as well as the release into the wild pathways. Purple loosestrife thrives in a variety of habitats including lakes, reservoirs, ponds, river and stream banks, and drainage ditches. Like many ANS plants, disturbed areas are more prone to infestation. Mature plants are extremely prolific and can produce up to 2.7 million seeds/plant annually (Thompson *et. al.*, 1987). Once established, purple loosestrife outcompetes and replaces native plants that provide a higher quality food source and habitat for a variety of native wildlife. If left untreated, the plant can form dense, single species stands resulting in decreased biodiversity as well as lost recreational and commercial fishing opportunities.

**Brazilian watermilfoil (*Myriophyllum aquaticum*)**
Brazilian watermilfoil is an aquatic perennial native to South America. The plant was introduced to the U. S. in the 1800s and was most likely spread through the release into

the wild pathway, most likely from aquariums or water gardens. There were no reports from KYANSTF members of the plant occurring in Kentucky, but distribution maps on Natureserve.org indicate a Kentucky presence. In Kentucky, the plant could spread through physical transport between water bodies, fragmenting of existing populations in previously infested waters, and release into the wild. It is often mislabeled and sold for use in watergardens and aquaria. Brazilian watermilfoil grow in lakes, reservoirs, ponds, and low energy areas of streams and rivers. The plant prefers shallow water but is well adapted to water level fluctuations, occurring as floating vegetation in deeper lake waters and surviving on the wet banks of rivers and lakes (Pieterse and Murphy, 1993). The plant forms dense vegetative mats that can crowd out native plants and harm native organisms dependent on these plants for food and habitat. These mats also shade out phytoplankton resulting in the disruption of balanced aquatic food webs. Furthermore, dense vegetative mats restrict recreational opportunities such as swimming, boating, angling, as well as commercial fishing.

**Common reed (*Phragmities australis*)**

Common reed is a large perennial grass widely distributed throughout Europe, Asia, Africa, the Americas, and Australia. While there are native types of common reed, recent evidence suggests that invasive genotypes are responsible for the dramatic spread of this species into aquatic habitats where it was previously not found (Staltonstall, 2002). Some evidence suggests the more invasive genotypes have been introduced to North America from the Old World (Metzler and Rozsa, 1987). When the plant's invasive genotype was initially introduced in the U. S. is unknown, but it is believed to have occurred in states along the Gulf of Mexico. Common reed exhibits invasive characteristics and thrives in Kentucky's aquatic habitats. Within the state, the plant is prevalent in western Kentucky (especially in brackish water areas of strip mine sites) and along the Ohio River border counties. Common reed continues to spread in Kentucky through physical transport between waters, and fragmentation and spread of existing populations in previously infested waters. The plant can grow in disturbed as well as pristine areas but is especially common along roadside drainage ditches and in wetlands. The plant is highly tolerable of variable environmental conditions and thrives from alkaline soils to acidic wetlands and from brackish waters to freshwater areas (Marks *et. al.*, 1993). Common reed spreads aggressively, crowding out native wetland plants. This alters the wildlife support of diverse native plant assemblages and threatens native organisms dependent on them.

**Curly pondweed (*Potamogeton crispus*)**

Curly pondweed is a submerged aquatic plant native to Europe, Asia, and Africa and was first introduced into the U. S. in the 1850s (Stuckey, 1979). In Kentucky, the plant is found in some Ohio River border counties as well as scattered throughout the state. Curly pondweed continues to spread in the state through physical transport between water bodies, fragmenting of existing populations in previously infested waters, as well as release into the wild from aquariums and water gardens. The plant can be found in lakes, reservoirs, ponds, rivers and streams. Curly pondweed spreads primarily by dropping burr-like winter buds called turions. A single plant can produce hundreds of turions that germinate the following growing season. The plant also reproduces vegetatively from rhizomes and stem fragments (Vermont Department of Environmental Conservation and

Fish & Wildlife *et. al.*, 1998). During its growing season, curly pondweed forms dense vegetative mats that remove photosynthetic light from the water column, resulting in alterations to balanced aquatic food webs. The mats crowd out native vegetation and negatively impact native organisms dependent on native vegetation for food and habitat. These vegetative mats also interfere with economically important recreational activities such as boating, swimming, angling, as well as commercial fishing.

**Japanese stiltgrass (*Microstegium vimineum*)**
Japanese stiltgrass is an annual grass native to Asia. The plant was first discovered in the U. S. around 1919 in Tennessee. The initial U. S. introduction was possibly the result of the dried plant's use as packing material for imported goods. Currently, the plant is well established throughout Kentucky and continues to spread through physical transport between water bodies and fragmenting of existing populations in previously infested waters. Japanese stiltgrass grows on stream banks, river bluffs, wetlands, and in upland areas. The plant is slow to colonize undisturbed areas but can quickly form single species stands in disturbed areas. This results in fewer habitats for native plants and less food and cover for native animals. Once established, Japanese stiltgrass alters soil conditions by raising pH and immobilizing nitrogen, which promotes an unfavorable environment for native plants (Ehrenfeld *et. al.*, 2001).

**Reed canarygrass (*Phalaris arundinacea*)**
Reed canarygrass is a perennial grass native to Europe. It is unknown when the plant was initially introduced to the U. S., but this species now occurs across much of the country. The initial U. S. introduction occurred when the plant was released into the wild as a food source for grazing livestock. Within this state, the plant is now prevalent in western Kentucky and in many border counties along the Ohio River. The plant has continued to spread in Kentucky through physical transport between water bodies and the fragmenting of existing populations in previously infested waters. The plant thrives on lakeshores, river and stream banks, and in ponds and wetlands. Once established, reed canarygrass forms dense, impenetrable stands and continues to spread through creeping rhizomes. These dense stands crowd out native plants and displace native animals. The plant also promotes silt deposition, resulting in constriction of waterways and altered hydrologic regimes (Lyons, 1998).

**Japanese knotweed (*Polygonum cuspidatum*)**
Japanese knotweed is an herbaceous perennial native to Asia. The plant was first introduced to the U. S. in the late 1800s as an ornamental plant and for erosion control. Exactly where the plant was initially introduced is unknown. Within Kentucky, the plant has become well established in the central and eastern portion of the state. Japanese knotweed continues to spread in the state through physical transport between water bodies, fragmentation of existing populations in previously infested waters, and release into the wild from water gardens. Japanese knotweed grows rapidly on stream and riverbanks as well as in wetlands. The plant spreads through extensive rhizomes, has been observed growing through 2 inches of asphalt, and can produce up to 21 new shoots/square ft (Seiger, 1991). This species' leaves and stems fall quickly and are extremely persistent, preventing the germination and growth of native plants' seeds.

Japanese knotweed forms very dense thickets that crowd out native vegetation, consequently harming native organisms dependent on native plants for food and habitat and reducing overall biodiversity.

**Alligator weed (*Alternathera philoxeroides*)**
Alligator weed is an aquatic emergent plant native to South America. It is unknown when the plant was first introduced to North America, but this species was most likely brought here for use as an ornamental plant in water gardens. Within the state, alligator weed thrives in wetlands, ponds, drainage ditches, and upland areas of western Kentucky. The plant continues to spread within the state through physical transport between water bodies, the fragmenting of existing populations in previously infested waters, as well as being released into the wild from water gardens. The plant forms roots in shallow water soils as well as dense mats extending over deeper water. Alligator weed continues to spread through its extensive underground rhizomes and the plants' canopy can smother most other herbaceous plant species (Gunasekera, 1999). Alligator weed crowds out native plants, decreasing biodiversity and reducing habitat and food resources for native organisms. Dense mats of this plant restrict sunlight penetration through the water column, resulting in disturbance to balanced aquatic food webs. Large infestations of the plant can create anoxic conditions, harming or killing native flora and fauna (Groves *et. al.*, 1995). Alligator weed mats can restrict or prevent economically important activities such as boating, angling, and swimming as well as disrupt commercial fishing operations.

**Water hyacinth (*Eichhornia crassipes*)**
Water hyacinth is a free-floating aquatic plant native to South America. It was initially introduced into the U. S. in 1884 at the Cotton States Exposition in New Orleans (Invasives.org, 2007), and has since spread across the southeastern U. S. and into parts of the northeastern and western U. S. The plant was first brought to the U. S. as an ornamental plant for water gardens and then subsequently released into the wild. In Kentucky, water hyacinth has been found in western regions of the state. The plant spreads in Kentucky through physical transport between water bodies, the fragmenting of existing populations in previously infested waters, as well as release into the wild from water gardens. Water hyacinth flourishes in lakes, reservoirs, rivers, ponds, and wetlands. The species is the fastest growing saltwater, terrestrial, and freshwater plant with the ability to double its biomass every 6-18 days, dependent on site and season (Lindsey and Hirt, 1999). The plant is particularly troublesome in low energy areas because its dense, floating vegetative mats can reduce dissolved oxygen, alter area hydrology, and increase rates of sedimentation (Toft, 2000). Vegetative mats also displace native plant and animal assemblages, interfere with commercial fishing operations, and ruin water recreation opportunities, especially boating and swimming.

**ANS Fish of Kentucky- Established**

**Silver carp (*Hypophthalmichthys molitrix*)**
Silver carp are large (up to 3 ft long) fish native to China. They were first introduced in the U. S. in 1973 and have since spread at least throughout the Mississippi River basin. Silver carp were imported into this country to control plankton blooms in ponds, lakes

and sewage lagoons. They were then accidentally released into the wild as a result of failure to maintain effective biosecurity and reached Kentucky through the middle Mississippi River basin. In Kentucky, they currently occur in the Mississippi River, Ohio River, lower Tennessee River, lower Cumberland River, part of the Green River, and in Kentucky and Barkley Lakes. Silver carp inhabit large rivers, lakes, ponds, and impoundments. They are large planktivores and pose a direct threat to native fish and mussels that depend on plankton as a food source (Spartaru and Gophen, 1985). Some of the native planktivores that silver carp directly compete with are commercially important filter feeding fishes such as bigmouth buffalo and paddlefish as well as the early life stages of important forage and sportfish species. Silver carp can damage commercial fishing nets that are usually not big and/or strong enough to hold them. Furthermore, these fish will jump out of the water when disturbed and have caused serious injury to both recreational boaters and commercial fishermen.

**Bighead carp (*Hypophthalmichthys nobilis*)**
Bighead carp are large fish (up to 3 ft long) native to China. In 1973, they were first introduced to the U. S. in Arkansas in an effort to control phytoplankton blooms and improve water quality in ponds and lakes. Subsequently, they were accidentally released into the wild as a result of failure to maintain effective biosecurity by escaping a state fish hatchery during a flooding event. By the 1980's, bighead carp began to appear in the open waters of the Mississippi and Ohio rivers (Jennings, 1988). Within Kentucky, they can currently be found in the Mississippi River, Ohio River, lower Tennessee River, lower Cumberland River, part of the Green River, Kentucky Lake, and Barkley Lake. Bighead carp thrive in large rivers as well as lakes, reservoirs, and ponds. They are planktivores that compete directly with native fish and native mussels that depend on plankton for food resources. Like silver carp, these fish directly compete with commercially valuable filter-feeding fish species such as bigmouth buffalo and paddlefish as well as the early life stages of important forage and sportfish species. Furthermore, these fish can damage commercial fishing nets that are usually not big and/or strong enough to hold them.

## ANS Fish of Kentucky- Potential Arrivals

**Black carp (*Mylopharyngodon piceus*)**
Black carp is another large (up to 3 ft long) member of the carp family native to Asia. The fish was initially introduced to the U. S. in 1994 in the state of Missouri for use as a biocontrol for snails in aquaculture operations but were accidentally released into the wild due to failed biosecurity during a flooding event. The fish has not been recorded in Kentucky but has been documented in the Mississippi River raising concerns that the fish may eventually invade Kentucky waters. Thus far, black carp captured in the wild have been sterile triploid organisms, raising hopes that the species will not reproduce in Kentucky's waters. However, there have been concerns about the functional sterility of triploids of some species, prompting fears of possible spread and reproduction (Nico *et. al.* 2005). The black carp's preferred habitat is large, slow moving rivers such as the Mississippi and Ohio rivers. The fish is a bottom-dwelling molluscivore elevating concerns that this species could threaten Kentucky's diverse native mollusk community,

especially the threatened and endangered species such as the clubshell mussel and fantail mussel (Conover, In review).

**Snakehead (*Channa* sp. or *Parachanna* sp.)**
Snakeheads are members of the *Channidae* family and are air-breathing freshwater fishes from two genera, *Channa* and *Parachanna*. Snakeheads in the genus *Channa* are native to Asia, Malaysia, and Indonesia, while *Parachanna* are native to Africa. The first record of their occurrence in the U. S. was in 1977 at Silverwood Lake in California. The mode of their original introduction is unknown, but they are a popular food item at Asian markets and aquarium enthusiasts sometimes seek them as pets. Snakeheads have not been observed in the wild in Kentucky, but reports indicate a presence as close as Virginia. The fish live in slow-moving rivers and streams, as well as ponds and other wetland areas. Snakeheads are voracious predators, and if they become established in Kentucky, they could outcompete native fish for food resources and habitat (Courtney and Williams, 2004).

**Round goby (*Neogobius melanostomus*)**
The round goby is a small, bottom-dwelling fish native to Europe and Asia. Their initial U. S. introduction was believed to have occurred in the Great Lakes during ballast water exchange on a freighter. They are currently not in Kentucky but have been documented as close as Ohio. The round goby lives in lakes and rivers on rocky substrates. They feed on small fish, invertebrates, as well as the eggs of other fish. The fish is a voracious predator, outcompeting native fish for food resources. Mussels are among this species' invertebrate food sources, and if established, the round goby could threaten Kentucky's threatened and endangered mussel populations. Adults are very aggressive defenders of spawning sites causing further harm to native fish by preventing them from utilizing these important areas. Furthermore, females are frequent spawners, spawning approximately every 20 days from spring through summer (University of Michigan Museum of Zoology Animal Diversity Web, 2002).

**ANS mollusks of Kentucky- Established**

**Zebra mussel (*Dreissena polymorpha*)**
Zebra mussels are bivalves native to the Caspian and the Black seas. In 1988, they were initially introduced into the U. S. at Lake St. Clair, near Detroit, Michigan, when a freighter exchanged ballast water containing zebra mussel larvae. The larvae quickly spread, and this species now occurs in the Mississippi River and most of the river's major tributaries including the Ohio, Tennessee, and Cumberland rivers. Currently in Kentucky, zebra mussels are reportedly found in the Ohio River, Barkley Lake, Dewey Lake, and Kentucky Lake, and could spread further through physical transport between water bodies. Zebra mussels thrive in slow-moving rivers and lakes and are filter feeders that compete with native species dependent on plankton as a food source. They are prolific breeders, resulting in direct competition with native mussels for available habitat. Their ability to outcompete native mussel populations for food and habitat is of particular concern in Kentucky because of the state's diverse, native mussel community, comprised of many threatened or endangered species. Zebra mussels are also known to clog

industrial pipes, costing industries millions of dollars in economic damages every year nationwide (O'Neill, 1995).

**Asian clam (*Corbicula fluminea*)**
Asian clams are freshwater bivalves native to Asia. When and how they were initially introduced into the U. S. is unknown. The clam is sought after for aquariums, a food source in Asia, and used as fishing bait. Therefore, their release into the wild was most likely through aquariums or angling, or for cultural reasons. Within Kentucky, the Asian clam has been documented in 83 of the 120 counties and continues to spread through physical transport between water bodies and release into the wild. Asian clams can be found in lakes, reservoirs, rivers, and streams of all sizes but are usually found in moving water due to their high dissolved oxygen requirement. They prefer muddy, sandy, or gravel substrates and are tolerant of cold water temperatures. Asian clams are filter feeders and compete with native organisms that rely on plankton as a food source. Most troublesome is their prolific ability to reproduce (up to 1000 organisms/$m^2$) (Stites *et. al.*, 1995), which could result in habitat and food competition with threatened and endangered native mussel species. Like the zebra mussel, they are known to clog industrial pipes resulting in economic loss.

**ANS Algae of Kentucky- Established**

**Rock snot (*Didymosphenia geminata*)**
Rock snot is a large freshwater diatom (algae), native to northern North America and northern Europe. In the past, the algae could only be found in small amounts and occurred in pristine lakes, rivers, and streams of northern latitudes. Recently, rock snot has increased its southern range. Exactly why this species has begun to exhibit invasive characteristics and expand range is presently unknown. The algae can be found in the Cumberland River in Kentucky and other watersheds common to Tennessee and Kentucky. Rock snot is problematic because it can grow in large mats covering all available bottom substrate of rivers and streams. The algae's massive blooms can affect fish, plant, and invertebrates by excluding suitable habitat and out-competing native diatoms. Furthermore, rock snot can ruin fishing and swimming activities and has been reported to cause eye irritation of swimmers in affected areas (Kilroy, 2004).

**ANS Mammals of Kentucky- Potential Arrivals**

**Nutria (*Myocastor coypus*)**
Nutria are large rodents native to South America. This species was initially introduced into the U. S. in the 1930's in Louisiana as a source of fur for trappers. They have also been introduced into other Gulf states as a means of controlling aquatic vegetation in lakes, ponds, rivers, and streams. Nutria have not been documented in Kentucky but have been recorded as nearby as Tennessee. The rodent lives in burrows near lakes, reservoirs, rivers, and streams, and rarely strays more than 100 m from water. They are voracious feeders and can eat up to 25% of their body weight per day in vegetation (Hygnstrom et. al., 1994). Nutria will eat almost any aquatic or terrestrial green plant, including agricultural crops, and have been known to clear entire aquatic habitats of vegetation.

This ecosystem change from vegetated habitat into open water habitat threatens any native organism dependent on vegetated wetlands for food and cover. There have been reports of nutria feeding on freshwater mussels (National Geographic, 2007), which could further harm Kentucky's threatened and endangered mussel populations. Nutria burrows have also been known to undermine riverbanks and dykes resulting in increased erosion rates (Global Invasive Species Database, 2005).

## Existing Authorities and Programs

**What has been done to stop the introduction and spread of ANS in Kentucky?**

Effective and efficient management of ANS within Kentucky requires a thorough understanding of existing federal, regional, and state programs related to ANS as well as existing authorities governing these efforts. While efforts at each of these levels exist, Kentucky does not have an inclusive ANS management strategy. This plan attempts to address this by providing components necessary to implement strategies that can prevent and control ANS. This section of the plan synthesizes information regarding authorities and regulations currently in place in Kentucky at either the federal, regional, or state level. Less formal ANS management efforts are also addressed at the end of the section. The primary purpose is to facilitate the implementation and coordination of current and future ANS management strategies and to help identify gaps in existing ANS management efforts, which could hinder or limit attainment of plan goals. Some information gathered for this section derives from the Kentucky Legislature website (www.lrc.ky.gov) and the Environmental Law Institute's report, "Halting the Invasion."

**Federal Role**

The federal government's role related to ANS management in Kentucky derives from the management of lands by federal entities within the state as well as several federal acts regarding ANS that affect states. In 1990, section 1204 of the Nonindigenous Aquatic Nuisance Prevention and Control Act (amended as the National Invasive Species Act of 1996) called for states to develop Nonindigenous Aquatic Invasive Species Management Plans and established the federal Aquatic Nuisance Species Task Force (ANSTF). The federal ANSTF published the Guidance for State and Interstate Aquatic Invasive Species Management Plans, which has been central in the development of Kentucky's plan. The Act provides a 75:25 federal to state match of funds to achieve goals outlined in plans approved by the federal ANSTF. Furthermore, the federal ANSTF has partnered with the U. S. Fish and Wildlife Service (USFWS) to develop the Asian Carp Working Group and the Asian Carp National Management Plan. The Group and Plan will help manage the magnitude of problems associated with Asian carp in the U. S. Another important recent development has been the proposed rule under the federal Plant Protection Act. The federal Animal and Plant Health Inspection Service (APHIS) has proposed to allow states to request approval to impose prohibitions or restrictions on the movement in interstate commerce of specific articles, which may be plants and animals.

Below are some federal agencies that have either jurisdiction over lands in Kentucky or the ability to offer assistance with ANS if they become problematic within the state.

U. S. Fish and Wildlife Service

The U.S. Fish and Wildlife Service's (USFWS) mission is working with others to conserve, protect and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people. In Kentucky, the USFWS is responsible for the Wolf Creek National Fish Hatchery and manages the Clarks River National Wildlife Refuge. The USFWS has enforcement authority of the federal Endangered Species Act,

which could be applied if a particular ANS was threatening the survival of a federally listed threatened or endangered species within Kentucky. The USFWS also allocates federal funds (75:25) for implementation of state and regional ANS management plans approved by the federal ANSTF. Furthermore, the federal ANSTF has partnered with USFWS to develop the Asian Carp Working Group and the Asian Carp National Management Plan. The Group and Plan will help manage the magnitude of problems associated with Asian carp in the U. S. Recently, the USFWS added black carp (*Mylopharyngodon piceus)* to its list of injurious fishes under the Lacey Act. By this action, the USFWS prohibits the importation into or transportation between the United States (or any territory or possession of the United States) of live black carp, gametes, viable eggs, or hybrids without a special permit.

U. S. Army Corps of Engineers

The U. S. Army Corps of Engineers (USACE) is responsible for investigating, developing, and maintaining the nation's water and related environmental resources. The Corps actively manages many recreational lakes as well as important river navigational features such as locks and dams throughout Kentucky. In response to the zebra mussel's U. S. introduction and resulting large-scale economic losses, the Nonindigenous Aquatic Nuisance Prevention and Control Act authorized the Corp's Zebra Mussel Research Program. This program is the only federally authorized research program for development of technology to control zebra mussels. Hopefully, information garnered from the research program can be applied to help control zebra mussels in Kentucky, which would reduce pressures on Kentucky's threatened and endangered freshwater mussel species.

U. S. Forest Service

The U. S. Department of Agriculture (USDA) Forest Service's mission is to achieve quality land management under the sustainable multiple-use management concept to meet the diverse needs of people. The U. S. Forest Service has identified invasive species as one of the four critical threats to our nation's ecosystems. In response to this threat, they have implemented the U. S. Forest Service invasive species program. The goal of the program is to reduce, minimize, or eliminate the potential for introduction, establishment, spread, and impact of invasive species across all landscapes and ownerships. The U. S. Forest Service has the authority to manage millions of acres of national forests and grasslands nationwide, including the Land between the Lakes National Recreation Area and Daniel Boone National Forest in Kentucky.

National Park Service

The National Park Service's (NPS) mission includes preserving unimpaired the natural and cultural resources and values of the national park system for the enjoyment, education, and inspiration of this and future generations. In response to the threat of invasive species, the NPS has developed a "Strategic Plan for Managing Invasive Nonnative Plants on National Park System Lands." As part of the program, the NPS is testing mechanical, chemical, and cultural management methods and biological control techniques. The plan has provided a strong and clear policy on managing nonnative plant

species within the national park system. In Kentucky, NPS-managed lands include Mammoth Cave National Park and Cumberland Gap National Historic Park.

**Regional Role**

Prevention and control of ANS occurs on a regional as well as national and state level. Kentucky is involved regionally in efforts to prevent, detect, and control ANS. Regional coordination provides networking opportunities for participants and can help coordinate management activities such as monitoring, research, and educational efforts. Kentucky is a member of the following regional groups.

Mississippi River Basin Panel on ANS

Kentucky is currently a member of the Mississippi River Basin Panel (MRBP). The MRBP helps to identify ANS action priorities, develop recommendations for the federal ANS Task Force, educate the public on control efforts, and coordinate ANS activities in the Mississippi River basin. The panel provides up to date information to those in each state managing ANS. Kentucky has already participated in development of ANS brochures through this organization.

Southeast Aquatic Resources Partnership

Kentucky is a member of the Southeast Aquatic Resources Partnership (SARP). This partnership aims to protect, conserve, and restore (with their partners) the aquatic resources of the Southeast U.S. One of their key issues of greatest concern is dealing with problems associated with ANS. Kentucky participated in development of a regional ANS brochure through this organization.

Southeast Exotic Pest Plant Council

Kentucky is a member of the Southeast Exotic Pest Plant Council (SE-EPPC). This council is a regional non-profit organization dedicated to controlling invasive plants (terrestrial and aquatic) and restoring natural ecosystems. Kentucky has a state chapter, the Kentucky Exotic Pest Plant Council (KY-EPPC), which is discussed further under the state role.

**State Role**

Each state has primary responsibility for the health of wild flora and fauna and their habitats. To maintain or improve environmental conditions, states must manage threats, such as ANS. While existing state authorities concerning ANS management in Kentucky are clear, some of the existing regulations in regards to specific ANS are not. This section attempts to describe ANS regulations as they relate to potential ANS pathways of introduction and spread and the specific groups of organisms that are regulated. Potential gaps in existing regulations are described later in the section. Existing authorities and regulations that are or could be applied to prevention, detection, and control efforts are listed below.

Aquaculture- Existing Authorities

The following state agencies have been delegated authority concerning the governance of aquaculture operations within the state of Kentucky.

*Environmental and Public Protection Cabinet*

The mission of the Environmental and Public Protection Cabinet is to raise the standard of living for Kentucky families through economic growth that is environmentally responsible and sustainable. They have authority within the permitting process of aquaculture operations. Before a Kentucky Pollution Discharge Elimination Permit (KPDEP) is issued to an aquaculture operation applicant, the Environmental and Public Protection Cabinet must determine that the aquaculture project is intended to produce a crop, which has significant commercial value or is intended for research into possible production of such a crop.

*Division of Water*

The mission of the Division of Water is to manage, protect, and enhance the water resources of the Commonwealth for present and future generations through voluntary, regulatory, and educational programs. They are a division of the Environmental and Public Protection Cabinet, and have the following authority concerning the permitting process of aquaculture operations. Aquaculture operations may obtain a KPDEP through the Division of Water- Kentucky Pollution Discharge Elimination System Branch when the Environmental and Public Protection Cabinet has determined that the aquaculture project is intended to produce a crop, which has significant commercial value or is intended for research into possible production of such a crop.

*The Department of Fish and Wildlife Resources*

The Department of Fish and Wildlife Resources, which includes the Division of Fisheries and the Division of Wildlife, is a steward of Kentucky's fish and wildlife resources and their habitats. The Department manages for the perpetuation of these resources and their use by present and future generations, and through partnerships, enhances wildlife diversity and promotes sustainable use, including hunting, fishing, boating, and other nature-related recreation. The agency has been delegated enforcement and inspection authorities concerning aquaculture operations.

Aquaculture- Existing Regulations

In terms of aquaculture operations, the following Kentucky Administrative Regulations (KAR) and Kentucky Revised Statutes (KRS) have been identified as relevant to management of ANS within the state. The entire regulation is located in Appendix II and a synopsis of information within the regulation is provided here. While many of these regulations do not specifically deal with ANS, they provide a legislative framework for preventing possible ANS introductions and spread through aquaculture operations. Potential problems with existing regulations are identified, if applicable.

*401 KAR 5:080. Criteria and standards for the Kentucky Pollutant Discharge Elimination System (KPDES).*

Synopsis:
-Aquaculture operations must obtain a KPDES permit through the Division of Water-Kentucky Pollution Discharge Elimination System (KPDEP) Branch, a division of the Environmental and Public Protection Cabinet.
-Section 2.(2)1.a. Aquaculture operations must produce a crop with significant or potentially significant commercial value.
-Section 2.(3). Applicants must demonstrate that if non-indigenous species are cultivated, the species will have minimal adverse effects on indigenous flora and fauna and the commercial value of the introduced species is at least equal to the displaced or affected indigenous flora and fauna.

*301 KAR 1:115. Propagation of Aquatic Organisms*

Synopsis:
-Section 2. Before acquiring or propagating aquatic organisms, a Fisheries Commercial Propagation permit must be obtained from the Department of Fish and Wildlife Resources.
-Section 7. Provides for inspection of facilities by a conservation officer and permit revocation if not in compliance with regulations.

*301 KAR 1:110. Prohibition on raising or hatching fish in public waters.*

Synopsis:
-No person or organization shall use public waters to raise or hatch fish or aquatic organisms for private or commercial purposes except as specified in section 2 of this administrative regulation. The exception specified in section 2 is for paddlefish in aquaculture operations that occur in approved water supply lakes.

*301 KAR 1:171. Grass carp supplier requirements.*

Synopsis:
-Section 2. Suppliers of triploid grass carp must have a live fish and bait dealers license and a fish transportation permit. If the triploid grass carp are propagated, a fisheries commercial propagation permit must be obtained. Monthly reports must be provided to the Division of Fisheries (DOF) assuring that each grass carp sold or delivered is a triploid fish. Failure to supply monthly reports will be cause for license or permit revocation.
-Section 3. A fisheries commercial propagation permit for triploid grass carp will not be issued until DOF personnel have inspected the facility and determined that no diploid grass carp could escape into public waters. The U.S. Fish and Wildlife Service's Triploid Grass Carp Certification Program must be used to certify all grass carp sold or transported are triploids. Diploid grass carp resulting from the production of triploids must be destroyed on site by the propagator.
-Section 4. The DOF may take random samples of grass carp and if diploid fish are found, the license/permit will be revoked. The licensee/permittee will be responsible for removing and destroying all grass carp from a shipment containing diploid fish that were

stocked in Kentucky waters, and will be required to reimburse the pond owner the full purchase price of the fish, including transportation costs.

Aquatic Animals (Mussels, Fish, and "Other Wildlife") - Existing Authorities

*The Department of Fish and Wildlife Resources*
The Department of Fish and Wildlife Resources are stewards of Kentucky's fish and wildlife resources and their habitats. They manage for the perpetuation of these resources and their use by present and future generations. Through partnerships, they enhance wildlife diversity and promote sustainable use, including hunting, fishing, boating and other nature-related recreation. The agency has been delegated the following authority concerning aquatic animals.

In terms of aquatic animals, the following Kentucky Administrative Regulations (KAR) and Kentucky Revised Statutes (KRS) have been identified as relevant to management of ANS within the state. The entire regulation can be found in Appendix II and a synopsis of information within the regulation is provided here.

Aquatic Animals (Mussels, Fish, and "Other Wildlife")-Existing Regulations

*KRS 150.520 Department may regulate musseling.*

Synopsis:
-The Department of Fish and Wildlife Resources may regulate musseling to prevent depletion of native mussel beds as well as insure proper propagation of mussels. Regulation includes authority to close beds if deemed necessary.

*KRS 150.110 Enforcement of law as to mussels.*

Synopsis:
-Provides the Department of Fish and Wildlife Resources with inspection and enforcement authority concerning musseling regulations.

*KRS 150.990 Penalties.*

Synopsis:
-Provides for fines and jail time for violation of musseling regulations.

*KRS 150.180 Buying, selling, or transporting protected wildlife, mussels and fishes, raw fur, or processed wildlife.*

Synopsis:
-(6) No out of state live fish or wildlife may be brought into Kentucky without a permit. No permit will be issued unless the live fish or wildlife are deemed safe.
-(7) No stocking of fish is allowed unless a permit is obtained or unless performed by Department of Fish and Wildlife Resources personnel.

*301 KAR 1:122. Importation, possession; live fish.*

Synopsis:
-Section 1. No live fish, or live bait organisms, not native or established in Kentucky waters may be bought, sold, possessed, imported, or released into Kentucky waters, except with the approval of the Division of Fisheries (DOF).
-Section 2. Exceptions to Section 1 are: aquarium fish not in section 3, triploid or diploid grass carp (if the proper conditions are met), and other nonnative fishes unless approval is granted by the DOF. No aquarium species may be released directly or indirectly into Kentucky waters.
-Section 3. The following shall not be imported, sold, or possessed in aquaria:
(1) Subfamily *Serrasalminae* - piranha, piraya, pirae, or tiger characins.
(2) *Astyanax mexicanus* - Mexican banded tetra, Mexican minnow or Mexican tetra.
(3) *Petromyzon marinus* - sea lamprey.
(4) Genus *Clarias* - walking catfish.
(5) Genus *Channa* - snakeheads of Asia and Africa.
(6) *Dreissena polymorpha* - zebra mussel.
-Section 4. Exceptions to this list can be made if the applicant demonstrates that the species shall be used for legitimate scientific or educational purposes.

Potential problem with existing regulation:
-The list above is incomplete. It could be updated to include ANS fish and bivalves identified as most problematic by the KYANSTF, such as the round goby and Asian clam. Other species such as silver carp, bighead carp, and black carp identified as most problematic by the KYANSTF, may be exempt from the list because commercial fisherman are attempting to find viable markets for these species.

*301 KAR 1:120. Live fish sales and handling; licensure.*

Synopsis:
-Individuals or companies who sell live fish must have a live fish and bait dealers license, unless they meet the conditions of section 2 unless they are transporting live fish from one state to another state through Kentucky without conducting any type of business in this Commonwealth or are valid holders of commercial propagation permits and those individuals or companies who sell fish for food in establishments licensed to sell retail or wholesale food stuffs.

*301 KAR 1:125. Transportation of fish.*

Synopsis:
-Section 1. Individuals or corporations who transport aquatic organisms into, within, or through Kentucky must have a transportation permit.
-Section 2. Department of Fish and Wildlife Resources personnel may inspect transporters of aquatic organisms to insure they have proper permits and licenses, organisms in transport are free of disease, and no prohibited species are present.

*301 KAR 1:130. Live bait for personal use.*

Synopsis:
Section 1. "Live bait" means minnows, shad, herring, crayfish, salamanders, frogs (except bullfrogs), tadpoles, native lampreys, Asiatic clams (*Corbicula* sp.) and aquatic organisms except mussels.
Section 3. No mussels may be taken for use as bait except Asiatic clams (*Corbicula* sp.). At any given time, sport fishermen may have in his/her possession no more than:

(1) 500 minnows;
(2) 500 crayfish;
(3) Twenty-five (25) dusky salamanders (spring lizards) of the genus *Desmognathus*;
(4) Five (5) frogs (other than bullfrogs);
(5) Five (5) tadpoles;
(6) 100 native lampreys (mud eels);
(7) 500 aquatic invertebrates other than mussels;
(8) 500 shad;
(9) 500 herring;
(10) Any number of Asiatic clams (*Corbicula* sp.).

Potential problem with existing regulation: Allowing Asian clams to be used as bait could increase the spread of Asian clams (i.e. bait bucket release). Due to the fact that the rusty crayfish is native to north central Kentucky, bait dealers currently sell it legally. Use of rusty crayfish as bait could be regulated due to the species' invasive characteristics in eastern Kentucky.

*KRS 150.105 Destruction or control of animals causing damage.*

Synopsis:
-With approval, conservation officers may destroy or bring under control any wild animal, fish or wild birds, protected or unprotected which are causing damage to persons, property or other animals, fish or birds or spreading diseases and which in the judgment of the Commissioner of Kentucky Fish and Wildlife Resources, with the approval of the Commission, should be eliminated or controlled to prevent further damage.

Plants and Animals (aquatic and terrestrial) occurring on Kentucky State Nature Preserves Commission (KSNPC) Properties- Existing Authorities

*Kentucky State Nature Preserves Commission*
The Kentucky State Nature Preserves Commission's mission is to protect Kentucky's natural heritage by (1) identifying, acquiring and managing natural areas that represent the best known occurrences of rare native species, natural communities and significant natural features in a statewide nature preserve system; (2) working with others to protect biological diversity; and (3) educating Kentuckians as to the value and purpose of nature preserves and biodiversity conservation. The Commission has been granted the following authority on Kentucky State Nature Preserves lands.

Plants and Animals (aquatic and terrestrial) occurring on Kentucky State Nature Preserves Commission (KSNPC) Properties- Existing Regulations

In terms of aquatic and terrestrial plants and animals occurring on KSNPC properties, the following Kentucky Administrative Regulations (KAR) have been identified as relevant to management of ANS within the state. The entire regulation can be found in Appendix II and a synopsis of information within the regulation is provided here.

*400 KAR 2:090. Management, use, and protection of nature preserves.*

Synopsis:
-Section 13.1. Plant species not native to the site or vicinity may be eliminated.
-Section 13.3. Control of exotic plants and animals may be undertaken in a manner approved by the commission. There may be no attempt to eradicate exotic species that have become a stable part of the biotic community unless this can be accomplished without disturbance of natural conditions.
-Section 13.4. Control measures shall be undertaken only by commission staff or others approved by the commission.
-Section 13.5. Habitat manipulations and protective measures in favor of particular species may be undertaken only as approved by the commission. Approval will be based upon a finding by the commission that describes the proposed activities and addresses species life history, habitat requirements of the species, characteristics and objectives of the preserve and other relevant information.
-Section 13.6. No plants, animals, or their reproductive bodies can be brought into a nature preserve except with approval of the commission.

**Identified Gaps in Authorities and Regulations**
Currently, there are no known authorities or regulations concerning ANS plants including algae, unless they occur on federal lands or KSNPC properties. Creating state agency authority governing ANS plants and development of regulations to manage problematic ANS plants on all state lands should be a priority.

Existing regulation (see 301 KAR 1:122) could be amended to include fish and bivalve ANS deemed most problematic by the KYANSTF but could exclude the black carp, silver carp, and bighead carp due to attempts by commercial fishermen to market these species. To avoid facilitating the spread of Asian clams and rusty crayfish, existing regulation (see 301 KAR 1:130) could be revised to exclude their use as bait.

**ANS Management Plan, Task Force, Councils, Public Participation, and Other Programs**

Kentucky ANS Management Plan
The Nonindigenous Aquatic Invasive Prevention and Control Act (NANPCA) calls on states to develop ANS plans and provides federal funds to help states maintain and achieve the goals of their plans. The Kentucky ANS Management Plan is Kentucky's

response to the call for nationwide action. A Kentucky ANS Task Force, comprised of key stakeholders across the state, has been formed to help develop the most effective plan possible.

Kentucky Exotic Pest Plant Council (KY-EPPC)

The Kentucky Exotic Pest Plant Council (KY-EPPC) was established in 2000 to address invasive plants in the state. It is a non-profit organization and state chapter of the Southeast Exotic Pest Plant Council (SE-EPPC). KY-EPPC's purpose is, "To raise awareness and promote public understanding regarding the threat posed by invasive exotic pest plants to native plant communities in Kentucky; to facilitate the exchange of information concerning the management and control of invasive exotic pest plants through support of research and monitoring; to serve as an educational, advisory and technical support resource on exotics in Kentucky; to initiate actions to protect Kentucky from the introduction, establishment and spread of invasive exotics; and to provide a forum for all interested parties to participate in meetings, workshops, and on a rotational basis with other chapters, host a symposium for the SE-EPPC to share the benefits from the information provided by SE-EPPC and other recognized experts". Furthermore, the KY-EPPC has a list of invasive plants that are ranked in terms of threat and provides a yearly "Kentucky's Least Wanted Plants" list.

Public Involvement

In the past, public participation has not been actively sought in addressing ANS concerns. This plan seeks to change this, making the public an active and integral part of ANS management.

Other Programs

In addition to the authorities, regulations, groups, and programs listed above, Kentucky also attempts ANS prevention, detection, control, and education through:

- The University of Kentucky (UKY) has recently formed the UK Invasive Species Initiative. They will attempt an interdisciplinary approach to help monitor, model, prevent, mitigate, and eradicate invasive aquatic and terrestrial species in Kentucky.
- The Tracy Farmer Center for the Environment at UKY has an outreach program that teaches students about invasive species utilizing a hands-on approach.

## Objectives, Strategies, Actions, and Cost Estimates

The **4 main goals** of the plan are:

1. Stop new introductions of ANS into Kentucky.
2. Prevent the spread of ANS currently in Kentucky and neighboring states.
3. Limit damages from ANS that cannot be eradicated.
4. Educate the public and stakeholders so they do not facilitate introductions and/or dispersal of new or existing ANS.

The **4 objectives** necessary to meet these goals include:

1. Raise public and stakeholder awareness of ANS issues.
2. Provide programs to prevent introductions and transport of ANS.
3. Develop and utilize an early detection and rapid response (EDDR) system.
4. Offer effective communication and coordination of ANS management activities.

**Objective 1: Raise public and stakeholder awareness of ANS issues.**

**Strategy 1A: Develop an ANS education program specific to Kentucky.**

Action 1A1: Impacts of ANS vary from state to state, and currently Kentucky does not have an ANS education program specific to the state. The ANS coordinator, working with the KYANSTF education subcommittee, could develop an ANS education program tailored to Kentucky. Any existing ANS federal education campaigns, such as Habitattitude.net and Protectyourwaters.net, as well as regional, state agency, and NGO campaigns relevant to Kentucky could be incorporated to save time and money.

Cost Estimate: Computer, presentations, webpage design, printing supplies, postage, signage, etc. = $15,000/year.

**Strategy 1B: Target and educate key groups about ANS.**

Action 1B1: The KYANSTF has identified groups most likely to facilitate introductions and/or spread of ANS (see section C. Problem Definition and Ranking) in Kentucky. The ANS coordinator could target and educate these groups as well as other groups such as students and NGO's that could help prevent introduction and spread of ANS.

Cost Estimate: For in-state travel (including vehicle) = $23,000/year.

**Strategy 1C: Identify and secure outside funding to maintain and improve the ANS education program.**

Action 1C1: Developing, maintaining, and expanding the ANS education program may require funding beyond that provided upon plan approval. The ANS coordinator and the

ANS education subcommittee could work to identify and secure outside funding for the ANS education program and campaign. Information regarding grants and other funding opportunities could be disseminated to other interested parties who could also submit proposals to secure funding.

Cost Estimate: Identifying and attempting to secure outside funding for the ANS education program will be part of the ANS coordinator's regular duties. Cost estimate for postage, media, etc. = $250/year.

**Strategy 1D: Assess public and stakeholder awareness and perceptions of ANS.**

Action 1D1: Public and stakeholder awareness and perceptions of ANS in Kentucky are unknown. An annual survey that assesses these parameters could identify ANS awareness gaps and shortfalls. Future education efforts could be tailored to address these gaps resulting in more efficient and effective educational programs. An annual survey could also help determine the success of ANS education message conveyance on a year-to-year basis.

Cost Estimate: If implemented, cost may be higher in the first year because a survey will need to be created. The University of Kentucky (UKY) Survey Research Center could be utilized to help keep costs down. To create and administer an annual ANS survey = $5000/year.

**Objective 2: Provide programs to prevent introductions and spread of ANS.**

**Strategy 2A: Create an ANS coordinator position with funds received upon approval of the KY ANS Management Plan. Duties of the ANS coordinator could be to pursue the strategies outlined under Objectives 1, 2, 3, and 4.**

Action 2A1: Creation of a full-time (37.5 hours/week) Kentucky ANS coordinator position would allow one person to focus on developing and implementing efficient and effective ANS management programs.

Cost Estimate: $50,000/year salary (including healthcare and retirement benefits) + $8,000 (16% administrative overhead costs) = $58,000.

**Strategy 2B: Annually review and update the plan to address identified gaps and needs and make necessary changes to the KY ANS species list.**

Action 2B1: Due to the evolving nature of the ANS problem, the plan will need to be reviewed and updated annually. The ANS coordinator working with the ANS management subcommittee, could address identified gaps and needs, such as strengthening existing regulations and determining authority governing ANS plants occurring outside federal and KSNPC lands, and review and update the KY ANS species list and associated pathways on an annual basis.

Cost Estimate: $1000/year.

**Strategy 2C: Identify and secure outside funding to maintain existing and create new ANS management programs.**

Action 2C1: Maintaining existing and creating new ANS management programs may require funding beyond that provided upon plan approval. The ANS coordinator could work to identify and secure outside funding. Information regarding grants and other funding opportunities could be disseminated to other interested parties who could also submit proposals to secure funding.

Cost Estimate: Identifying and attempting to secure outside funding for ANS management programs will be part of the ANS coordinators regular duties. Cost estimate for postage, media, etc. = $250/year.

**Strategy 2D: Identify and secure funds to research the biological and economical impacts of ANS in Kentucky.**

Action 2D1: When developing efficient and effective ANS management strategies, it is important to know the biological and economical impacts unique to the state. The ANS coordinator could work to identify and secure research funds. Information obtained could also be disseminated to interested parties who could submit proposals to secure funding.

Cost Estimate: Identifying and attempting to secure outside funding to research ANS impacts within Kentucky will be part of the ANS coordinators regular duties. Cost estimate for postage, media, etc. = $250/year.

**Strategy 2E: Develop a database of ANS (density and range) from existing datasets to determine baseline levels.**

Action 2E1: Information about the occurrence of ANS in Kentucky is currently unclear. Little is known about the extent of infestations and the movement of ANS into and around the state. Creating a database from existing datasets, including the KY Fish and Wildlife Information System, could begin to address this but would require agreement and cooperation between state agencies, consulting firms, and other entities involved in data collection.

Cost Estimate: Assuming the ANS coordinator takes the lead in database management, creation of the database would require purchase of a GIS software license. Estimated funds = $ 1500/year.

**Objective 3: Develop an early detection and rapid response (EDRR) system.**

**Strategy 3A: Determine authority for developing, housing, and maintaining an ANS EDRR system.**

Action 3A1: Preventing new introductions and early eradication are the most cost effective ways that Kentucky can avoid the higher costs of managing existing ANS problems. Currently, there is no authority for developing, housing and maintaining an ANS EDRR system. Before an EDRR system can be developed and utilized, this authority needs to be determined. An EDRR system is a complex, involved and expensive process and will likely require interagency cooperation.

Cost Estimate: Determining authority of the ANS EDRR system, with input from the KYANSTF rapid response subcommittee, will be part of the ANS coordinators regular duties. Cost estimate for communication efforts between KYANSTF members, including possible meetings, phone calls, and mailings = $1000/year.

**Strategy 3B: Develop a flexible EDRR system.**

Action 3B1: The ANS coordinator, working with the ANS EDRR subcommittee, could work to develop an EDRR system. An effective and flexible EDRR system could include the following components:
a) Conditions under which the EDRR team would be deployed.
b) List of approved control and containment techniques.
c) Licenses and permits necessary for specific control techniques.
d) Funding mechanisms.
e) Criteria for measuring response effectiveness.

Cost Estimate: Developing the ANS EDRR system will be part of the ANS coordinators regular duties. Cost estimate for communication efforts (possible meeting, phone calls, mailings, etc.) between KYANSTF members to develop (not utilize) an EDRR system = $250/year.

**Strategy 3C: Utilize the EDRR system as determined by conditions and criteria.**

Action 3C1: The ANS EDRR system could be utilized when conditions determined during development of the rapid response system are met.

Cost Estimate: Cost of EDRR system utilization will vary depending upon water body size, equipment and supplies needed, ANS type, etc. and should become clearer as the EDRR system develops. Estimate = $10,000/utilization.

**Objective 4: Offer effective communication and coordination of ANS management activities.**

**Strategy 4A: Establish a permanent KYANSTF and related subcommittees (education, management, EDRR) in Kentucky.**

Action 4A1: To guide and assist the development of the KY ANS Management Plan, the KYANSTF and related subcommittees were created. These bodies were initially created for the time period required for plan approval. To maximize the effectiveness and

efficiency of statewide management efforts, the KYANSTF and the ANS subcommittees should become permanent bodies.

Cost Estimate: Establishment of a permanent KYANSTF and related subcommittees will be part of the ANS coordinator's regular duties. Cost estimate for communication efforts between KYANSTF members, including possible meetings, phone calls, and mailings = $250/year.

**Strategy 4B: Create an ANS coordinator position (this is the same position proposed in Objective 2).**

Action 4B1: Currently, there is no one working (full-time) to communicate and/or coordinate ANS control efforts in Kentucky. Creation of this position would fill this void.

Cost Estimate: To create an ANS coordinator position (this is the same position proposed in Objective 2) = $58,000/year.

**Strategy 4C: Generate strong in-state, regional, and national ties.**

Action 4C1: Cooperation and strong ties between in-state, regional, and federal organizations are essential for successful ANS management because ANS do not respect county, state, or political boundaries. Regular communication between these organizations will be necessary to keep up with new ANS that may be threatening Kentucky waters as well as provide opportunities for cooperative prevention.

Cost Estimate: Extensive travel for meetings, conferences, and symposiums will be required = $5,000/year.

**Strategy 4D: Foster an exchange of ideas and information regarding ANS within Kentucky.**

Action 4D1: Currently, there is not an annual state level opportunity for those working with ANS in Kentucky to network and exchange knowledge. The recent formation of the UKY Invasive Species Initiative could fill this need.

Cost Estimate: $1,000/year.

## Priorities for Action

The Kentucky ANS Management Plan aims to advance ANS management efforts by identifying ANS problems and providing programs to effectively manage the identified problems. To date, the plan has successfully identified priority ANS that are listed below, and more general management efforts, including education programs and rapid response system, are in their formative stages. During this early transitional period, developing specific priorities for action for individual species is difficult. Thus, Kentucky currently intends to strengthen ANS management efforts by building on existing ANS control measures and securing additional funding (see section F.). This initial approach allows general, but cohesive, ANS management efforts to be implemented until a time when additional resources and knowledge, including the assimilation of baseline data, allow us to develop specific strategies for individual ANS.

**Most problematic ANS identified by the KY ANS Task Force:**

Plants:

- Eurasian watermilfoil (*Myriophyllum spicatum*)
- Purple loosestrife (*Lythrum salicaria*)
- Brazilian watermilfoil (*Myriophyllum aquaticum*)
- Common reed (*Phragmities australis*)
- Curly pondweed (*Potamogeton crispus*)
- Japanese stiltgrass (*Microstegium vimineum*)
- Reed canarygrass (*Phalaris arundinacea*)
- Japanese knotweed (*Polygonum cuspidatum*)
- Alligator weed (*Alternathera philoxeroides*)
- Water hyacinth (*Eichhornia crassipes*)

Fish:

- Silver carp (*Hypophthalmichthys molitrix*)
- Bighead carp (*Hypophthalmichthys nobilis*)
- Black carp (*Mylopharyngodon piceus*)
- Snakehead (*Channa* sp. or *Parachanna* sp.)
- Round goby (*Neogobius melanostomus*)

Mollusks:

- Zebra mussel (*Dreissena polymorpha*)
- Asian clam (*Corbicula fluminea*)

Algae:

- Rock snot (*Didymosphenia geminata*)

Mammals:

- Nutria (*Myocastor coypus)*

## Implementation Table

| Number | Action | Funding Source | Lead Organization | Cooperating Organization | Funding/Staff | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Recent efforts | | Planned efforts | |
| | | | | | FY 2006 ($/Staff) | FY 2007 ($/Staff) | FY 2008 ($/Staff) | FY 2009 ($/Staff) |
| 1A1 | Develop an ANS education program specific to KY | Funds received upon Plan approval | KDFWR | UKY | 0/0 | 0/0 | 15,000/0 | 2,500/0 |
| 1B1 | Educate key groups about ANS | Funds received upon Plan approval | KDFWR | UKY | 0/0 | 0/0 | 23,000/0 | 3,000/0 |
| 1C1 | Secure outside funding to maintain and improve the ANS education program | Funds received upon Plan approval | KDFWR | UKY | 0/0 | 0/0 | 250/0 | 250/0 |
| 1D1 | Assess public and stakeholder awareness and perceptions of ANS | Funds received upon Plan approval | KDFWR | UKY | 0/0 | 0/0 | 5,000/0 | 5,000/0 |
| 2A1 | Create an ANS coordinator position | Funds received upon Plan approval | KDFWR | UKY | 0/0 | 0/0 | 58,000/1 | 58,000/1 |
| 2B1 | Annually review and update the Plan | Funds received upon Plan approval | KDFWR | UKY | 0/0 | 0/0 | 1000/0 | 1000/0 |
| 2C1 | Secure outside funding to maintain existing and create new ANS management programs | Funds received upon Plan approval | KDFWR | UKY | 0/0 | 0/0 | 250/0 | 250/0 |
| 2D1 | Secure outside funding to research the biological and economical impacts of ANS in Kentucky | Funds received upon Plan approval | KDFWR | UKY | 0/0 | 0/0 | 250/0 | 250/0 |
| 2E1 | Develop a KY ANS database from existing datasets | Funds received upon Plan approval | KDFWR | UKY | 0/0 | 0/0 | 1500/0 | 1500/0 |
| 3A1 | Determine authority governing the KY ANS EDRR system | Funds received upon Plan approval | KDFWR | UKY | 0/0 | 0/0 | 1000/0 | 250/0 |
| 3B1 | Develop an EDRR system | Funds received upon Plan approval | KDFWR | UKY | 0/0 | 0/0 | 250/0 | 250/0 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 3C1 | Utilize the EDRR as determined by conditions and criteria | Funds received upon Plan approval | KDFWR | UKY | 0/0 | 0/0 | 10,000/0 | 10,000/0 |
| 4A1 | Establish a permanent KYANSTF and related subcommittees | Funds received upon Plan approval | KDFWR | UKY | 0/0 | 0/0 | 250/0 | 250/0 |
| 4C1 | Generate strong in-state, regional, and national ties | Funds received upon Plan approval | KDFWR | UKY | 0/0 | 0/0 | 5,000/0 | 5,000/0 |
| 4D1 | Develop an annual conference for those working with ANS in Kentucky (and surrounding regions) | Funds received upon Plan approval | KDFWR | UKY | 0/0 | 0/0 | 1,000/0 | 1,000/0 |
| | | | | | | **Totals** | **121,750/1** | **88,500/1** |

## Program Monitoring and Evaluation

A program monitoring and evaluation system provides a means for determining success of proposed ANS management efforts. The system can also be an important component of the annual review process because it can provide opportunities to "adjust" management actions if the intended results are not achieved. In this plan, we have developed specific strategies and actions to help us achieve outlined goals and objectives. However, we do not know which ANS management strategies will be achieved in the first year of implementation. With this in mind, the following approach of monitoring and evaluating the early years of management actions is proposed.

A three-method approach could be applied to the goals and objectives of the plan. First, an "indicator action" method could be used to select a current program (e.g., education program) and determine whether the program has been funded and effectively executed. Establishment and effective execution of a program would provide a measurement of success.

A second method applies "quantitative biological measures." This method uses field sampling to determine whether ANS have spread or if new introductions have occurred. Since Kentucky does not have an ANS baseline database, this method could not be currently employed. However, it could in the future if necessary baseline data are collected or if a baseline database is created from existing datasets.

A third method could utilize "quantitative social methods." Public and stakeholder awareness and perceptions of ANS can be determined through the use of questionnaires. Use of indicators 1 and 3 could measure some aspects of plan progress even without indicator 2.

Once the ANS coordinator position is established, this person could select which method(s) will be utilized and apply them to plan goals and objectives on an annual basis. The KYANSTF could then use information gathered from the selected methods of monitoring plan progress to review and update the plan.

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## Glossary

Adaptation- the development of physical and behavioral characteristics that allow organisms to survive and reproduce in their habitats.

Alien- with respect to a particular ecosystem, any species capable of propagating through seeds, eggs, spores, or other biological material, that is not native to that ecosystem.

Annual- a plant that flowers, produces seed, and dies in one growing season.

Anoxic- depleted of oxygen.

Aquatic- living in or on the water for all or a substantial part of an organism's life span.

Aquatic nuisance species- non-native, aquatic species that threaten the diversity or abundance of native species, or the ecological stability of waters, or commercial, agricultural, aquacultural, or recreational activities dependent on such waters.

Asexual reproduction- reproduction in which an organism produces one or more clones of itself.

Assemblages- communities composed of several to many different species that assemble themselves based on specific site conditions.

Ballast water- any water that is placed in the hold of a ship for the purposes of maintaining stability.

Biocontrol- a method of reducing or eliminating ANS by introducing predators or microorganisms that attack the targeted pests but spare other species in the area.

Biodiversity- the range of organisms present in a given ecological community or system.

Biosecurity- precautions taken to minimize the risk of introducing an ANS outside a contained area.

Biotic- used to describe living features of a natural system.

Bivalve- a marine or freshwater mollusk that has its body contained within two shells joined by a hinge. Mussels and clams are bivalves.

Colonize- to establish plants or animals, or become established, in a new area.

Control- limiting the distribution and abundance of ANS through biological, chemical, or mechanical means.

Diatom- a microscopic one-celled alga that has silica-filled cell walls or shells divided into two halves.

Diploid carp- a member of the carp family that is reproductively fertile and has not been genetically altered.

Dispersal- the movement of organisms away from their place of birth or from centers of population density.

Early Detection and Rapid Response (EDRR)- efforts designed to detect new ANS in time to allow efficient and environmentally sound assessments to be made and respond to invasions in an effective, environmentally sound manner that will prevent the spread and permanent establishment of invasive species.

Ecosystem- the complex of a community of organisms and its environment.

Eradicate- to completely eliminate a population from a geographic area.

Exotic – a non-native organism transported intentionally or accidentally from another region.

Fauna- the animal life of a particular region or period, considered as a whole.

Flora- plant life, especially all the plants found in a particular country, region, or time regarded as a group.

Food web- the interlocking food chains within an ecological community.

Fragmentation- the breaking up of ANS plants into pieces, each of which is capable of forming a new organism.

Gamete- a specialized male or female cell with half the normal number of chromosomes that unites with another cell of the opposite sex in the process of sexual reproduction.

Genotype- a group of organisms that share a similar genetic makeup.

Herbaceous- used to describe plants or plant parts that are fleshy and wither after each growing season, as opposed to plants such as trees that grow woody stems and are persistent.

Indigenous- existing within a historical ecological range, usually within a balanced system of coevolved organisms (i.e. the range an organism would or could occupy without direct or indirect introduction and/or care by humans).

Introduction- the intentional or unintentional release, escape, dissemination, or placement of a species into an ecosystem as a result of human activity.

Invasive species- an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health.

Invertebrate- lacking a spine or backbone.

Microbe- a microscopic organism, especially one that transmits a disease.

Mitigate- to reduce the severity of impacts on fish or wildlife habitat.

Molluscivore- species whose primary diet consists of mollusks and invertebrates.

Native species- with respect to a particular ecosystem, a species that other than as a result of an introduction, historically occurred or currently occurs in that ecosystem.

Nonindigenous – an organism transported intentionally or accidentally from another region.

Non-native- an organism living beyond its natural or historical range of distribution.

Pathways- natural and human connections that allow movement of organisms or their reproductive materials, such as seeds, spores, or eggs, from place to place.

Perennial- a plant that lasts for more than two growing seasons.

Planktivore- an animal that feeds primarily on plankton.

Population- all individuals of a single species within a defined habitat or geographic area such as a pond or watershed.

Phytoplankton- very small free-floating algae.

Rhizome- a thick underground horizontal stem that produces roots and has shoots that develop into new plants.

Risk assessment- a science-based process to evaluate the economic and/or environmental risk(s) of invasive species.

Stakeholders- individuals and entities with a common interest in particular ANS, pathways, or associated issues, including but not limited to, State, tribal, and local government agencies, academic institutions, the scientific community, nongovernmental entities including environmental, agricultural, and conservation organizations, trade groups, commercial interests, and private landowners.

Stolon- a specialized type of horizontal aboveground shoot, a colonizing organ that arises from an axillary bud near the base of the plant.

Substrate- the surface on which an organism grows or lives.

Taxa- a grouping of organisms given a formal taxonomic name such as species, genus, family.

Triploid carp- a member of the carp family that is reproductively sterile because it has been genetically altered so as to have an additional or extra set of somatic chromosomes.

Watershed- the geographic area that drains to a single water body or hydrographic unit such as a lake, stream, or estuary.

## APPENDIX I: Acronyms

| | |
|---|---|
| ANS | Aquatic Nuisance Species |
| DOF | Division of Fisheries |
| EDRR | Early Detection and Rapid Response |
| FTE | Full Time Equivalency |
| KAR | Kentucky Administrative Regulations |
| KPDEP | Kentucky Pollution Discharge Elimination Permit |
| KRS | Kentucky Revised Statutes |
| KSNPC | Kentucky State Nature Preserves Commission |
| KYANSTF | Kentucky Aquatic Nuisance Species Task Force |
| KY-EPPC | Kentucky Exotic Pest Plant Council |
| KDFWR | Kentucky Department of Fish and Wildlife Resources |
| MRBP | Mississippi River Basin Panel |
| NANPCA | Nonindigenous Aquatic Nuisance Prevention and Control Act |
| NGO | Non-governmental Organization |
| NPS | National Park Service |
| SARP | Southeast Aquatic Resources Partnership |
| SE-EPPC | Southeast Exotic Pest Plant Council |
| TVA | Tennessee Valley Authority |
| UKY | University of Kentucky |
| USACE | United States Army Corps of Engineers |
| USDA | United States Department of Agriculture |
| USFWS | United States Fish and Wildlife Service |
| WMI | Watershed Management Initiative |

## APPENDIX II: Other Identified ANS within Kentucky

**PLANTS**

| Scientific name | Common name |
|---|---|
| *Achyranthes japonica* | Japanese chaff flower |
| *Acorus calamus* | Sweetflag |
| *Buddleia davidii* | Butterfly bush |
| *Cyperus difformis* | Variable flatsedge |
| *Cyperus iria* | Iria flatsedge |
| *Cyperus rotundus* | Purple flatsedge |
| *Dioscorea polystachya* | Air yam |
| *Egeria densa* | Brazilian waterweed |
| *Elodea Canadensis* | Broad waterweed |
| *Hydrilla verticillata* | Hydrilla |
| *Iris pseudacorus* | Yellow iris |
| *Ludwigia uruguayensis = L. grandiflora spp. hexapetala* | Large-flower Primrose-willow |
| *Lysimachia nummularia* | Creeping Jenny |
| *Marsilea quadrifolia* | European water fern |
| *Mentha spicata* | Spearmint |
| *Mentha x piperita* | Peppermint |
| *Murdannia keisak* | Marsh dewflower |
| *Najas minor* | Brittle naiad |
| *Nymphoides peltata* | Floating heart |
| *Polygonum persicaria* | Spotted ladysthumb |
| *Polygonum sachalinense* | Giant knotweed |
| *Populus alba* | White poplar |
| *Rorippa nasturtium-aquaticum* | Watercress |
| *Rumex obtusifolius* | Bitter dock |
| *Salvinia minima* | Water spangles |
| *Spirodela punctata* | Dotted Water-flaxseed |

**Fish**

| Scientific name | Common name |
|---|---|
| *Alosa aestivalis* | Blueback herring |
| *Alosa pseudoharengus* | Alewife |
| *Ameiurus catus* | White catfish |
| *Carassius auratus* | Goldfish |
| *Ctenopharyngodon idella* | Grass carp |
| *Culaea inconstans* | Brook stickleback |
| *Cyprinus carpio* | Common carp |
| *Esox lucius* | Northern pike |

| | |
|---|---|
| *Lepomis auritus* | Redbreast sunfish |
| *Metynnis lippincottianus* | Silver dollar |
| *Morone americana* | White perch |

**Molluscs**

| **Scientific name** | **Common name** |
|---|---|
| *Dreissena bugensis* | Quagga mussel |

**Crustaceans**

| **Scientific name** | **Common name** |
|---|---|
| *Orconectes rusticus* | Rusty crayfish |

# APPENDIX III: Existing Regulations Pertinent to ANS Management in Kentucky

## Aquaculture

*401 KAR 5:080. Criteria and standards for the Kentucky Pollutant Discharge Elimination System (KPDES).*

*NECESSITY, FUNCTION, AND CONFORMITY: KRS 224.10-100 authorizes the Natural Resources and Environmental Protection Cabinet to issue, continue in effect, revoke, modify, suspend or deny under such conditions as the cabinet may prescribe, permits to discharge into any waters of the Commonwealth. KRS 224.16-050 provides that the cabinet may issue federal permits pursuant to 33 USC Section 1342(b) of the Federal Water Pollution Control Act (33 USC Section 1251 et seq.) subject to the conditions imposed in 33 USC Section 1342(b) and (d). This section further provides that any exemptions granted in the issuance of KPDES permits shall be pursuant to 33 USC Sections 1311, 1312, and 1326(a). This administrative regulation sets forth the criteria and standards for the KPDES permitting system.*

*Section 2. Criteria for Issuance of Permits to Aquaculture Projects.*
*2) Criteria.*
*(a) KPDES permits shall not be issued to an aquaculture project unless:*
*1. The cabinet determines that the aquaculture project:*
*a. Is intended by the project operator to produce a crop which has significant direct or indirect commercial value, or is intended to be operated for research into possible production of such a crop.*

*3. The applicant has demonstrated, to the satisfaction of the cabinet, that if the species to be cultivated in the aquaculture project is not indigenous to the immediate geographical area, there shall be minimal adverse effects on the flora and fauna indigenous to the area, and the total commercial value of the introduced species is at least equal to that of the displaced or affected indigenous flora and fauna.*

*301 KAR 1:115. Propagation of Aquatic Organisms*

*NECESSITY, FUNCTION, AND CONFORMITY: KRS 150.280 provides that no person shall propagate or hold wildlife without a permit. This administrative regulation establishes the requirements for obtaining a permit and the requirements that shall be followed by permit holders.*

*Section 2. Before acquiring or propagating aquatic organisms, a person must obtain a permit.*
*(2) Permit applicants may obtain the Fisheries Commercial Propagation Application form from the department.*

*Section 7. Inspections of Facilities and Revocation of permits.*

*(1) The permit holder shall allow a conservation officer to inspect his facilities.*
*(2) The department shall:*
*(a) Revoke the permit of a person found guilty of violating a statute or administrative regulation pertaining to propagation of fish; and*
*(b) Not renew the propagation permit for a period of up to three (3) years of a person that has been found guilty of violating a statute or administrative regulation pertaining to propagation of fish.*
*(3) Fees paid for revoked permits shall not be refunded.*

*301 KAR 1:110. Prohibition on raising or hatching fish in public waters.*

*RELATES TO: KRS 150.025, 150.180(2)(7), 150.280*
*STATUTORY AUTHORITY: KRS 150.025, 150.280*
*NECESSITY, FUNCTION, AND CONFORMITY: The purpose of this administrative regulation is to prohibit the raising or hatching of fish in public waters. It is necessary in order to protect the fish population.*

*Section 1. A person or organization shall not use public waters to raise or hatch fish or aquatic organisms for private or commercial purposes except as specified in Section 2 of this administrative regulation. This includes cage culture of fishes.*
*Section 2. The commissioner may grant approval and issue a permit for paddlefish to be stocked and reared in approved water supply lakes for aquaculture purposes pursuant to 301 KAR 1:115, Section 6. (KFWR-F-147; 1 Ky.R. 64; eff. 11-13-74; 32 Ky.R. 2083; 33 Ky.R. 86; eff. 7-12-06.)*

*301 KAR 1:115. Propagation of aquatic organisms.*
*Section 6. The commissioner may grant approval and issue a permit for paddlefish to be stocked and reared in approved water supply lakes for aquaculture purposes as provided for in 301 KAR 1:110 by completing a Fisheries Commercial Propagation Application and submitting it to the Fisheries Division.*
*(1) A municipality may allow a second party to rear paddlefish if the commissioner grants approval and issues a permit for paddlefish to be stocked and reared in an approved water supply lake.*
*(2) If a municipality or other public water supply entity allows a second party to rear paddlefish, a contractual agreement between the two (2) granting permission to use the lake for rearing paddlefish shall be required for the extent of the rearing period. A copy of the contractual agreement shall be submitted to the department before a permit is issued.*
*(3) Water supply lakes that are currently open to sport fishing shall be required to remain open to sport fishing throughout the length of the rearing of paddlefish.*
*(4) Paddlefish shall be the only species permitted to be stocked in the approved water supply lakes.*
*(5) The number of paddlefish stocking events for each rearing period shall be limited to one (1) for each approved water supply lake. Commissioner approval may be granted and shall be obtained prior to any additional stocking events.*
*(6) The name of each water supply lake requested for consideration for approval as a*

*rearing facility for paddlefish shall be listed on the propagation permit application.*

*(7) A propagation permit shall be obtained annually for each year of the paddlefish rearing period.*

*(8) The department shall not:*

*(a) Enforce the protection of the stocked paddlefish; or*

*(b) Establish paddlefish sport fish administrative regulations in any of the approved water supply lakes.*

*(9) Paddlefish that escape in the stream, either above or below the lake, shall not be considered property of the permit holder.*

*(10) The department shall not be responsible for corrective actions with any fish populations in the approved lakes used for aquaculture purposes.*

*(11) If a municipality rears paddlefish without a contractual agreement with a second party, it shall provide the department with a name of a person responsible for the rearing of the paddlefish in the approved water supply lakes.*

*(12) The permit holder that has been issued the Fisheries Commercial Propagation permit may use gill nets to take paddlefish only from the lakes that have been approved and are listed on the propagation permit and shall be on site each time gill nets are used in the approved water supply lakes.*

*(a) The department shall be notified at least one (1) week in advance of any harvest of paddlefish from the approved water supply lakes, including the random sampling of the stocked paddlefish that require the use of gill nets.*

*(b) Gill nets shall only be used in the approved water supply lakes from December 1 through the last day of March.*

*(c) Gill nets shall not have a bar mesh size smaller than five (5) inches.*

*(d) Permit holders shall attach a metal tag provided by the department to each gill net used.*

*(e) Paddlefish shall be the only species of fish harvested; any other species of fish captured shall be immediately released, without undue injury, to the waters where it was taken.*

*301 KAR 1:171. Grass carp supplier requirements.*

*RELATES TO: KRS 150.010, 150.025, 150.180, 150.990*

*STATUTORY AUTHORITY: KRS 150.025*

*NECESSITY, FUNCTION, AND CONFORMITY: KRS 150.025(1) authorizes the department to promulgate administrative regulations to establish the procedures for transporting and conserving wildlife. This administrative regulation establishes the procedures for acquiring, transporting and producing triploid grass carp.*

*Section 1. Definitions. (1) "Diploid grass carp" means a fish of the genus and species Ctenopharynogodon idella that is reproductively fertile and has not been genetically altered and therefore has the normal set of somatic chromosomes as determined by blood sample.*

*(2) "Triploid grass carp" means a fish of the genus and species Ctenopharynogodon idella that is reproductively sterile because it has been genetically altered so as to have an additional or extra set of somatic chromosomes as determined by blood sample.*

*Section 2. Acquisition of Triploid Grass Carp (Ctenopharynogodon idella) by a Supplier. A person wishing to supply triploid grass carp shall:*

*(1) Obtain a live fish and bait dealer's license as established in 301 KAR 1:120;*

*(2) Obtain a fish transportation permit as established in 301 KAR 1:125 that lists triploid grass carp as the species to be transported;*

*(3) If the triploid grass carp will be propagated, obtain a fisheries commercial propagation permit as established in 301 KAR 1:115; and*

*(4) Provide the Division of Fisheries with written assurances on a monthly basis that each grass carp sold or delivered for use in Kentucky waters has been tested and certified by the U.S. Fish and Wildlife Service's Triploid Grass Carp Certification Program to be a triploid fish. Failure to supply these written assurances shall be cause for license or permit revocation.*

*Section 3. Propagation of Triploid Grass Carp. (1) A person shall apply to the Division of Fisheries for a Fisheries commercial propagation permit for propagating triploid grass carp.*

*(2) A fisheries commercial propagation permit for triploid grass carp shall not be issued until the Division of Fisheries personnel have made an on-site inspection of the applicant's propagation facility to determine that adequate containment measures exist to preclude escape for all life stages of any diploid grass carp into public waters.*

*(3) The Division of Fisheries shall determine and specify the number of broodstock diploid (sterile) grass carp that may be obtained from out-of-state sources.*

*(4) A person shall utilize the U.S. Fish and Wildlife Service's Triploid Grass Carp Certification Program to certify all grass carp sold or transported are triploids.*

*(5) Diploid grass carp resulting from the production of triploids shall be destroyed on site by the propagator.*

*Section 4. Eradication of Diploid Grass Carp. (1) The Division of Fisheries may take random samples of grass carp shipped into and within Kentucky and from other stocks held by suppliers.*

*(2) A triploid grass carp licensee or permittee shall have his or her license or permit revoked if diploid grass carp are discovered.*

*(3) The licensee or permittee shall be responsible for removing and destroying all grass carp from a shipment containing diploid fish that were stocked in Kentucky waters, and shall reimburse the pond owner the full purchase price of the fish, including transportation costs. (15 Ky.R. 1988; eff. 3-22-1989; 30 Ky.R. 2335; 31 Ky.R. 24; eff. 7-14-2004.)*

**Aquatic Animals (Mussels, Fish, and "Other Wildlife")**

*KRS 150.520 Department may regulate musseling.*

*The department shall make such requirements by administrative regulations governing the taking, selling, and buying of mussels and the reporting of musseling operations as it may deem best for the proper enforcement of this chapter. To prevent depletion of the*

*mussel beds and to insure proper propagation of the mussels, the department may close any beds to operators at any time and for such length of time as it deems necessary. During such closed season on any bed no one shall take mussels there from. When an order is issued closing any mussel bed, due notice of the same shall be published pursuant to KRS Chapter 424.*

*KRS 150.110 Enforcement of law as to mussels.*

*The commissioner and conservation officers may arrest without warrant anyone violating any of the provisions of KRS 150.520 or any of the rules and regulations made by the department for the protection of mussels under this chapter. They may inspect mussels in any warehouse, boat, store, car or receptacle when they have good cause to believe that any of the provisions of KRS 150.520 or any of the rules or regulations made there under have been or are being violated. This authority does not include the right to enter any dwelling house without a search warrant. When the officers find mussels in the possession of anyone in violation of this chapter, the mussels shall be confiscated and sold in the manner provided by KRS 150.120 for the sale of confiscated wildlife.*

*KRS 150.990 Penalties.*

*(8) Any person who violates the provisions of KRS 150.180, 150.520, 150.525, or administrative regulations issued there under shall for the first offense be fined not less than one hundred dollars ($100) nor more than one thousand dollars ($1,000); and shall for a second offense be fined not less than five hundred dollars ($500) nor more than one thousand five hundred dollars ($1,500); and for any subsequent offense, be fined two thousand dollars ($2,000).*
*(9) Any person who violates the provisions of KRS 150.520 or administrative regulations issued there under shall, if the violation relates to methods of taking mussels, for a first offense be imprisoned in the county jail for no more than thirty (30) days; for a second offense be imprisoned in the county jail for no more than six (6) months; and for any subsequent offense be imprisoned in the county jail for no more than one (1) year. The penalties for violation of this subsection shall be in addition to the penalties for violation of subsection (8).*

*KRS 150.180 Buying, selling, or transporting protected wildlife, mussels and fishes, raw fur, or processed wildlife.*

*(6) No person shall import or transport into the State of Kentucky or receive shipment in the state from without the state, any live fish or wildlife without first procuring from the department a written fish transportation permit or wildlife transportation permit. If it is determined upon inspection that such fish or wildlife would not constitute a menace to the state and are free from disease and other undesirable physical characteristics, the commissioner shall issue a permit for a fee to be determined by the Fish and Wildlife Commission by administrative regulation, pursuant to KRS Chapter 13A. A fish transportation permit shall be valid for one (1) year from the date of issuance, and a wildlife transportation permit shall be valid for specific dates as indicated on the permit.*

*(7) No person may at any time stock any species of fish secured from any source into the public waters of the Commonwealth without first securing a permit from the commissioner.*

*301 KAR 1:122. Importation, possession; live fish.*

*RELATES TO: KRS 150.025, 150.175, 150.180, 150.190*
*STATUTORY AUTHORITY: KRS 150.025*
*NECESSITY, FUNCTION, AND CONFORMITY: KRS 150.025 authorizes the department to promulgate administrative regulations regarding the taking of wildlife to carry out the purposes of KRS Chapter 150, including the protection and conservation of wildlife. This administrative regulation establishes the species of aquatic life which are prohibited in the Commonwealth.*

*Section 1. A live fish, live minnow or live bait organisms, including a reproductive part thereof, not native or established in Kentucky waters shall not be bought, sold, possessed, imported, used or released into the waters of this Commonwealth, except as specified in Sections 2 and 4 of this administrative regulation.*

*Section 2. Exceptions. (1) Aquarium species except those in Section 3 of this administrative regulation may be imported, sold, or possessed in aquaria, but shall not be released directly or indirectly into the waters of this Commonwealth.*
*(2) Triploid (sterile) grass carp (Ctenopharyngodon idella) may be imported, sold, or possessed provided the proper permit is obtained as provided in 301 KAR 1:171.*
*(3) Diploid (fertile) grass carp may be imported and possessed only by certified propagators for the exclusive purpose of producing triploid grass carp.*
*(4) Other nonnative fishes may be imported, possessed, and sold with the approval of the Division of Fisheries.*

*Section 3. The following live aquatic organism shall not be imported, sold, or possessed in aquaria:*
*(1) Subfamily Serrasalminae - piranha, piraya, pirae, or tiger characins.*
*(2) Astyanax mexicanus - Mexican banded tetra, Mexican minnow or Mexican tetra.*
*(3) Petromyzon marinus - sea lamprey.*
*(4) Genus Clarias - walking catfish.*
*(5) Genus Channa - snakeheads of Asia and Africa.*
*(6) Dreissena polymorpha - zebra mussel.*

*Section 4. Commissioner Approval. The commissioner may permit the importation of a banned aquatic species if the applicant demonstrates that the species shall be used for legitimate scientific or educational purposes.*

*301 KAR 1:120. Live fish sales and handling; licensure.*

*RELATES TO: KRS 150.025, 150.175, 150.180, 150.190, 150.235, 150.485*
*STATUTORY AUTHORITY: KRS 13A.350, 150.025*

*NECESSITY, FUNCTION, AND CONFORMITY: This administrative regulation is necessary in order to control the flow of live fish from and into natural waters and commercial channels to prevent the spread of disease or undesirable species. This amendment is necessary to eliminate unnecessary and confusing wording.*

*Section 1. All individuals or companies who sell live fish retail or wholesale must have a live fish and bait dealer's license issued in the name of the individual or company that is transacting business in this commonwealth. This license or an exact copy thereof must be in the possession of the persons who are transporting, selling or possessing live fish for sale in Kentucky.*

*Section 2. Those individuals or companies transporting live fish from one (1) state to another state through Kentucky without conducting any type of business in this commonwealth are not required to have a live fish and bait dealer's license, but must have a valid transportation permit.*

*Section 3. Valid holders of commercial propagation permits and those individuals or companies who sell fish for food in establishments licensed by another state agency to sell retail or wholesale food stuffs are not required to have a live fish and bait dealer's license. (KFWR-F-LF2-1; 1 Ky.R. 150; eff. 12-11-74; Am. 5 Ky.R. 1077; eff. 8-1-79; 14 Ky.R. 1081; eff. 1-4-88.)*

*301 KAR 1:125. Transportation of fish*

*RELATES TO: KRS 150.010, 150.025, 150.180, 150.485*
*STATUTORY AUTHORITY: KRS 13A.350, 150.025*
*NECESSITY, FUNCTION, AND CONFORMITY: This administrative regulation provides for the control over the transportation of fish into, through, and within the state. It is necessary to protect the resident fish population.*

*Section 1. All individuals, corporations, or other business entities who transport any live fish, live bait (as defined in 301 KAR 1:130) or other live aquatic organism into, within, or through the Commonwealth of Kentucky must have a transportation permit issued in the name of the individual, corporation, or other business entity transacting the business.*

*Section 2. All officers and agents of the Department of Fish and Wildlife Resources have the authority to demand, at any time, proof by the transporter that:*
*(1) An appropriate transportation permit or exact copy, listing the species carried, is in possession.*
*(2) An appropriate live fish and bait dealers license has been issued, if the organisms are to be sold to another individual, corporation, or other business entity in Kentucky or transported from Kentucky to be sold outside of the commonwealth.*
*(3) The organisms in transport are free of disease and that no prohibited species listed in 301 KAR 1:122 are present.*

*(4) That a bill of lading showing the origin and destination of all of the organisms being transported is in possession. (KFWR-F-TP1-1; 1 Ky.R. 346; eff. 2-5-75.)*

*301 KAR 1:130. Live bait for personal use.*

*RELATES TO: KRS 150.010, 150.170, 150.175, 150.340, 150.450*
*STATUTORY AUTHORITY: KRS 150.025*
*NECESSITY, FUNCTION, AND CONFORMITY: KRS 105.025 authorizes the department to promulgate administrative regulations establishing the procedures for taking fish and creel and the areas from where fish and creel may be taken. This administrative regulation establishes the procedures for the taking of live bait and restricts use to personal use.*

*Section 1. Definitions. (1) "Live bait" means minnows, shad, herring, crayfish, salamanders, frogs except bullfrogs, tadpoles, native lampreys, Asiatic clams (Corbicula sp.) and aquatic organisms except mussels.*
*Section 3. No mussels shall be taken for use as bait except Asiatic clams (Corbicula sp.). A sport fishermen shall have in his possession no more than:*
*(1) 500 minnows;*
*(2) 500 crayfish;*
*(3) Twenty-five (25) dusky salamanders (spring lizards) of the genus Desmognathus;*
*(4) Five (5) frogs (other than bullfrogs);*
*(5) Five (5) tadpoles;*
*(6) 100 native lampreys (mud eels);*
*(7) 500 aquatic invertebrates other than mussels;*
*(8) 500 shad;*
*(9) 500 herring;*
*(10) Any number of Asiatic clams (Corbicula sp.).*

*KRS 150.105 Destruction or control of animals causing damage.*

*Notwithstanding any other provisions of this chapter, the commissioner may, with the approval of the commission, authorize conservation officers or any other persons to destroy or bring under control in such manner as he deems necessary any wild animal, fish or wild birds, protected or unprotected which are causing damage to persons, property or other animals, fish or birds or spreading diseases and which in his judgment should be eliminated or controlled to prevent further damage.*

**Plants and Animals (aquatic and terrestrial) occurring on Kentucky State Nature Preserves Commission (KSNPC) Properties**

*400 KAR 2:090. Management, use, and protection of nature preserves.*

*RELATES TO: KRS 146.410, 146.440*
*STATUTORY AUTHORITY: KRS 146.465, 146.475, 146.485*

*NECESSITY, FUNCTION, AND CONFORMITY: KRS 146.485 requires the commission to establish rules for the management, use, and protection of nature preserves. This administrative regulation sets forth rules to be applied to the management and use of all nature preserves, and to fulfill the purposes of KRS 146.440.*

*Section 13. Management of Animals and Plants (1) Control of plant succession.*

*(a) Control of plant succession by deliberate manipulation may be undertaken if preservation or restoration of a particular vegetation type or preservation of a species of animals or plants monitored by the commission is designated an objective of the nature preserve by the commission.*

*(b) Plant succession control measures may be undertaken in such a manner as approved by the commission.*

*(c) Vegetation may be managed within the following limitations:*

*1. Plant species not native to the site or vicinity may be eliminated by cutting, girdling, grubbing, or basal or spot foliar application of specified herbicide;*

*2. The time of burning during the year, the frequency of burning, and the fractional amount of the area that may be burned each year shall be specified;*

*3. Invading native woody species may be eliminated or controlled by cutting, girdling, grubbing, or basal application of specified herbicide.*

*(d) The use of herbicides may be specified by the commission.*

*(2) Control of noxious species.*

*(a) Species of plants and animals which are noxious in fact shall be controlled only if they are determined by the commission to be jeopardizing the natural integrity of the nature preserve.*

*(b) Except for removal from trails, access lanes, and firebreaks as approved by the commission, there shall be no control of native plants which are not noxious but may otherwise appear undesirable.*

*(c) There shall be no control of predators, rodents, insects, snakes, or other animals except as approved by the commission, even though they may appear harmful or undesirable.*

*(d) There shall be no use of pesticides except as approved by the commission.*

*(3) Control of exotic species.*

*(a) Control of exotic plants and animals may be undertaken in a manner approved by the commission. There may be no attempt to eradicate exotic species that have become a stable part of the biotic community unless this can be accomplished without disturbance of natural conditions.*

*(b) Control of exotic plants may be undertaken by control of plant succession as provided in this administrative regulation or by management practices allowed in this administrative regulation.*

*(4) Any measures for population control of any species to be applied must be provided for in a written plan approved by the commission. Except as provided in the articles of dedication or approved by the commission, control measures shall be undertaken only by the commission staff or others approved by the commission.*

*(5) Management of species of plants and animals monitored by the commission and species of management concern.*

*(a) Habitat manipulations and protective measures in favor of particular species*

*shall be undertaken only as approved by the commission. Approval shall be based upon a finding by the commission that describes the proposed activities and addresses species life history, habitat requirements of the species, characteristics and objectives of the preserve and other relevant information.*

*(b) Control of plant succession in favor of particular species shall be as provided in this administrative regulation.*

*(6) Introduction of plants and animals. No plants or animals or their reproductive bodies shall be brought into a nature preserve or moved from one (1) place to another within a preserve except with approval of the commission.*

## APPENDIX IV: Response to Public Comments

This appendix presents a summary of the written public comments received by the KY ANS Task Force on the Kentucky Aquatic Nuisance Species Management Plan. From March 12, 2008 through April 11, 2008, the Kentucky Aquatic Nuisance Species Management Plan was posted on the Kentucky Department of Fish & Wildlife Resources homepage (http://www.kdfwr.state.ky.us/) for a 30-day public comment period.

During this period, a total of six written comments were received. Two comments were from Kentucky residents, two from individuals of unknown residence, and two from personnel representing separate out-of-state organizations. Task Force responses to the comments are indicated below in bold italics.

**Comments**

**1. Comments received from Anda A. Ray, representing the Tennessee Valley Authority (TVA) - Environmental Stewardship and Policy. Comments have been summarized.**

Crayfish:
TVA states that the following crayfish are the top three invasive species that have been documented to impact native crayfishes. Many introductions were a result of bait bucket release. TVA suggests that it would be prudent to ban possession of these species.

*Orconectes rusticus*, (Rusty Crayfish)
*Procambarus clarkii*, (Red Swamp Crayfish)
*Orconectes virilis*, (Virile or Northern Crayfish)
***Response:*** ***Kentucky has a "Live Bait for Personal Use" regulation (301 KAR 1:130) that limits the amount and type of live bait that can be possessed and sold. Currently, the rusty crayfish (Orconectes rusticus), which is native to north central Kentucky, can be sold legally by bait dealers. However, under the "Potential Problem with Existing Regulation" heading that follows the regulation, it is suggested in the Plan that use of the rusty crayfish as bait might be regulated in the future due to the species' invasive characteristics in eastern Kentucky.***

***The Red Swamp Crayfish (Procambarus clarkii) and Virile or Northern Crayfish (Orconectes virilis) were not selected by the Task Force as "Problem-causing ANS in Kentucky" (those deemed the biggest threats to KY) or "Other Identified ANS within Kentucky" listed in Appendix II. Therefore, at this time, these species are not candidates for active management. However, due to the evolving nature of the ANS problem, the lists will be reviewed and updated annually and the problem status of the two crayfishes mentioned above could be upgraded in the future and qualify them for active management.***

Fish:

TVA recommends that Kentucky consider adding Inland Silverside to the Plan due to the fact that the species is established in Kentucky and introductions can negatively impact native brook silversides.

***Response:*** ***The Inland Silverside was not selected by the Task Force as "Problem-causing ANS in Kentucky" (those deemed the biggest threats to KY) or "Other Identified ANS within Kentucky" listed in Appendix II. Therefore, at this time, this species is not a candidate for active management. However, due to the evolving nature of the ANS problem, the lists will be reviewed and updated annually, and the problem status of the Inland Silverside could be upgraded in the future and qualify it for active management.***

Plants:

Common Reed (*Phragmites australis*) – (p. 18) TVA recommends the use of the reference, Staltonstall (2002) – Proceedings of the National Academy Sciences, USA, 99 (4): 2445-2449 – "Cryptic invasion by a non-native genotype of *Phragmites australis* into North America" in support of the introduction and spread of invasive non-native genotypes of *Phragmites*.

***Response:*** ***The text has been modified to include this citation.***

Curly pondweed (*Potamogeton crispus*) – (p. 18) – The introduction of curly pondweed in the United States was in the 1850's and is referenced in Stuckey (1979) – Bartonia 46:22-42 – "Distributional history of *Potamogeton crispus* (curly pondweed) in North America.

***Response:*** ***The species description has been corrected and the citation added to the Plan.***

Water hyacinth (*Eichhornia crassipes*) – (p. 20) – The description implies that water hyacinth has the ability to overwinter in Kentucky. TVA is unaware of any documented cases of overwintering populations of water hyacinth in Kentucky and recommends including documentation if overwintering occurs.

***Response:*** ***The species description has been changed from "can be found in western regions of the state" to "has been found in western regions of the state" to reduce the implication that water hyacinth overwinters in Kentucky. The species description attempts to convey a water hyacinth presence in western Kentucky (source unknown), not the ability of the plant to overwinter in Kentucky's aquatic habitats.***

Hydrilla (*Hydrilla verticillata*) – Although this species is listed in Appendix II: Other Identified ANS within Kentucky, it is not included with the species on pp. 17-19. This species is one of the most problematic aquatic weeds in the United States and is found in the western portion of Kentucky in the Kentucky Reservoir. Considering the potential that boating and angling pose for its spread, this species should be considered a major threat to the waters of Kentucky and treated accordingly in the Kentucky ANS Plan.

***Response:*** ***Inclusion on either list qualifies individual ANS as candidates for active management. Due to the evolving nature of the ANS problem, the lists will be reviewed annually and problems reprioritized as/if necessary.***

Appendix II (p. 53) – *Ludwigia grandiflora spp. grandiflora* is listed as a synonym for *Ludwigia uruguayensis*. The synonym should be *L. grandiflora spp. hexapetala* – see Neson & Kartesz (2000) – Castanea 65: 123- 125 – "Observations on the *Ludwigia uruguayensis* complex (*Onagraceae*) in the United States".
***Response:*** ***The synonym has been changed to L. grandiflora spp. hexapetala.***

Monotypic versus Monospecific – The document uses the term "monotypic" to refer to a stand or colony of plants consisting of a single species. This term is generally used in a taxonomic context in a situation where there is only one species within a genus. TVA recommends using the term "monospecific" in this context.
***Response:*** ***The term "monotypic" has been replaced with "single species" throughout the document.***

Criteria for Ranking:
TVA recommends using scoring criteria for ranking various species with a numerical value in order to provide some indication of the relative "threat" posed by a species.
***Response:*** ***Although ANS on both lists ("Problem-causing ANS in Kentucky" and "Other Identified ANS within Kentucky") are candidates for active management, the "Problem-causing ANS in Kentucky" have been deemed by the Task Force as the current biggest threats to Kentucky aquatic habitats. The Task Force agrees that numerical ranking indicating relative threat posed by species is a better way to prioritize ANS, but at this time, we do not posses the knowledge (i.e. ecological risk assessments, baseline distribution data) to accurately prioritize individual ANS threat on a numerical basis. See "Priorities for Action" (p. 40).***

**2. Comment received from David Hunt, resident of Pleasant Run, Kentucky.**

I agree that all non-native species need to be controlled. My biggest complaint is that in Lake Cumberland (especially Big South Fork of the Cumberland), the striped bass introduced into the lake, greatly influences the population of the native species, such as the small breeds like crappie, bluegill, and even small bass. I know the income of local businesses would be affected by that loss, but I would love to see them go, for the sake of the natural residents (fish) of the lake, not the aliens, legal or not.
***Response:*** ***The Task Force recognizes the potential impacts of non-native stocked fish species on native populations but did not place striped bass on either the "Problem-causing ANS in Kentucky" and "Other Identified ANS within Kentucky" lists because the threats posed by this species were deemed relatively small in the context of the comparative dangers posed by other ANS listed in the Plan. Furthermore, the ANS lists will be reviewed annually to incorporate any species deemed as an increasing ANS threat.***

**3. Comment received from Nathan W. Long, Vice President Lake Management Services, Aquatic Control Incorporated. Seymour, Indiana.**

I was curious as to why Hydrilla (*Hydrilla verticilata*) and Brazilian elodea (*Egeria densa*) were left off the list of ANS species? These two plants probably account for more

than 50% of the control expenditures on ANS in this country (millions annually in FL for control of hydrilla and millions annually in CA for control of BE). Indiana has recently been battling a hydrilla invasion with a goal of eradication and I am sure they would be happy if hydrilla was targeted in KY in order to reduce the chances of reintroduction. They spend nearly half a million this year in an eradication effort. KY is definitely in the line of fire for these plants as hydrilla has already been found in KY Lake and the Ohio River. Brazilian elodea is also already in KY. You may want to get in touch with Doug Keller, Indiana's ANS coordinator. He can be reached at dkeller@dnr.in.gov. I'm sure he would be glad to help. Hope these comments help.

***Response:*** ***Both of the mentioned species (Hydrilla verticilata, Egeria densa) are listed in Appendix II "Other Identified ANS within Kentucky" and therefore are candidates for active management. Furthermore, the ANS list will be reviewed annually, and the two ANS mentioned might be upgraded to the "Problem-causing ANS in Kentucky" list, which contains ANS deemed the current biggest threats to Kentucky aquatic habitats.***

**4. Comment received from Chad McKnight, residency and/or affiliation unknown.**

I would like to see a pamphlet to help identify these ANS.

***Response:*** ***A main component of the Plan is the development of an education program specific to Kentucky. Although the education program has not yet been developed, an important part of most ANS education programs is developing materials to aid in identifying ANS so they are not released accidentally. Information on identifying some ANS can be found at protectyourwaters.net.***

**5. Comment received from Wayne Rosso, residency and/or affiliation unknown.**

Read part of plan and it seems like it will be a step in right direction. Just a couple of notes on my experience with ANS. Several years ago I was at Kentucky Lake (summer) and noticed water hyacinth washing up on shore. There must have been hundreds of plants in just the small area of shore I was walking/fishing. Guess these came in barges? Do you have reports in Kentucky Lake every year? Seems to be little danger in establishing population of water hyacinth with our cold winters.

Also, own some property along Cypress Creek in Muhlenberg County. Curly pondweed has been so bad the last few years it chokes most of the creek and makes it unsuitable for fishing.

***Response:*** ***Although it is impossible to determine at this point, it is possible that the water hyacinth you observed may have come into Kentucky Lake on a barge. Many ANS plants are introduced when whole plants or fragments of plants are brought in on barges, boats, and other watercraft from outside sources.***

***At this time, Kentucky Lake is not monitored for ANS on an annual basis, but the Task Force does have a good idea of what ANS are established there.***

***Due to our cold winters, you are correct that there is little danger of water hyacinth overwintering in Kentucky. However, the plant persists, with the most likely source being the "release into the wild" pathway.***

***Furthermore, water hyacinth (p. 20) and curly pondweed (p. 18) are listed in "Problem-causing ANS in Kentucky" making both candidates for active management.***

**6. Comment received from Lonnie Nelson, Kentucky resident and retired KDFWR employee.**

I read through the proposal on aquatic nuisance species. Very nice job!!! I will admit that reading a PDF file on a 17-inch screen is hard on an old man's eyes. I probably missed as much as I comprehended, so I'll refrain from criticism. Just wanted to let you know that I read the document and approve of the department's stated position of stopping invasive species as much as possible. I am impressed with the inclusion of the section on public education on the subject. Thanks for the opportunity to comment.

***<u>Response:</u> The Task Force appreciates the general public's support and suggestions with regard to the Plan, and we strongly agree that development of an ANS education program be a main and important component.***