

Appendix 3.2 Kentucky's priority research and survey needs by taxonomic class.

Class ACTINOPTERYGII and CEPHALASPIDOMORPHI

Fishes and Lampreys

Research projects

- 1 Conduct life history studies to determine habitat use/requirements, spawning location and timing, fecundity, diet, competition, and population dynamics.
 - 2 Conduct studies to determine vulnerability of priority species to specific conservation issues.
 - 3 Resolve taxonomic status of species considered to be complexes (i.e., multiple taxa that are rare and may require protection), and provide formal descriptions and diagnoses for known or putative undescribed species.
 - 4 Assess potential impacts of non-indigenous fishes to priority species.
 - 5 Determine impact of increased sedimentation to fish communities resulting from agriculture, mining, and timber harvest.
 - 6 Determine impacts of impoundments to priority fish species.
 - 7 Examine underlying causes and biological consequences of population fragmentation for priority species existing in small isolated populations
 - 8 Develop a captive rearing program for potential reintroduction or population augmentation.
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Survey projects

- 1 Utilize available resources (e.g., Southern Illinois University Carbondale ichthyological collection) to update and fill gaps in distributional information.
 - 2 Conduct baseline surveys and status assessments for priority species lacking complete distributional information.
 - 3 Determine distribution and abundance of nonindigenous species that may pose a threat to priority species.
 - 4 Identify high priority sites and landowners (public and private) for priority fish species conservation and recovery.
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Appendix 3.2 Continued.

Class BIVALVIA

Mussels

Research projects

- 1 Conduct research into controlled propagation to discover methods and techniques most suitable to recover populations.
 - 2 Identify hosts for mussels (especially those that are unknown) for both natural distribution and for propagation.
 - 3 Identify the food and feeding requirements of freshwater mussels.
 - 4 Identify suitable and critical habitat (i.e., substrate, flow) requirements for freshwater mussels.
 - 5 Identify limiting factors in current mussel populations, such as host fish presence/absence, host fish densities, critical densities at which mussels need to maintain recruitment.
 - 6 Identify limiting factors in current mussel populations, such as host fish presence/absence, host fish densities, critical densities at which mussels need to maintain recruitment.
 - 7 Examine reproductive behavior for all species and document seasonal timing of gametogenesis in association with environmental variables.
 - 8 Conduct research into the life history requirements of freshwater mussels.
 - 9 Increase the awareness of mussels and their link to the environment through outreach education.
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Survey projects

- 1 Conduct baseline surveys and status assessments for priority species that lack complete distributional information.
 - 2 Survey areas within historic range to determine current distribution (and conduct at a frequency to determine long term monitoring) (specifically Salt River, Upper Kentucky, Upper Cumberland, Middle and Upper Green, and any of the deep larger rivers).
 - 3 Identify high priority sites and landowners (public and private) for mussel conservation and recovery. These sites should be located within priority areas.
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Appendix 3.2 Continued.

Class MALACOSTRACA

Crayfish, amphipod, isopod

Research projects

- 1 Identify suitable and critical habitat requirements, key habitat corridors and high-priority areas for targeted conservation efforts.
 - 2 Conduct studies to assess impacts of groundwater pollution (e.g. agricultural runoff, salt from roads, siltation) on cave species, and develop best management practices to guard against perturbations to groundwater.
 - 3 Conduct studies to determine impacts of management activities on priority species.
 - 4 Conduct studies to determine vulnerability of priority species to specific conservation issues.
 - 5 Conduct life history studies to assess reproductive requirements and timing, diet, and population dynamics of key species.
 - 6 Examine effects of diseases, contaminants, and stochastic events on populations of priority species.
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Survey projects

- 1 Conduct baseline surveys and status assessments for priority species lacking complete distributional information.
 - 2 Determine distribution and abundance of non-native crayfish species that may pose a threat to priority species.
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Appendix 3.2 Continued.

Class AMPHIBIA

Amphibians

Research projects

- 1 Conduct field research to gather life history information and increase and/or refine our basic knowledge of habitat use and habitat requirements for priority amphibian species where needed so that habitat management guidelines can be developed and/or improved. Included here would be conducting demographic studies to determine breeding success, egg and larval survivorship, successful metamorphosis, longevity of adults, high value habitats, etc.
- 2 Establish projects to identify factors limiting expansion and/or recovery of priority amphibian populations and determine habitat patch size and/or degree of habitat connectivity needed to sustain viable populations of priority species in today's often-highly-fragmented landscapes.
- 3 Examine interactions and basic ecological relationships between selected priority amphibian species and their close relatives (i.e. *Plethodon ventralis*-*P. dorsalis*; *Plethodon wehrlei*-*P. kentucki*-*P. glutinosus*; *Plethodon cinereus*-*P. richmondi*-*P. electromorphus*; *Ambystoma barbouri*-*A. texanum*; *Rana pipiens*-*R. sphenoccephala*; *Hyla avivoca*-*H. versicolor*-*H. chrysoscelis*, etc.). Several priority amphibian species appear to either compete with or hybridize with similar, related species in areas where both occur in the same habitats, and this may play a role in limiting the range or abundance of some of the rarer species.
- 4 Examine responses of priority amphibian species to species-specific and/or guild-specific conservation actions performed within Priority Amphibian Conservation Areas.
- 5 Develop techniques for the successful reintroduction of extirpated priority amphibian species into historic portions of their Kentucky ranges within Priority Amphibian Conservation Areas.
- 6 Develop reliable recognition characters for *Rana areolata circulosa* tadpoles.
- 7 Examine effects of diseases (iridovirus, ranavirus, etc.), contaminants (pesticides, herbicides, mercury contamination from power plants, etc.), and stochastic events (drought, flooding, etc.) on populations of priority amphibian species.
- 8 Examine impacts of various types of land use (grazing, surface mining, timber harvest, etc.) on priority amphibian species and amphibian communities.

Survey projects

- 1 Compile available baseline data on distribution, life history, ecology, habitat requirements, and population status/trends for all Kentucky amphibians with emphasis on priority amphibian species. This data could be coupled with species identification information and photographs to complete an in-progress book on Kentucky's amphibians and reptiles that would be available to the public.
 - 2 Conduct and/or coordinate field surveys to gather additional data on distribution, life history, ecology, habitat requirements, and population status/trends for all Kentucky amphibians as needed, with emphasis on priority amphibian species.
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Appendix 3.2 Continued.

- 3** Establish protocols for the preparation of species distribution maps for amphibians that could show year-by-year changes in the Kentucky range of any selected species.
 - 4** Survey Wildlife Management Areas and other public lands throughout Kentucky for amphibians, with emphasis on priority species and their most significant habitats.
 - 5** Sample priority amphibian species and/or suitable surrogates for contaminants (i.e. pesticides, herbicides, mercury from power plants, etc.), diseases (i.e. iridovirus), and incidence of various deformities and establish long-term monitoring protocols.
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Appendix 3.2 Continued.

Class AVES

Birds

Research projects

- 1 Develop GIS modeling applications that aid in identifying available habitats required by priority species.
 - 2 Examine land use impacts to avian species (e.g., grazing, mining, hunting, developments, silviculture, human disturbance, communication towers, river channelization, etc.). Where feasible, conduct pre- and post-impact monitoring of avian communities (productivity and species composition).
 - 3 Establish demographic studies for priority species (e.g., nest success, juvenile survival, etc.) to identify factors limiting populations.
 - 4 Determine habitat requirements of marsh birds and whether those requirements differ for breeding versus transient birds.
 - 5 Research basic life history requirements for transient shorebirds (staging site selection, minimum invertebrate density, resting site characteristics, etc.).
 - 6 Examine impacts among and between species and with other flora and fauna (e.g., disease, predation, nest parasitism, hybridization, introduced species, invasive plants, etc.).
 - 7 Examine effects of abiotic factors (e.g., pesticides, stochastic events, etc.) to priority species.
 - 8 Conduct research needed to validate assumptions upon which models that predict habitat objectives are based (shorebird, waterfowl, and landbird habitat objectives).
 - 9 Research effects of habitat loss outside of Kentucky on migratory birds and how these losses may affect birds that breed, stage, or winter in Kentucky.
 - 10 Compare breeding phenology and habitat requirements of the American woodcock to that of traditional breeding areas in northern states.
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Survey projects

- 1 Gather baseline data on distribution and population status of marsh birds and distribution of emergent wetland habitat in Kentucky.
 - 2 Gather baseline data on distribution and population status of transient shorebirds and shorebird habitat in Kentucky.
 - 3 Gather baseline data on distribution and population status for landbirds where data is lacking (e.g., bank swallow, common raven, red-headed woodpecker, least flycatcher, Bell's vireo, etc.) and identify suitable habitat availability (e.g., banks, cliffs, savannahs, early successional habitat, reclaimed mine lands, etc.).
 - 4 Conduct winter surveys for priority avian species on areas improved through various incentive program practices (e.g., Habitat Buffers for Upland Birds under CP-33 of Conservation Reserve Program) through partnerships with Partners in Flight, Southeast Quail Study Group, etc. This will assist in establishing long-term monitoring protocols.
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Appendix 3.2 Continued.

- 5 Develop survey technique to collect population trend data for species or suites of species that existing surveys do not capture (e.g., Henslow's sparrow, Bachman's sparrow, Bewick's wren, golden-winged warbler, Swainson's warbler, short-eared owl, green heron, yellow-crowned night-heron, bank swallow, hooded merganser, wintering birds, etc.) and establish monitoring protocols for each.
 - 6 Continue pilot raptor survey at Peabody Wildlife Management Area and expand or revise into monitoring protocol.
 - 7 Survey habitats in Kentucky for neotropical migrant songbird use.
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Appendix 3.2 Continued.

Class MAMMALIA

Mammals

Research projects

- 1 Establish projects for priority mammal species to identify factors limiting populations (i.e., survival, low densities, habitat connectivity, etc.), especially for those species experiencing declines.
 - 2 Examine land use impacts (i.e. silviculture, grazing, mining, fire regimes, hunting, developments, human disturbance, etc.) on mammal species that are experiencing declines or have unknown trends.
 - 3 Examine impacts of disease and contaminants on populations of mammals in decline or of unknown status. These issues seem to be particularly important in Allegheny woodrats and the various bat species.
 - 4 Examine habitat use by declining species during critical periods of their life cycle (e.g., foraging and breeding habitat of swamp rabbits with litters).
 - 5 Examine responses of priority mammal species to targeted habitat improvement practices (e.g., response of bat populations to cave improvements designed to improve hibernacula conditions, response of cotton mouse/swamp rabbits to various Wetland Reserve Program practices).
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Survey projects

- 1 Distribution data for many of the bat species (both summer and winter) is lacking. Specifically, intensive surveys (i.e., mist-net, harp trap, Anabat, etc.) need to be conducted throughout Kentucky during the foraging or “swarming” periods of the year. Additionally, targeted efforts to identify new hibernacula for these species must also occur.
 - 2 Data for swamp rabbits and Appalachian cottontails and (e.g., distribution, abundance, population status, etc.) is generally lacking. We need to expand upon previous surveys that have been conducted in Kentucky for these species (i.e., Sole 1994, 1999 respectively). Targeted habitat restoration projects and management recommendations can be based on survey results.
 - 3 Intensive trapping surveys are needed in order to gather distribution and abundance data for the priority small mammal species. Surveys will be targeted at portions of the expected ranges where we lack site records. Specifically, we (1) lack the most information for rock shrews and cotton mice in Kentucky, (2) have marginal information regarding abundance of cinereus shrews and Kentucky red-backed voles (distribution data for these species is fair to good), and (3) need additional surveys to better delineate the range and abundance of Allegheny woodrats.
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Appendix 3.2 Continued.

Class REPTILIA

Reptiles

Research projects

- 1 Conduct field research to gather life history information and increase and/or refine our basic knowledge of habitat use and habitat requirements for priority reptile species where needed so that habitat management guidelines can be developed and/or improved. Included here would be conducting demographic studies to determine breeding success, juvenile survivorship, longevity of adults, high value habitats, etc.
 - 2 Establish projects to identify factors limiting expansion and/or recovery of priority reptile populations and determine habitat patch size and/or degree of habitat connectivity needed to sustain viable populations of priority species in today's often-highly-fragmented landscapes.
 - 3 Examine responses of priority reptile species to species-specific and/or guild-specific conservation actions performed within Priority Reptile Conservation Areas.
 - 4 Develop techniques for the successful reintroduction of extirpated priority reptile species into historic portions of their Kentucky ranges within Priority Reptile Conservation Areas.
 - 5 Examine responses of priority reptile species to targeted habitat improvement practices.
 - 6 . Develop techniques for the successful reintroduction of extirpated priority reptile species into historic portions of their ranges in Kentucky.
 - 7 Evaluate effectiveness of various types of barriers and underpasses in areas where priority reptile species are particularly vulnerable to highway mortality (e.g. KY 307 at Obion WMA, KY 268 at Sloughs WMA, etc.).
 - 8 Examine effects of contaminants (pesticides, herbicides, mercury contamination from power plants, etc.) on populations of priority reptile species.
 - 9 Examine impacts of various types of land use (grazing, surface mining, timber harvest, etc.) on priority reptile species and reptile communities.
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Survey projects

- 1 Compile available baseline data on distribution, life history, ecology, habitat requirements, and population status/trends for all Kentucky reptiles with emphasis on priority reptile species. This data could be coupled with species identification information and photographs to complete an in-progress book on Kentucky's amphibians and reptiles that would be available to the public.
 - 2 Conduct and/or coordinate field surveys to gather additional data on distribution, life history, ecology, habitat requirements, and population status/trends for all Kentucky reptiles as needed, with emphasis on priority reptile species.
 - 3 Establish protocols for the preparation of species distribution maps for reptiles that could show year-by-year changes in the Kentucky range of any selected species.
 - 4 Survey Wildlife Management Areas and other public lands throughout Kentucky for reptiles, with emphasis on priority species and their most significant habitats.
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Appendix 3.2 Continued.

- 5** Sample priority reptile species and/or suitable surrogates for contaminants (i.e. pesticides, herbicides, mercury from power plants, etc.), diseases (i.e. iridovirus), and incidence of various deformities and establish long-term monitoring protocols.

