Appendix 3.9 Kentucky's Comprehensive Wildlife Conservation Strategy priority monitoring needs by taxonomic class. A "P" indicates the project includes population monitoring, while "H" indicates that the project includes habitat monitoring.

Aquatic monitoring projects

Class ACTINOPTERYGII and CEPHALASPIDOMORPHI	Fishes and Lampreys

Established projects

P	H	Continue partnering with Kentucky Division of Water's Watershed Management Initiative.
P		Assist Kentucky State Nature Preserves Commission in monitoring of heritage listed species.

New projects

P		Establish protocols, schedules, and sites for long-term population monitoring to assess status and trends for priority species. These efforts should be coordinated with any existing monitoring programs established by other state and federal agencies, academic institutions, and Non-Government Organizations.
	H	Locate and assess habitat where known populations of SGCN occur.
P		Monitor distribution and abundance of nonindigenous fishes and their impacts on priority species.

Class BIVALVIA	Mussels

Established projects

P		Assist Kentucky State Nature Preserves Commission in monitoring of heritage listed species.

New projects

P		Monitor population status and trends (age class, size distribution, recruitment, life history) across the state.
P	H	Establish monitoring locations to document health of priority areas and frequent areas at regular intervals to allow long-term trend data to be collected.

Appendix 3.9 Continued.

Class MALACOSTRACA	Crayfish, amphipod, isopod

Existing projects

	H	Monitor the impacts of FILO stream mitigation work on population status and trends of crayfish.

New projects

P	H	Monitor population status and trends across the state; specifically, identify high-priority watersheds for long-term population/habitat monitoring efforts.
P	H	Monitor the impacts of habitat management activities on populations.
P		Monitor the impacts of diseases and contaminants on populations.
P		Monitor the distribution and abundance of non-native crayfish species and their impacts on crayfish SGCN.

Appendix 3.9 Continued.

Terrestrial monitoring projects

Class AMPHIBIA	Amphibians

Established projects

P Partner with KSNPC to ensure that data is regularly exchanged for priority amphibian species that are of interest to both KSNPC and KDFWR.

New projects

P Establish and maintain a database to allow amphibian distribution, life history, and population information to be compiled in some organized form on an annual basis.

P Monitor available distribution records and population trends for all amphibians statewide - with an emphasis on priority species - by soliciting and tracking field data from KDFWR personnel, biologists from other state and federal agencies, biologists from The Nature Conservancy along with consulting firms and other NGOs, and members of the general public with biological expertise. Where possible, all such data should be vouchered in some manner; acceptable vouchers could include photographs, specimens or parts thereof, tape recordings (for calling frogs), detailed descriptions, or sketches. Field notes from biologists known to be familiar with the species being reported would be acceptable as well.

P Establish protocols for long-term amphibian population monitoring and establish long-term amphibian monitoring stations on selected public lands (WMAs, various NPS, USFS, and COE lands, etc.). Monitoring sites should be distributed generally across Kentucky but the majority should be located within Priority Conservation Areas. The emphasis will be on tracking populations of priority amphibian species and amphibian communities; we will target priority species but will gather information on all amphibian species encountered at the established sites. Standard field methods used at each site may include coverboard surveys, time-constrained leaf litter/stream searches, visits to special high-value habitats (cave entrances, seeps, breeding ponds, etc.), various types of trapping, night sampling, listening to anuran vocalizations, road cruising on rainy evenings, visual encounter surveys, and sampling in and near historic locations (see Heyer, W., M. Donnelly, R. McDiarmid, L. Hayek, and M. Foster. 1994. Measuring and Monitoring Biological Diversity: Standard methods for Amphibians. Smithsonian Institution Press, Washington and London).

Appendix 3.9 Continued.

P	H	Monitor short- and long-term responses of priority amphibian species and amphibian communities both to microhabitat projects (e.g. construction of vernal pools for breeding) and large-scale habitat protection, restoration, or management projects such as wetland or forest restoration or prescribed burning. Such monitoring is needed in order to allow us to better understand the responses of individual species to various forms of management and to be able to add, revise, or alter management activities as indicated. Recommended monitoring guidelines are set forth in Dodd 2003 (Dodd, C. K. 2003. Monitoring Amphibians in Great Smoky Mountains National Park, U.S. Geological Survey Circular 1258).
P	H	Where possible, monitor habitat condition and priority species response for at least five years after the management activity has been completed.
P		Establish database(s) to track both positive and negative results from all amphibian monitoring activities and update regularly to other agency databases through data sharing.
P		Coordinate data collection and analysis at the appropriate scale (state, regional, or national) to facilitate data sharing.

Class AVES	Birds

Established projects

P	Partners in Flight Point County Surveys: Continue monitoring points through 2006 for Central Hardwoods Bird Conservation Area (BCR) and through 2009 for Appalachian Mountains BCR to determine population trends, as recommended in analyses by Buehler et al. (2004).
P	Partners In Flight (PIF) Point Count Surveys: Combine avian survey points with other states for Mississippi Alluvial Valley and East Gulf Coastal Plain BCRs.
P	Partners In Flight (PIF) Point Count Surveys: Analyze avian point count data, including data from U.S. Forest Service, East Gulf Coastal Plain BCR, and Mississippi Alluvial Valley BCR, and then compare to Breeding Bird Survey (BBS) trends and incorporate detection probabilities into future analyses.
P	Partners In Flight (PIF) Point Count Surveys:Establish additional points in habitats other than forest (i.e., grassland, early successional, and wetlands) and establish routes for habitat comparisons (e.g., CP-33 monitoring).
P	Breeding Bird Surveys: Partner with Kentucky State Nature Preserves Commission to ensure that all routes are conducted annually.

Appendix 3.9 Continued.

P	Breeding Bird Surveys:Establish new routes or reroute existing routes where needed to ensure better species coverage.
P	Christmas Bird Counts:Partner with Audubon Society and Kentucky Ornithological Society to ensure that all routes are conducted annually.
P	Christmas Bird Counts:Establish new routes or reroute existing routes where needed to ensure better species coverage.
P	Colonial Nesting Waterbirds:Partner with Kentucky State Nature Preserves Commission, Kentucky Ornithological Society, and other state/federal agencies and non-governmental organizations to document status and distribution of colonies.
P	Colonial Nesting Waterbirds:Conduct a statewide comprehensive aerial survey of all colonies at least once every three years.
P	Colonial Nesting Waterbirds:Annually monitor the status of known and new colonies.
P	Waterfowl: Continue to conduct winter waterfowl surveys.
P	Waterfowl: Continue to participate in the mid-winter waterfowl survey (a nationwide, coordinated monitoring effort conducted during a specific time period).
P	Waterfowl: Continue to participate in cooperative waterfowl banding programs.
P	Waterfowl: Continue to participate in the Mississippi Flyway “Wingbee” (provides demographic data from hunter harvested American Black Duck, Hooded Merganser, and Northern Pintail).
P	Bald Eagle: Continue midwinter eagle surveys until species is delisted and then follow requirements in post-delisting monitoring plan or conduct surveys only every few years.
P	Bald Eagle: Continue to conduct aerial nesting surveys and monitor nest productivity and follow delisting monitoring plan when developed.
P	Peregrine Falcon:Continue monitoring following U.S. Fish and Wildlife Services guidelines through 2015 (productivity monitoring, contaminants, new nest site searches, banding).
P	Peregrine Falcon: Focus monitoring at established nest box sites.
P	Interior Least Tern: Partner with the Interior Least Tern Working Group to standardize methodology and coordinate monitoring activities.

Appendix 3.9 Continued.

P Interior Least Tern: Continue to annually monitor the lower Ohio River population through aerial surveys and ground nest counts.

P Interior Least Tern: Partner with the Missouri Department of Conservation to continue annual monitoring of the Mississippi River population through aerial surveys and ground nest counts.

P American Woodcock: Continue annual singing grounds survey.

New projects

P Neotropical Migrant Songbirds: Establish pilot migration station using Monitoring Avian Productivity and Survivorship (MAPS) protocol and establish long-term migration monitoring.

P Neotropical Migrant Songbirds: Establish migration monitoring for species not currently covered by existing programs, such as Bank Swallow, as identified by Partners in Flight (Rich et al. 2005 draft).

P Transient Shorebirds: Adopt the International Shorebird Survey (ISS) protocol.

P Transient Shorebirds: Train volunteers and biologists on shorebird identification and survey methodology.

P Transient Shorebirds: Establish long-term shorebird monitoring program based on initial surveys.

P Transient Shorebirds: Partner with the Lower Mississippi Valley Joint Venture and the Kentucky Ornithological Society to participate in the Lower Mississippi Valley Shorebird Count (a coordinated survey effort conducted each year in August).

P Marshbirds:Adopt the Standardized North American Marsh Bird Monitoring Protocol (Conway 2004).

P Marshbirds: Train volunteers and biologists on marsh bird vocalizations and survey methodology.

P Marshbirds: Establish long-term marsh bird monitoring program based on initial surveys.

P All Raptors: Establish nesting, winter, and migration monitoring protocol for raptors following surveys at Peabody Wildlife Management Area and pilot research from universities.

Appendix 3.9 Continued.

P All Raptors: Establish migration monitoring program for species of concern based on recommendations by Rich et al. (2005 draft).

P Barn Owls: Collect existing nesting and banding records and establish database to better track nest sites.

P Barn Owls: Establish network by which nest boxes are readily available to rehabilitators, agencies, and non-governmental organizations.

P Whooping Crane: Partner with the U.S. Fish and Wildlife Service and the Operation Migration project to document Whooping Crane occurrence and distribution in Kentucky.

P Whooping Crane: Create a whooping crane network for biologists and the public to report sightings in Kentucky.

P Establish targeted monitoring based on results from research or initial surveys for species not well detected by existing monitoring programs, such as non-colonial breeding waterbirds (green heron), nocturnal breeding birds (owls), non-singing birds (hooded merganser), golden-winged warbler, etc.

P Implement banding programs to facilitate monitoring where feasible (American woodcock, raptors, transient shorebirds, etc.).

H Partner with regional agencies to map current available habitat using both GIS and on-the-ground surveys.

H Model potential changes in available habitat based on predictive factors (proposed habitat improvement projects, changes in management activities, drought, urban sprawl, etc.).

H Update habitat maps every three to five years and focus habitat restoration and land acquisition projects in areas where declines are observed.

P Follow guidelines set forth by programs such as in the Coordinated Bird Monitoring document (CBM 2004).

P Monitor priority species at least two years prior to and two years after management activity.

P Track monitoring efforts through databases that are linked to GIS programs.

P Establish database for all banding activities.

Appendix 3.9 Continued.

P	Maintain Kentucky Department of Fish and Wildlife Resources species databases and update regularly with other agency databases through data sharing (i.e., exchange data with permitting agencies).
P	Coordinate data collection and analysis at appropriate scale (state, regional, national, etc.) to facilitate data sharing (CBM 2004).
P	Where possible, utilize national or regional monitoring databases.

Class MAMMALIA	Mammals

Established projects

P	Emergence counts at priority maternity caves are conducted on a 2-year cycle; gray bats and Virginia big-eared bats use caves for maternity sites.
P	Hibernacula counts at Priority 1 and 2 caves are conducted on a 2-year cycle, targeting Indiana bats, gray bats, and Virginia big-eared bats. These hibernacula counts also provide information on other species of bats if present.
P	Longer-term Allegheny woodrat monitoring at 3 general locations (Mammoth Cave, east Kentucky, and southeast Kentucky) throughout the woodrat's range. Intensive mark/recapture trapping is slated to occur approximately every 5 years.
P	Hunter harvest information is gathered annually from voluntary cooperators; although scant information is received regarding swamp rabbits, and especially Appalachian cottontails, the information we gather allows us to monitor hunter success rates (which provides a "per unit effort" index to population levels).
P	We currently have black bear monitoring efforts underway, which consists of live-trapping efforts, mark/recapture (with trail cameras and traps), and "hair-snare" sets. This is allowing us to monitor various aspects of our bear population.

New projects

P	H	Monitor responses of mammal species/communities following large-scale restoration projects. Longer-term monitoring of projects (e.g., cave-gating, wetland restoration, vegetation manipulation, etc.) is needed in order to better understand mammalian responses and devise management recommendations. Monitoring schemes under this scenario are species-dependent, meaning that the type of monitoring we would use would depend on the mammal species we were trying to benefit.

Appendix 3.9 Continued.

P Longer-term sampling grids or transects need to be established in Priority Conservation Areas and other suitable habitats to sample for small mammals and meso-mammals (i.e., lagomorphs and spotted skunks). We will be able to gather population information on species currently identified on our STWG list, but these sampling grids or transects will also provide us valuable information on small mammal communities as a whole. Sampling methods may include such things as drift fence and pitfall arrays, Sherman live traps, or small Havaharts (for Allegheny woodrats, lagomorphs, and spotted skunks).

P A monitoring program for bat populations needs to be established during the summer and early fall seasons, especially for those species that are poorly sampled under our existing monitoring programs (#1 and #2 in previous section). This monitoring program may involve a combination of longer-term monitoring sites (i.e., net the same sites each sampling period) and short-term sites (i.e., net a site 2 consecutive sampling periods and sample elsewhere). Monitoring will consist of mist-netting for a pre-determined number of "net nights" in various habitats within our Priority Conservation Areas. It will also consist of roost emergence counts if roost sites are located for priority species (via radio telemetry). Ideally, we will be able to monitor bats within Priority Conservation Areas on a 2 year cycle (i.e., half of our areas would be sampled in year 1, the other half in year 2, and then repeat the cycle).

Class REPTILIA Reptiles

Established projects

P Partner with KSNPC to ensure that data are regularly exchanged for priority reptile species that are of interest to both KSNPC and KDFWR.

New projects

P Establish and maintain a database to allow reptile distribution, life history, and population information to be compiled in some organized form on an annual basis.

P Monitor available distribution records and population trends for all reptiles statewide - with an emphasis on priority species - by soliciting and tracking field data from KDFWR personnel, biologists from other state and federal agencies, biologists from The Nature Conservancy along with consulting firms and other NGOs, and members of the general public with biological expertise. Where possible, all such data should be vouchered in some manner; acceptable vouchers could include photographs, specimens or parts thereof, detailed descriptions, or sketches. Field notes from biologists known to be familiar with the species being reported would be acceptable as well.

Appendix 3.9 Continued.

P		Establish protocols for long-term reptile population monitoring and establish long-term reptile monitoring stations on selected public lands (WMAs, various NPS, USFS, and COE lands, etc.). Monitoring sites should be distributed generally across Kentucky but the majority should be located within Priority Conservation Areas. The emphasis will be on tracking populations of priority reptile species and reptile communities; we will target priority species but will gather information on all reptile species encountered at the established sites. Standard field methods used at each site may include coverboard surveys, visits to special high-value habitats (rocky areas, abandoned gravel pits and quarries, wetlands, abandoned buildings, old sawmills and log landings, wetlands with adjacent rubbish dumps, etc.), various types of trapping, night sampling, road cruising, visual encounter surveys, and sampling in and near historic locations.
P	H	Monitor short- and long-term responses of priority reptile species and communities both to microhabitat projects (e.g. construction of vernal pools for breeding) and large-scale habitat protection, restoration, or management projects such as wetland or forest restoration or prescribed burning. Such monitoring is needed in order to allow us to better understand the responses of individual species to various forms of management and to be able to add, revise, or alter management activities as indicated. Recommended monitoring guidelines for amphibians are set forth in Dodd 2003 (Dodd, C. K. 2003. Monitoring Amphibians in Great Smoky Mountains National Park, U.S. Geological Survey Circular 1258); methods for reptiles will differ somewhat from these.
P	H	Where possible, monitor habitat condition and priority species response for at least five years after the management activity has been completed.
P		Establish database(s) to track both positive and negative results from all reptile monitoring activities and update regularly to other agency databases through data sharing.
P		Coordinate data collection and analysis at the appropriate scale (state, regional, or national) to facilitate data sharing.