

Appendix N. Most relevant conservation actions for SGCN according to responses to the Species Survey free-response questions from the statewide Species Survey. Note: All actions were derived from survey respondents only with no suggested actions from the survey team.

Table N-1. Most relevant conservation actions for SGCN according to responses to the Species Survey free-response questions from the statewide Species Survey. Note: All actions were derived from survey respondents only with no suggested actions from the survey team.

Species	Relevant Actions	Effective Actions	Major Barriers
Whooping Crane	<ul style="list-style-type: none"> · Continued management of wetlands (e.g., control of invasive plants) · Restoring wetlands that provide important stopover and roosting habitat · Provide secure wintering habitat · Education of general public to reduce illegal shooting 	<ul style="list-style-type: none"> · Protection and restoration of large wetland complexes · Reintroduction of migratory populations · Restoration of Goose Pond Fish and Wildlife Area and Patoka National Wildlife Refuge (NWR) 	<ul style="list-style-type: none"> · Funding · Cost of delivery and location of projects · Lack of personnel · Illegal shootings
Sandhill Crane	<ul style="list-style-type: none"> · Wetland protection and restoration · Public education · Conservation easements on farm land surrounding protected areas · Resist establishment of hunting season · Buffers around suitable habitat 	<ul style="list-style-type: none"> · Wetlands Reserve Program · Partners for Wildlife program · Creation of Goose Pond · Restoration at Muscatatuck NWR · Wetland restoration · Wildlife preservation areas, particularly Jasper-Pulaski · Healthy Rivers Initiative 	<ul style="list-style-type: none"> · Competition with agriculture for land area · Political will · Funding · Cost of implementation and location of projects · Property values; landowners unwilling to sell land
Great Egret	<ul style="list-style-type: none"> · Maintain availability of shallow water feeding habitats · Cleaning of polluted areas such as the Calumet River · Wetland protection 	<ul style="list-style-type: none"> · Construction of wetlands (e.g., Goose Pond) · Development of Eagle Marsh at Ft. Wayne 	<ul style="list-style-type: none"> · Competition with recreational uses for Indiana reservoirs/lakes · Cooperation of industry and land owners

Species	Relevant Actions	Effective Actions	Major Barriers
<i>American Bittern</i>	<ul style="list-style-type: none"> · Acquire and restore large wetland complexes · Control invasive wetland plants · Habitat preservation 	<ul style="list-style-type: none"> · Creation of Goose Pond FWA · Development of Eagle Marsh at Ft. Wayne 	<ul style="list-style-type: none"> · Budget · Limited wetland availability
<i>Least Bittern</i>	<ul style="list-style-type: none"> · Acquire and restore large wetland complexes · Control invasive wetland plants · Habitat preservation · Restoration of hemi-marsh · Protection from road kills where marshes are bisected by roads 	<ul style="list-style-type: none"> · Creation of Goose Pond · Restoration of wetlands at Patoka River 	<ul style="list-style-type: none"> · Budget · Lack of land for restoring marshes
<i>Yellow-crowned Night-heron</i>	<ul style="list-style-type: none"> · Reduce recreational overuse of habitats · Statewide survey to assess status 	<ul style="list-style-type: none"> · Restoration and acquisition of large wetland complexes like Goose Pond FWA 	<ul style="list-style-type: none"> · Lack of adequate budget to manage for invasive plant control and water levels at Goose Pond and similar large wetland complexes
<i>Black-crowned Night-Heron</i>	<ul style="list-style-type: none"> · Reduce disturbance at breeding sites · Cleanup of polluted areas 	<ul style="list-style-type: none"> · Production of suitable foraging habitat (e.g., Goose Pond) · Restoring the Grand Calumet River 	<ul style="list-style-type: none"> · Political support · Cooperation with private industrial landowners where current colonies exist
<i>Eastern Whip-poor-will</i>	<ul style="list-style-type: none"> · Educate public about value of vegetative disturbance · Removal of understory invasive plants · Targeted surveys · Management of large tracts of mature forest 	<ul style="list-style-type: none"> · Surveys of nocturnal birds · Management of young forest habitat 	<ul style="list-style-type: none"> · Uneducated public · Expense of invasive plant removal · Lack of species knowledge
<i>Common Nighthawk</i>	<ul style="list-style-type: none"> · Increase gravel-surfaced sites for breeding · Provision of suitable rooftop habitat for nesting 	<ul style="list-style-type: none"> · Initiatives in Indianapolis have increased awareness 	<ul style="list-style-type: none"> · Changing architectural preferences for roofing · Cooperation by private building owners and roofing companies · Limited resources
<i>Common Gallinule</i>	<ul style="list-style-type: none"> · Preserve and restore large wetland complexes · Control invasive wetland plants · Long-term management of water levels in large wetlands 	<ul style="list-style-type: none"> · Creation of Goose Pond · Eagle Marsh restoration at Ft. Wayne 	<ul style="list-style-type: none"> · Inadequate budget for wetland management · Cooperation of private landowners · Lack of resources

Species	Relevant Actions	Effective Actions	Major Barriers
<i>Black Rail</i>	<ul style="list-style-type: none"> · Large wetland restoration projects · Management for high-diversity marshes · Control of invasive wetland plants · Water control structures 	<ul style="list-style-type: none"> · Creation of Goose Pond · Restoration of Patoka River National Wildlife Refuge 	<ul style="list-style-type: none"> · Political will · Inadequate budget · Lack of land available for wetland restoration
<i>King Rail</i>	<ul style="list-style-type: none"> · Large wetland restoration projects · Control invasive plants · Manage water levels · Restoration of hemi-marsh · Management of ditch habitat adjacent to refuges 	<ul style="list-style-type: none"> · Creation of Goose Pond · Restoration at Limberlost Swamp Wetland Preserve · Establishment of additional habitat at Patoka River NWR 	<ul style="list-style-type: none"> · Political will · Inadequate budget · Lack of land suitable for restoration · Legal problems with water control structures
<i>Virginia Rail</i>	<ul style="list-style-type: none"> · Preserve marsh habitats · Control invasive wetland plants · Maintain natural water flow · Restore wetlands 	<ul style="list-style-type: none"> · Wetland Reserve Program · Creation of Goose Pond · Management of Pine Creek in Benton County · Wetland restoration at Eagle Marsh in Ft. Wayne · Restoration at Limberlost Swamp Wetland Preserve 	<ul style="list-style-type: none"> · Political will · Inadequate budget · Lack of land available for wetland restoration
<i>Sharp-shinned Hawk</i>	<ul style="list-style-type: none"> · Maintain large patches of contiguous forest · Resist housing development on forest lands · Maintain forest habitat along Lake Michigan shoreline · Restore forests 	<ul style="list-style-type: none"> · Creation of nature preserves, such as Goose Pond 	<ul style="list-style-type: none"> · Loss and fragmentation of mature forests · Inadequate funding

Species	Relevant Actions	Effective Actions	Major Barriers
<i>Short-eared Owl</i>	<ul style="list-style-type: none"> · Maintain restored grasslands and hayfields · Reduce mowing of grasslands · Reduce conversion of grasslands to coal mines · Maintain CRP lands · Restore grasslands 	<ul style="list-style-type: none"> · CRP enrollments · Restoration of grasslands at Goose Pond 	<ul style="list-style-type: none"> · Cooperation of private landowners · Cooperation of coal mine companies · Unwillingness to use fire as management tool · Inadequate funding
<i>Red-shouldered Hawk</i>	<ul style="list-style-type: none"> · Preserve large contiguous mature forests, especially riparian areas · Resist housing development on forest lands · Restore forested wetlands 	<ul style="list-style-type: none"> · Reforestation of bottomland forests in southern Indiana · Creation of wildlife management areas, such as Goose Pond 	<ul style="list-style-type: none"> · Political will · Cooperation of private landowners · Cooperation of timber companies · Inadequate funding · Pressures from development
<i>Broad-winged Hawk</i>	<ul style="list-style-type: none"> · Protect large forest patches · Forest habitat restoration 	<ul style="list-style-type: none"> · Proposed purchase of new protected forests near Muscatatuck and along the Wabash River · Creation of wildlife management areas, such as Goose Pond 	<ul style="list-style-type: none"> · Political will · Zoning regulations · Pressures from development · Inadequate funding
<i>Northern Harrier</i>	<ul style="list-style-type: none"> · Restore grasslands · Restore wetlands 	<ul style="list-style-type: none"> · Creation of Kankakee Sands Restoration · Creation of wildlife management areas, such as Goose Pond 	<ul style="list-style-type: none"> · Inadequate funding · Large scale of habitat required for breeding
<i>Peregrine Falcon</i>	<ul style="list-style-type: none"> · Minimize disturbance during nesting season · Continue active management · Public education in urban areas 	<ul style="list-style-type: none"> · Reintroduction/hacking programs · Artificial nest boxes · Continued active management · Nest monitoring · Rescue of injured birds 	<ul style="list-style-type: none"> · Industrial activity (possible contamination) · Collisions with buildings or vehicles · Budget for monitoring · Cooperation of private landowners
<i>Bald Eagle</i>	<ul style="list-style-type: none"> · Maintain bottomland floodplain habitat · Protection of individual nest sites 	<ul style="list-style-type: none"> · Strong state agency action · Public education campaigns 	<ul style="list-style-type: none"> · Cooperation among state and federal agencies · None currently; species

Species	Relevant Actions	Effective Actions	Major Barriers
	<ul style="list-style-type: none"> · Manage water levels in rivers and lakes · Improve water quality 	<ul style="list-style-type: none"> · Protection of nesting areas · Restoration of wetland habitat, such as Goose Pond 	<ul style="list-style-type: none"> · is recovered and doing well
Mississippi Kite	<ul style="list-style-type: none"> · Preserve large continuous riparian woodlands · Forest habitat restoration 	<ul style="list-style-type: none"> · Protection of forest habitat at state and city parks · Restoration of Patoka River National Wildlife Refuge 	<ul style="list-style-type: none"> · Conversion of forest habitat to housing and agriculture
Osprey	<ul style="list-style-type: none"> · Maintain habitat · Improve water quality · Preserve nest sites 	<ul style="list-style-type: none"> · Reintroduction program · Provision of nesting platforms · Population monitoring 	<ul style="list-style-type: none"> · Inadequate funding · Cooperation of owners of large manmade towers used for nesting
Barn Owl	<ul style="list-style-type: none"> · Protect and restore grasslands · Preserve suitable nest sites · Increase CRP grasslands 	<ul style="list-style-type: none"> · CRP enrollment · Provision of nest boxes · Population monitoring 	<ul style="list-style-type: none"> · Agricultural economics · Other priorities · Urban sprawl
Ruddy Turnstone	<ul style="list-style-type: none"> · Protect and restore migratory stopover sites, especially along Lake Michigan shoreline 	<ul style="list-style-type: none"> · Restoration of Goose Pond FWA and Patoka River NWR 	<ul style="list-style-type: none"> · Development/contamination issues along Lake Michigan · Lack of available land for habitat restoration projects along Lake Michigan
Upland Sandpiper	<ul style="list-style-type: none"> · Preserve grasslands · Reduce mowing of grasslands 	<ul style="list-style-type: none"> · Kankakee Sands restoration efforts 	<ul style="list-style-type: none"> · Cooperation of farmers
Buff-breasted Sandpiper	<ul style="list-style-type: none"> · Maintain open areas with short grass, such as sod farms · Maintain shallow-water areas · Create new shorebird management areas · Control invasive plants in non-agricultural wetlands 	<ul style="list-style-type: none"> · Creation of Goose Pond and other large wetland complexes 	<ul style="list-style-type: none"> · Cooperation of private landowners · Political will · Budget constraints
Piping Plover	<ul style="list-style-type: none"> · Maintain shallow-water areas · Protect suitable nesting sites · Protect areas along Lake Michigan with 	<ul style="list-style-type: none"> · Cane Ridge management area · Creation of Goose Pond 	<ul style="list-style-type: none"> · Development/contamination issues along Lake Michigan · Human disturbance · Political will · Inadequate budget

Species	Relevant Actions	Effective Actions	Major Barriers
	<ul style="list-style-type: none"> · sandbars, pools for foraging · Reintroduction 		<ul style="list-style-type: none"> · High cost associated with location of projects
<i>Short-billed Dowitcher</i>	<ul style="list-style-type: none"> · Maintain shallow-water areas · Preserve large wetland complexes · Control invasive wetland plants 	<ul style="list-style-type: none"> · Development and management of Goose Pond · Purchase of large wetland projects 	<ul style="list-style-type: none"> · Political will · Inadequate budget for active habitat management
<i>Wilson's Phalarope</i>	<ul style="list-style-type: none"> · Maintain shallow-water areas · Reintroduce light grazing into wetland/grassland systems · Control invasive plants 	<ul style="list-style-type: none"> · Kankakee Sands restoration · Creation and management of Goose Pond and Patoka River NWR 	<ul style="list-style-type: none"> · Political will · Management attitudes · Drainage on agricultural fields · Insufficient budgets
<i>American Golden-plover</i>	<ul style="list-style-type: none"> · Maintain wet-soil areas · Preserve large wetland complexes · Reduce conversion of farm land to development · Encourage no-till soybean production · Education of ag community · Assess impacts of wind farm development · Provide incentives to farmers to increase landowner participation 	<ul style="list-style-type: none"> · Conservation initiatives such as the Important Bird Area program and the Audubon Society · Pine Creek habitat area · Designation of Union Township in Benton County as an IBA · Willingness of wind-energy companies to work with IBA constraints 	<ul style="list-style-type: none"> · Drainage on agricultural fields · Political will · Management attitudes · Insufficient budgets for active management · Cooperation of farmers
<i>Greater Yellowlegs</i>	<ul style="list-style-type: none"> · Maintain shallow-water areas · Restore large wetland complexes · Create new shorebird management areas · Incentivize farmers to restore seasonal wetlands on their lands · Control invasive plants 	<ul style="list-style-type: none"> · Creation and management of Goose Pond · Planned acquisitions of large-scale state properties that include wetland management and restoration 	<ul style="list-style-type: none"> · Political will · Budget constraints · Cooperation of private landowners · Cooperation of DOT

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<i>Solitary Sandpiper</i>	<ul style="list-style-type: none"> · Maintain shallow-water areas · Restore large wetland complexes · Control invasive plants · Create new shorebird management areas · Restore ephemeral wetlands in forests and agricultural lands 	<ul style="list-style-type: none"> · Creation and management of Goose Pond · Planned acquisitions of large-scale state properties that include wetland management and restoration 	<ul style="list-style-type: none"> · Political will · Budget constraints · Cooperation of private landowners · Cultural change in the agricultural community
<i>Henslow's Sparrow</i>	<ul style="list-style-type: none"> · Increase CRP grasslands · Implement fire regimes · Control woody encroachment · Restore grasslands on reclaimed coal mines · Conservation easements · Maintain large grassland tracts · Minimize disturbance during nesting season · Improve grazing practices · Prevent conversion of grassland to row crops · Incentivize landowners to maintain grasslands in early successional stage 	<ul style="list-style-type: none"> · LRWP's Arrowhead Prairie restoration · CRP enrollment · CRP SAFE program · Grassland management at Prophetstown, Big Oaks, Pine Creek · Enforcement of no disturbance during the primary nesting season · Kankakee Sands restoration · Reclaiming strip mines · Land acquisition programs such as HRI, NAWCA partnerships, Patoka NWR 	<ul style="list-style-type: none"> · High commodity prices · Urban sprawl · Cooperation of private landowners · Budget constraints for active management · Increasing ownership fragmentation · Lack of manpower · Difficulty of acquiring new land for management · CRP enrollment caps · Inadequate financial incentives

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<i>Marsh Wren</i>	<ul style="list-style-type: none"> · Encourage wetland enrollment in protection programs for private lands · Habitat preservation and restoration · Improve water quality · Control invasive plants in wetlands 	<ul style="list-style-type: none"> · Creation of Goose Pond · LRWP's Eagle Marsh restoration · Removal of invasive species 	<ul style="list-style-type: none"> · Cooperation of private landowners · Funds for restoration of wetlands
<i>Sedge Wren</i>	<ul style="list-style-type: none"> · Prevent conversion of habitat to row crops · Reclaim coal mine grasslands · Maintain grassland habitat on marginal lands, CRP lands, and reclaimed coal mines · Implement fire regimes · Control woody encroachment · Maintain wet meadows 	<ul style="list-style-type: none"> · Creation and maintenance of large-scale grasslands at Prophetstown, Goose Pond, Big Oaks NWR and state gamebird habitat areas 	<ul style="list-style-type: none"> · Cooperation of private landowners · Budget constraints · Resources for habitat acquisition
<i>Worm-eating Warbler</i>	<ul style="list-style-type: none"> · Implement best management practices in forestry · Protect large blocks of contiguous forest · Limit forest conversion to non-forest uses 	<ul style="list-style-type: none"> · The Nature Conservancy (TNC) efforts to consolidate forest protection in the greater Brown County region 	<ul style="list-style-type: none"> · Urban sprawl · Domestic cats · Political will · Cooperation of private landowners and timber industry · Zoning restrictions · Land values
<i>Loggerhead Shrike</i>	<ul style="list-style-type: none"> · Reduce conversion of habitat to farmland · Protect reclaimed grasslands · Engage with private landowners to maintain suitable habitat, especially fencerows 	<ul style="list-style-type: none"> · Population monitoring 	<ul style="list-style-type: none"> · Cooperation of private landowners · Cooperation of coal companies · Agricultural economics
<i>Black-and-white Warbler</i>	<ul style="list-style-type: none"> · Limit conversion of forest to non-forest land uses 	<ul style="list-style-type: none"> · TNC efforts to consolidate forest protection in the greater Brown County region 	<ul style="list-style-type: none"> · Urban/suburban development · Domestic cats · Willingness of private landowners to maintain large blocks of forest · Land values
<i>Cerulean Warbler</i>	<ul style="list-style-type: none"> · Create small openings in forests · Retain large trees · Moderate levels of timber harvest within actively managed 	<ul style="list-style-type: none"> · Research into timber harvest effects on habitat quality 	<ul style="list-style-type: none"> · Cowbird nest predation · Forest fragmentation · Cooperation of public and private forest land managers · Difficulty in restoring

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	<ul style="list-style-type: none"> forests that retain some large diameter oaks and hickories along the edges of retained forest · Woodland restoration · Remove brown-headed cowbirds · Limit conversion of forest to non-forest land uses 		<ul style="list-style-type: none"> forests · Land values
<i>Kirtland's Warbler</i>	<ul style="list-style-type: none"> · Maintain stopover habitat in natural vegetation along Lake Michigan shoreline · Reduce conversion of forests to housing development 	<ul style="list-style-type: none"> · Identify stopover habitat, especially along Lake Michigan shoreline 	<ul style="list-style-type: none"> · Zoning regulations · Political will
<i>Hooded Warbler</i>	<ul style="list-style-type: none"> · Reduce development in forest lands · Maintain and increase the amount of large forested properties · Restore bottomland forests · Reduce forest fragmentation · Limit conversion of forests to non-forest land uses 	<ul style="list-style-type: none"> · TNC efforts to consolidate forest protection in the greater Brown County region 	<ul style="list-style-type: none"> · Cooperation of private landowners · Cooperation of timber companies · Willingness of public land managers to adopt forestry best management practices · Budget constraints · Availability of land for woodland restoration
<i>Western Meadowlark</i>	<ul style="list-style-type: none"> · Increase CRP grasslands · Reduce loss of reclaimed coal mine grasslands 	<ul style="list-style-type: none"> · Maintain grasslands in western counties 	<ul style="list-style-type: none"> · Cooperation of private landowners · Cooperation of coal companies with reclaimed grasslands
<i>Golden-winged Warbler</i>	<ul style="list-style-type: none"> · Maintain forested wetlands · Protect stopover habitat · Conserve small private woodlots 	<ul style="list-style-type: none"> · Identify stopover habitat 	<ul style="list-style-type: none"> · Cooperation of private landowners to maintain forest cover on their lands · Willingness of public land managers to manage for diversity of habitats on their properties
<i>Yellow-headed Blackbird</i>	<ul style="list-style-type: none"> · Restore and maintain large wetland complexes, especially in northern part of the state 	<ul style="list-style-type: none"> · Wetland restorations at Goose Pond FWA, Eagle Marsh in Ft. Wayne, Limberlost Swamp Wetland Preserve, Patoka River NWR 	<ul style="list-style-type: none"> · Lack of funding · Lack of land available near Lake Michigan for large wetland restoration

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<i>Black Tern</i>	<ul style="list-style-type: none"> · Maintain large wetland complexes · Active water management · Control invasive plants · Restore hemi-marsh 	<ul style="list-style-type: none"> · Wetland restoration at Goose Pond · Management at Pine Creek Gamebird Habitat Area · Potential acquisition of lands that might include large wetland complexes 	<ul style="list-style-type: none"> · Inadequate budget for active management · Selecting suitable sites to manage
<i>Least Tern</i>	<ul style="list-style-type: none"> · Restrict recreational overuse on rivers · Reduce disturbance at power plants · Control predator access · Control invasive plants · Establish permanent nesting habitat · Improve water quality 	<ul style="list-style-type: none"> · Habitat creation programs such as Cane Ridge, Gibson Lake, and Goose Pond · Active management · Working with power companies 	<ul style="list-style-type: none"> · Political will · Budget constraints to continue management activities · Unwillingness to change water quality standards
<i>Trumpeter Swan</i>	<ul style="list-style-type: none"> · Do not reopen active coal mines · Collaborate with coal companies on land use · Re-establish traditional breeding habitat · Remove non-native mute swans · Protection and restoration of wetlands, especially in the northern part of the state 	<ul style="list-style-type: none"> · Wetland restoration of Goose Pond FWA 	<ul style="list-style-type: none"> · Cooperation with private landowners · Cooperation with coal companies · Finding good locations for projects · Property values
<i>Rafinesque's Big-eared Bat</i>	<ul style="list-style-type: none"> · Continue monitoring efforts · Protect caves · Limit recreational caving · Protect mature forests · Protect riparian areas · Retain large hollow trees 	<ul style="list-style-type: none"> · Protection and monitoring of caves · Promoting mature forests 	<ul style="list-style-type: none"> · Time constraints · Funding · Resistance from public caving community · Limited public ownership of caves · Poor understanding of hibernation locations

Species	Relevant Actions	Effective Actions	Major Barriers
<i>Silver-haired Bat</i>	<ul style="list-style-type: none"> · Education and awareness · Reduce fatalities at wind energy facilities · Protect caves · Limit recreational caving · Continue monitoring efforts · Manage forests to provide roost trees 	<ul style="list-style-type: none"> · Raising cut-in speeds of wind turbines · Cave gating · Promoting forest cover 	<ul style="list-style-type: none"> · Costs associated with needed actions · Limited understanding of which caves are being used for hibernation · Cooperation from recreational caving organizations · Limited number of caves currently in public ownership · Lack of information about species' status · Removal of forest cover
<i>Eastern Red Bat</i>	<ul style="list-style-type: none"> · Reduce fatalities at wind energy facilities · Preserve intact forest habitat · Reduce urban sprawl and commercial property expansion · Reduce forest conversion to other land uses 	<ul style="list-style-type: none"> · Raising cut-in speeds at wind-energy facilities · Monitoring at wind energy sites · Research and mitigation efforts at wind farms 	<ul style="list-style-type: none"> · Disinterest in environmental issues · Land values · Wind farms · Increasing cost of energy
<i>Hoary Bat</i>	<ul style="list-style-type: none"> · Reduce fatalities at wind energy facilities · Protect forests · Learn more about the species' ecology 	<ul style="list-style-type: none"> · Feathering wind turbine blades below cut-in speeds · Monitoring at wind energy sites · Research and mitigation efforts at wind farms 	<ul style="list-style-type: none"> · Costs associated with lost production and turbine warranties that prevent blade feathering · Land values · No legal nexus to control wind energy facilities
<i>Southeastern Myotis</i>	<ul style="list-style-type: none"> · Protect caves · Monitoring to determine species' distribution (may be extirpated) · Re-establish older-growth bottomland hardwood forests 	<ul style="list-style-type: none"> · Cave gating · Monitoring efforts · Protection of roosts 	<ul style="list-style-type: none"> · Poor understanding of where species hibernates · Cooperation from recreational caving organizations · White-nose syndrome
<i>Gray Myotis</i>	<ul style="list-style-type: none"> · Protect caves · Restrict recreational caving · Population monitoring 	<ul style="list-style-type: none"> · Cave gating · Monitoring efforts · Roost protection 	<ul style="list-style-type: none"> · Cooperation from recreational caving organizations · Limited number of caves in public ownership · Limited understanding of caves where species hibernates/roosts · White-nose syndrome

Species	Relevant Actions	Effective Actions	Major Barriers
<i>Eastern Small-footed Myotis</i>	<ul style="list-style-type: none"> · Protect rocky habitat · Protect caves · Education and awareness · Inventory and monitoring 	<ul style="list-style-type: none"> · Cave gating · Locating populations 	<ul style="list-style-type: none"> · Lack of funding · Need better understanding of where species hibernates · cooperation from recreational caving organizations · Different ecology than other bats
<i>Little Brown Myotis</i>	<ul style="list-style-type: none"> · Protect roost trees · Decrease human visitation to caves used by bats · WNS research · Disease management · Protect intact forests · Reduce collisions with wind turbines · Preserve wetlands and riparian corridors · Public education and awareness · Population monitoring · Protect caves 	<ul style="list-style-type: none"> · Protection of caves · Contributions to national WNS implementation plan · Cave gating · Land acquisition projects 	<ul style="list-style-type: none"> · Lack of funding · No definitive methods for managing WNS · Disinterest in environmental issues · Pesticide use · Spread of WNS · Time constraints · Cooperation from wind energy
<i>Northern Long-eared Myotis</i>	<ul style="list-style-type: none"> · Prevent spread of WNS · Preserve intact forest · Protect wetlands and riparian corridors · Reduce mortalities from wind turbines · Public awareness and education · Protect caves · Restrict recreational cave use 	<ul style="list-style-type: none"> · Contributions to national WNS implementation plan · Cave gating · Research on species' ecology 	<ul style="list-style-type: none"> · Lack of funding · No clear solution to WNS · Disinterest in environmental issues · Time constraints
<i>Indiana Myotis</i>	<ul style="list-style-type: none"> · Control impacts of WNS · Protect roost trees · Decrease human visitation to caves · Protect hibernacula · Public education and awareness · Protect caves · Protect forests · Reduce pesticide use 	<ul style="list-style-type: none"> · Cave gating · WNS guidelines · Forest management · Contributions to national WNS implementation plan · identification/prot ection of maternity colonies 	<ul style="list-style-type: none"> · Limited knowledge of WNS · Lack of funding · Disinterest in environmental issues · Pesticide use
<i>Evening Bat</i>	<ul style="list-style-type: none"> · Limiting forest conversaion to non-forest uses · Locate populations and study ecology 	<ul style="list-style-type: none"> · Funding supporting other bat work 	<ul style="list-style-type: none"> · Land values · Public sentiment

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<i>Tri-colored Bat</i>	<ul style="list-style-type: none"> · Protect roost trees · Decrease human visitation to caves · Mitigate WNS · Protect forests · Protect wetlands and riparian corridors · Reduce mortality from wind turbines · Public education and awareness 	<ul style="list-style-type: none"> · Contributions to national WNS implementation plan · Cave gating · Funding for WNS research 	<ul style="list-style-type: none"> · No clear solution to WNS · Disinterest in environmental issues · Funding · Time constraints
<i>Least Weasel</i>	<ul style="list-style-type: none"> · Establish and monitoring and research program · Cut more timber to provide downed woody debris · Reduce loss of habitat connectivity · Expand grasslands and shrub lands 	<ul style="list-style-type: none"> · Forest management · Kankakee Sands restoration · Seasonal burns promote prey diversity 	<ul style="list-style-type: none"> · Funding · Lack of awareness · Difficulty of trapping · Lack of knowledge
<i>American Badger</i>	<ul style="list-style-type: none"> · Protect and restore grasslands · Enhance connectivity of habitat 	<ul style="list-style-type: none"> · CRP enrollment · Prairie restoration efforts at Kankakee 	<ul style="list-style-type: none"> · Farmer and landowner cooperation · Agricultural practices
<i>Swamp Rabbit</i>	<ul style="list-style-type: none"> · Restore bottomland hardwood forests · Create corridors between habitat patches · Reintroduction program · Enroll lands in WRP 	<ul style="list-style-type: none"> · Acquiring large blocks of habitat · Long-term research program 	<ul style="list-style-type: none"> · Land values · Cooperation of coal industry · Lack of funding · Lack of interest in the species
<i>Plains Pocket Gopher</i>	<ul style="list-style-type: none"> · Restore prairies · Establish populations through translocation 	<ul style="list-style-type: none"> · Kankakee Sands restoration · Restoration of non-game habitats by groups such as NICHES, TNC and Division of Nature Preserves · Recent inventory of current distribution 	<ul style="list-style-type: none"> · Lack of funding and staff · Cooperation of farmers · Public disinterest

Species	Relevant Actions	Effective Actions	Major Barriers
<i>Allegheny Woodrat</i>	<ul style="list-style-type: none"> · Land acquisition · Reintroduction program · Establish corridors between habitat · Reduce exposure to raccoon roundworm · Supplement genetic diversity · Forest management · Continue population monitoring 	<ul style="list-style-type: none"> · Identification and protection of habitats · Monitoring program · Raccoon roundworm baiting program · translocation program · captive breeding program · genetic analysis 	<ul style="list-style-type: none"> · Cooperation of landowners · Quarry industry · Raccoon population levels · Lack of public interest · Small population size
<i>Franklin's Ground Squirrel</i>	<ul style="list-style-type: none"> · Restore grassland habitat · Improve connectivity of grasslands · Translocation program 	<ul style="list-style-type: none"> · Land acquisition and management efforts · Grassland habitat restoration 	<ul style="list-style-type: none"> · Limited population size · Lack of knowledge about habitat suitability · Lack of funding · Public disinterest
<i>Star-nosed Mole</i>	<ul style="list-style-type: none"> · Basic population surveys 	<ul style="list-style-type: none"> · None taken directly 	<ul style="list-style-type: none"> · Little known about abundance and distribution · Limited funding
<i>Smoky Shrew</i>	<ul style="list-style-type: none"> · Basic population surveys · Maintain upland hardwood forests 	<ul style="list-style-type: none"> · No responses 	<ul style="list-style-type: none"> · Lack of funding · Lack of interest
<i>American Pygmy Shrew</i>	<ul style="list-style-type: none"> · Basic population surveys · Research habitat suitability 	<ul style="list-style-type: none"> · No responses 	<ul style="list-style-type: none"> · Cost and staffing · Lack of interest
<i>Hellbender</i>	<ul style="list-style-type: none"> · Restore riparian buffers · Improve water quality · Limit by-catch · Captive breeding and reintroduction · Public education and awareness · Continue population monitoring 	<ul style="list-style-type: none"> · Wastewater treatment · Land acquisition · Captive breeding and head starting · Translocations from West Virginia 	<ul style="list-style-type: none"> · Lack of funding · Coordination with landowners and farmers · Small population size
<i>Common Mudpuppy</i>	<ul style="list-style-type: none"> · Gather baseline population data · Improve water quality · Protect aquatic systems 	<ul style="list-style-type: none"> · None taken directly 	<ul style="list-style-type: none"> · Cost of improving sewage treatment facilities · Other priorities

Species	Relevant Actions	Effective Actions	Major Barriers
<i>Northern Cricket Frog</i>	<ul style="list-style-type: none"> · Conduct range wide survey · Research causes of decline, especially in northern Indiana · Protect wetlands · Establish new populations 	<ul style="list-style-type: none"> · None taken directly 	<ul style="list-style-type: none"> · Time constraints · Funding · Droughts · Lack of interest · Lack of knowledge · Conflicting land use needs
<i>Crawfish Frog</i>	<ul style="list-style-type: none"> · Repatriation · Establish no-plow zones · Captive breeding · Restore grasslands · Restore wetlands · Manage grasslands (burning and mowing) · Reclaim mine lands 	<ul style="list-style-type: none"> · No-plow zones around breeding wetlands · Wetland construction · Predator removal · Cattail removal · Captive rearing · Grassland and wetland restoration at Hillenbrand FWA · Translocations at Big Oaks · Reclaiming strip mines · Buffers around burrows 	<ul style="list-style-type: none"> · Funding · Conflicting land use needs · Education of landowners and managers · High cost of captive breeding · Disease
<i>Plains Leopard Frog</i>	<ul style="list-style-type: none"> · Protect wetlands · Protect grasslands · Assess abundance and range in Indiana 	<ul style="list-style-type: none"> · Habitat restoration at Kankakee Sands 	<ul style="list-style-type: none"> · Coordination with landowners · Lack of interest · Lack of knowledge
<i>Northern Leopard Frog</i>	<ul style="list-style-type: none"> · Increase wetland breeding areas · Protect buffers around wetlands · Improve water quality 	<ul style="list-style-type: none"> · Wetlands protected in land reserve programs 	<ul style="list-style-type: none"> · Cost of land acquisition · Ag and urban expansion · Cost of building wetlands
<i>Streamside Salamander</i>	<ul style="list-style-type: none"> · Protect streams · Protect forested riparian zones · Improve water quality · Survey to determine abundance and range 	<ul style="list-style-type: none"> · None taken directly 	<ul style="list-style-type: none"> · Funding · Personnel · Mismanagement of streams
<i>Blue-spotted Salamander</i>	<ul style="list-style-type: none"> · Protect/create vernal pools · Protect large wooded areas · Protect buffers around wetlands · Determine abundance and distribution (hybridization issues) 	<ul style="list-style-type: none"> · None taken directly 	<ul style="list-style-type: none"> · Funding · Cost of land acquisition · Cooperation of private landowners · Political will

Species	Relevant Actions	Effective Actions	Major Barriers
<i>Mole Salamander</i>	<ul style="list-style-type: none"> · Manage Twin Swamps Nature Preserve for habitat · Acquire habitat adjacent to Twin Swamps 	<ul style="list-style-type: none"> · None taken directly 	<ul style="list-style-type: none"> · Very limited range · Cost of land acquisition
<i>Green Salamander</i>	<ul style="list-style-type: none"> · Protect rocky cliff habitat · Protect forests adjacent to habitat · Population inventory 	<ul style="list-style-type: none"> · Increased survey efforts 	<ul style="list-style-type: none"> · Cooperation of agencies · Cooperation of private landowners · Very limited range
<i>Four-toed Salamander</i>	<ul style="list-style-type: none"> · Protect wetlands and upland habitat · Acquire land where species occurs · Incentivize landowners to protect woodlands and wetlands 	<ul style="list-style-type: none"> · Surveys · Protection of wetland and riparian habitat · Land acquisition at Muscatatuck Bottoms 	<ul style="list-style-type: none"> · Cost of land acquisition · Cooperation of landowners · Conflicting land use needs
<i>Red Salamander</i>	<ul style="list-style-type: none"> · Survey to determine whether species exists in Indiana · Protect stream quality 	<ul style="list-style-type: none"> · None taken directly 	<ul style="list-style-type: none"> · Funding · Personnel · Forestry practices
<i>Cottonmouth</i>	<ul style="list-style-type: none"> · Protect and restore river corridors · Restore floodplains · Reduce road barriers · Protect from poachers 	<ul style="list-style-type: none"> · Acquiring habitat · Expansion and improvement of Patoka River NWR 	<ul style="list-style-type: none"> · Cost of land acquisition · Poachers · Roads · Unwillingness to sell land
<i>Scarlet snake</i>	<ul style="list-style-type: none"> · Glade restoration and preservation via prescribed burning and selective cutting · Acquire glades where species occurs · Glade vegetation management 	<ul style="list-style-type: none"> · Acquisition of land in the Knob region 	<ul style="list-style-type: none"> · Urban sprawl · Limited population size · Cost of land acquisition
<i>Kirtland's Snake</i>	<ul style="list-style-type: none"> · Preserve low, wet woods and fields where burrowing crayfish are abundant · Proper habitat management (burns, mowing) · Remove trash and debris from habitat · Keep out of pet trade · Rangewide survey 	<ul style="list-style-type: none"> · Purchases at Muskatatuck Bottoms · Protection from development 	<ul style="list-style-type: none"> · Funding · Personnel · Pet trade

Species	Relevant Actions	Effective Actions	Major Barriers
<i>Timber Rattlesnake</i>	<ul style="list-style-type: none"> · Preserve large forest tracts · Mitigate road barriers · Limit development in forested areas · Protect den locations · Communication with public 	<ul style="list-style-type: none"> · HEE research to understand response to timber harvest · Land acquisition in southern Indiana 	<ul style="list-style-type: none"> · Lack of knowledge · Resistance from land developers · Unwillingness to protect venomous species · Roads
<i>Red-bellied Mudsnake</i>	<ul style="list-style-type: none"> · Determine whether extirpated status is correct · Protect suitable habitat 	<ul style="list-style-type: none"> · None taken directly 	<ul style="list-style-type: none"> · Willingness to preserve remaining habitat
<i>Copper-bellied Watersnake</i>	<ul style="list-style-type: none"> · Restore and protect habitat · Expand floodplain and upland habitat with multiple wetlands · Mitigate roads as barriers · Restrict clearing of forested bottomlands 	<ul style="list-style-type: none"> · Restoration of potential habitat in northeast Indiana · WRP and Healthy Forests programs · Outreach programs · Conservation agreements in coal industry 	<ul style="list-style-type: none"> · Lack of incentives to maintain woodlands and wetlands · Concerns about flooding · Roads · Lack of interest
<i>Rough Greensnake</i>	<ul style="list-style-type: none"> · Protect wetland and riparian habitat · Better population survey · Manage for healthy forest edge habitats · Limit mowing along roads · Restrict pesticide use 	<ul style="list-style-type: none"> · None taken directly 	<ul style="list-style-type: none"> · Public awareness
<i>Smooth Greensnake</i>	<ul style="list-style-type: none"> · Survey to determine remaining populations · Reduce burning during active season · Restrict herbicide use · Protect grasslands and edge habitat 	<ul style="list-style-type: none"> · Protection of lands through TNC, land trusts, and DNR Nature Preserves 	<ul style="list-style-type: none"> · Economic interests of land developers
<i>Massasauga</i>	<ul style="list-style-type: none"> · Acquire and manage habitat · Reduce shrub encroachment · Restore habitats adjacent to occupied areas · Maintain open habitats · Repatriation/translocation 	<ul style="list-style-type: none"> · Land acquisition and management · Fen conservation · Educational programs 	<ul style="list-style-type: none"> · Cost of land acquisition · Fear of snakes · Lack of interest · Funding · Unwillingness to sell land

Species	Relevant Actions	Effective Actions	Major Barriers
<i>Southeastern Crowned Snake</i>	<ul style="list-style-type: none"> · Acquire and manage habitat (forested knobs) · Maintain glade habitats (fire regimes) 	<ul style="list-style-type: none"> · Land acquisition and management 	<ul style="list-style-type: none"> · Manpower · Access to sites in private ownership · Unwillingness to sell land · Funding
<i>Butler's Gartersnake</i>	<ul style="list-style-type: none"> · No responses 	<ul style="list-style-type: none"> · No responses 	<ul style="list-style-type: none"> · No responses
<i>Western Ribbonsnake</i>	<ul style="list-style-type: none"> · Conserve wetlands · Rangewide survey to determine status and management needs 	<ul style="list-style-type: none"> · None taken directly 	<ul style="list-style-type: none"> · Funding · Lack of incentives to protect habitat
<i>Spotted Turtle</i>	<ul style="list-style-type: none"> · Conserve wetlands and small lakes · Improve water quality · Mitigate road barriers · Police pet trade · Incentivize landowners to retain wetland habitats 	<ul style="list-style-type: none"> · Wetland conservation and management 	<ul style="list-style-type: none"> · Funding · Unwillingness to sell land · Lack of resources · Roads · Cost of land acquisition
<i>Blanding's Turtle</i>	<ul style="list-style-type: none"> · Manage mesopredators · Protect large wetlands · Minimize nest disturbance · Mitigate road hazards · Surveys to determine status 	<ul style="list-style-type: none"> · Wetland restoration and management 	<ul style="list-style-type: none"> · Funding · Roads · Lack of resources · Unwillingness to sell land · Time constraints
<i>Eastern Mud Turtle</i>	<ul style="list-style-type: none"> · Accurately assess status of species · Preserve and restore bottomland hardwoods and floodplain swamps 	<ul style="list-style-type: none"> · Initiatives to preserve land along the Wabash River 	<ul style="list-style-type: none"> · Funding · Lack of knowledge · Cost of land acquisition
<i>Alligator Snapping Turtle</i>	<ul style="list-style-type: none"> · Survey to determine whether species is extirpated · Educate fishers 	<ul style="list-style-type: none"> · None taken directly 	<ul style="list-style-type: none"> · None
<i>River Cooter</i>	<ul style="list-style-type: none"> · Survey to determine population extent · Improve water quality · Eliminate construction of levees where practicable 	<ul style="list-style-type: none"> · None taken directly 	<ul style="list-style-type: none"> · Scale of water quality issues · Resistance from ag community
<i>Eastern Box Turtle</i>	<ul style="list-style-type: none"> · Educate landowners and citizens · Enhance forest connectivity · Protect large forest 	<ul style="list-style-type: none"> · Educational efforts · Land acquisition · Legislation protecting them 	<ul style="list-style-type: none"> · Cost of road crossing construction · Pet trade · Development in forests · Funding

Species	Relevant Actions	Effective Actions	Major Barriers
	<ul style="list-style-type: none"> · tracts · Control invasive woody plants · Remove mesopredators · Mitigate road hazards · Restrict collection for pet trade 	<ul style="list-style-type: none"> · from collection · HEE research on response to forest practices 	<ul style="list-style-type: none"> · Citizen attitudes
<i>Ornate Box Turtle</i>	<ul style="list-style-type: none"> · Reduce mesopredators · Maintain grassland habitat · Mitigate road hazards · Implement fire regimes · Conserve ephemeral wetlands · Supplement populations (headstarting) 	<ul style="list-style-type: none"> · Land acquisition · Population surveys · Kankakee Sands restoration · Habitat management 	<ul style="list-style-type: none"> · Unwillingness to sell land · Funding · Other priorities · Cost of habitat acquisition · Cooperation with landowners
<i>Redside Dace</i>	<ul style="list-style-type: none"> · Protect riparian corridors along small order streams · Control water withdrawal · Control take of bait · Understand effects of climate change · Write watershed management plans · Inform stakeholders · Keep streams cool · Maintain stream substrates 	<ul style="list-style-type: none"> · Introduction to second watershed · Investigation into population genetic structure 	<ul style="list-style-type: none"> · Coordination with landowners · Climate change · Lack of interest in BMPs · Drainage and irrigation practices · Funding
<i>Pallid Shiner</i>	<ul style="list-style-type: none"> · No responses 	<ul style="list-style-type: none"> · No responses 	<ul style="list-style-type: none"> · No responses
<i>Pugnose Shiner</i>	<ul style="list-style-type: none"> · No responses 	<ul style="list-style-type: none"> · No responses 	<ul style="list-style-type: none"> · No responses
<i>Bigmouth Shiner</i>	<ul style="list-style-type: none"> · No responses 	<ul style="list-style-type: none"> · No responses 	<ul style="list-style-type: none"> · No responses
<i>Longnose Dace</i>	<ul style="list-style-type: none"> · Reduce flashiness in watersheds · Wetland restoration · Conservation tillage · Reduce pollution · Implement BMPs · Remove dams 	<ul style="list-style-type: none"> · The Elkhart County surveyors office has implemented instream restoration projects in Baugo Creek which have helped stabilize some areas of the stream and create habitat 	<ul style="list-style-type: none"> · Coordination with landowners · Increases in agriculture production

Species	Relevant Actions	Effective Actions	Major Barriers
		<ul style="list-style-type: none"> Survey to determine distribution 	
<i>Northern Madtom</i>	<ul style="list-style-type: none"> Implement BMPs Survey deep water habitats of the Ohio River Restrict urban development 	<ul style="list-style-type: none"> None taken directly 	<ul style="list-style-type: none"> Funding Social importance
<i>Hoosier Cavefish</i>	<ul style="list-style-type: none"> Protect karst systems Implement BMPs Education of landowners Concentrated nutrient management Develop tools to limit septic system failures Implement monitoring program 	<ul style="list-style-type: none"> Purchasing caves 	<ul style="list-style-type: none"> Funding Lack of interest in karst systems Resistance to ordinance and policy changes Coordination with landowners
<i>Northern Brook Lamprey</i>	<ul style="list-style-type: none"> Protect habitat from dredging Reduce non-point source pollution 	<ul style="list-style-type: none"> Survey to determine current distribution 	<ul style="list-style-type: none"> Unwillingness to implement BMPs
<i>Western Sand Darter</i>	<ul style="list-style-type: none"> Reduce point and non-point source pollution Restore riparian buffers along large rivers Reduce bank erosion 	<ul style="list-style-type: none"> No responses 	<ul style="list-style-type: none"> No responses
<i>Spotted Darter</i>	<ul style="list-style-type: none"> Reduce point and non-point source pollution Stabilize banks Storm water policies and education Incentives to slow water from urban and residential areas Remove dams Implement Best Management Practices 	<ul style="list-style-type: none"> Work by TNC on Blue River to educate public in conservation 	<ul style="list-style-type: none"> Coordination with landowners Resistance to change agricultural practices Mining industry
<i>Cypress Darter</i>	<ul style="list-style-type: none"> Reconnect floodplains to river Protect oxbow lakes and sloughs 	<ul style="list-style-type: none"> Acquisition of floodplain lands in Wabash River and Ohio River 	<ul style="list-style-type: none"> Agricultural land prices Levee systems

Species	Relevant Actions	Effective Actions	Major Barriers
<i>Tippecanoe Darter</i>	<ul style="list-style-type: none"> · Reduce point and non-point source pollution in large rivers · Restore and maintain riparian buffers · Education of stakeholders on best practices 	<ul style="list-style-type: none"> · None taken directly 	<ul style="list-style-type: none"> · Coordination with landowners · Dam operations
<i>Variagate Darter</i>	<ul style="list-style-type: none"> · Reduce point and non-point source pollution · Restore and maintain riparian buffers · Protect current habitat · Dam management · Education for proper recreational use of rivers 	<ul style="list-style-type: none"> · None taken directly 	<ul style="list-style-type: none"> · Dam operations · Coordination with landowners
<i>Channel Darter</i>	<ul style="list-style-type: none"> · No responses 	<ul style="list-style-type: none"> · No responses 	<ul style="list-style-type: none"> · No responses
<i>Gilt Darter</i>	<ul style="list-style-type: none"> · protect riffle habitats in the Tippecanoe River from sedimentation · implement best management practices in the Tippecanoe River watershed 	<ul style="list-style-type: none"> · No responses 	<ul style="list-style-type: none"> · Coordination with landowners · Willingness to implement BMPs
<i>Ohio River Muskellunge</i>	<ul style="list-style-type: none"> · Create stocking plan if the subspecies still exists 	<ul style="list-style-type: none"> · Establishing populations in suitable lakes has helped to popularize public interest in muskellunge 	<ul style="list-style-type: none"> · Doubtful availability of the Ohio River subspecies for propagation · Funding
<i>Banded Pygmy Sunfish</i>	<ul style="list-style-type: none"> · Protect floodplain lands in Ohio and Wabash River drainages · Reconnect floodplains and rivers · Restrict draining of floodplain lakes · Conserve aquatic vegetation · Maintain natural water regime · Protect habitat from dredging 	<ul style="list-style-type: none"> · Acquisition of floodplain land in Wabash and Ohio River drainages 	<ul style="list-style-type: none"> · Coordination with agencies and landowners · Agricultural land prices
<i>Slimy Sculpin</i>	<ul style="list-style-type: none"> · Control invasive species in Lake Michigan · Control round goby · Public education 	<ul style="list-style-type: none"> · No responses 	<ul style="list-style-type: none"> · Funding · Political will · Manpower

Species	Relevant Actions	Effective Actions	Major Barriers
<i>Lake Sturgeon</i>	<ul style="list-style-type: none"> · Dam removal · Protect water quality · Improve agricultural techniques · Install fish ladder · Reduce sediment and nutrient loads · Reduce mortality due to anglers · maintain important spawning habitat below Williams Dam · restore riparian buffer zones 	<ul style="list-style-type: none"> · Denoting the species as endangered · making possession illegal · annual monitoring · limited propagation 	<ul style="list-style-type: none"> · Public awareness · Political support · Funding · High agricultural prices · Compliance with fishing regulations · Social support
<i>Longnose Sucker</i>	<ul style="list-style-type: none"> · No responses 	<ul style="list-style-type: none"> · No responses 	<ul style="list-style-type: none"> · No responses
<i>Greater Redhorse</i>	<ul style="list-style-type: none"> · Protect water quality · Dam removal · Reduce point and non-point source pollution · Implement BMPs · Restore riparian corridors · Reduce siltation and nutrient inputs · Maintain/increase flows and flow volumes 	<ul style="list-style-type: none"> · Agricultural BMPs · Dam removal on the Eel River 	<ul style="list-style-type: none"> · Funding · Social support · Farming industry · Willingness to implement BMPs
<i>Bantam Sunfish</i>	<ul style="list-style-type: none"> · Acquire land in floodplains of Ohio and Wabash Rivers · Connect floodplains to rivers 	<ul style="list-style-type: none"> · Land acquisition in Wabash and Ohio River floodplains 	<ul style="list-style-type: none"> · Agricultural land prices · Levees
<i>Trout-perch</i>	<ul style="list-style-type: none"> · No responses 	<ul style="list-style-type: none"> · No responses 	<ul style="list-style-type: none"> · No responses

Species	Relevant Actions	Effective Actions	Major Barriers
Cisco	<ul style="list-style-type: none"> · Protect watershed from nutrient impacts · Control vegetation in lakes · Increase agricultural BMPs · Limit high-speed boating · Create cost-share program for lake residents · Public education · Reintroductions · Manage adjacent lands · Protect natural shoreline habitats · Limit seawall construction 	<ul style="list-style-type: none"> · Bio-engineered seawall installed on South Twin Lake (LaGrange Co.) in 2012 · DNR worked with the University of Notre Dame and Purdue University to test environmental DNA (eDNA) techniques to determine the presence of cisco in several cold-water lakes in 2013 · DNR re-assessed the status (presence, catch rates, sex ratios, size- and age-structures) of cisco among lakes historically containing cisco (2012--14) · North Region Fisheries Section (DNR) is currently vetting new vegetation control guidelines (2012-14) for cold-water lakes to limit nutrient recycling and sustain water quality 	<ul style="list-style-type: none"> · Communication issues · Political will · Funding · Lack of resources · Public disinterest · Manpower · High agricultural commodity prices
Lake Whitefish	<ul style="list-style-type: none"> · No responses 	<ul style="list-style-type: none"> · No responses 	<ul style="list-style-type: none"> · No responses
Fanshell	<ul style="list-style-type: none"> · Protect current habitats · Reduce point and non-point source pollution · Restore and maintain riparian buffer zones · Prohibit take of mussels · Investigate life history 	<ul style="list-style-type: none"> · No responses 	<ul style="list-style-type: none"> · Lack of funding · Lack of landowner buy-in

Species	Relevant Actions	Effective Actions	Major Barriers
<i>White Catspaw</i>	<ul style="list-style-type: none"> · Address hydrologic alteration of headwater streams · Captive breeding if possible 	<ul style="list-style-type: none"> · Restoration efforts at Fish Creek NRDA 	<ul style="list-style-type: none"> · Likely extinct
<i>Northern Riffleshell</i>	<ul style="list-style-type: none"> · Address altered hydrology in headwaters to decrease flashiness downstream · Non-point source strategies to limit nutrients and sediments from moving downstream 	<ul style="list-style-type: none"> · No responses 	<ul style="list-style-type: none"> · Scale of agricultural industry
<i>Tubercled Blossom</i>	<ul style="list-style-type: none"> · No responses 	<ul style="list-style-type: none"> · No responses 	<ul style="list-style-type: none"> · No responses
<i>Snuffbox</i>	<ul style="list-style-type: none"> · Protect current habitats · reduce point and nonpoint source pollution · restore and maintain riparian buffer zones · augment populations · improve water quality · reduce siltation from ag practices · reduce flood peaks from storm water runoff and ditches · maintain instream habitat stability · Farm Bill programs and policy changes to maintain native cover 	<ul style="list-style-type: none"> · propagation of snuffbox from the Salamonie River to augment Tippecanoe River population 	<ul style="list-style-type: none"> · Lack of funding · Lack of landowner buy-in · Lack of public understanding
<i>Longsolid</i>	<ul style="list-style-type: none"> · No responses 	<ul style="list-style-type: none"> · No responses 	<ul style="list-style-type: none"> · No responses
<i>Pink Mucket</i>	<ul style="list-style-type: none"> · No responses 	<ul style="list-style-type: none"> · No responses 	<ul style="list-style-type: none"> · No responses
<i>Wavyrayed Lampmussel</i>	<ul style="list-style-type: none"> · Identify habitat requirements and current populations · Augment populations · Improve water quality · Reduce point and non-point source pollution · Restore and maintain buffer zones 	<ul style="list-style-type: none"> · Laws prohibiting take of mussels 	<ul style="list-style-type: none"> · Resistance to change · Cost · Lack of public knowledge · Lack of landowner buy-in

Species	Relevant Actions	Effective Actions	Major Barriers
<i>Round Hickorynut</i>	<ul style="list-style-type: none"> · Determine life history attributes · Improve water quality · Reduce point and non-point source pollution · Refine propagation techniques 	·	<ul style="list-style-type: none"> · Funding · Limited source populations for propagation
<i>White Wartyback</i>	· No responses	· No responses	· No responses
<i>Orangefoot Pimpleback</i>	· No responses	· No responses	· No responses
<i>Sheepnose</i>	<ul style="list-style-type: none"> · Protect current habitats · Reduce point and non-point source pollution · Restore and maintain riparian buffer zones 	· No responses	<ul style="list-style-type: none"> · Lack of funding · Lack of landowner buy-in
<i>Clubshell</i>	<ul style="list-style-type: none"> · Improve water quality · Refine propagation techniques · Determine life history attributes · Determine watersheds for reintroduction · Improve ditch maintenance practices · Landowner education · Augment populations 	· Restoration efforts at Fish Creek NRDA	<ul style="list-style-type: none"> · Cost constraints · Resistance to change · Lack of knowledge · Lack of landowner buy-in
<i>Ohio Pigtoe</i>	· No responses	· No responses	· No responses
<i>Rough Pigtoe</i>	· No responses	· No responses	· No responses
<i>Pyramid Pigtoe</i>	· No responses	· No responses	· No responses
<i>Fat Pocketbook</i>	<ul style="list-style-type: none"> · Improve water quality · Protect current habitats 	· No responses	<ul style="list-style-type: none"> · Lack of funding · Scale of water quality issues
<i>Kidneyshell</i>	<ul style="list-style-type: none"> · Protect current habitats · Improve water quality · Determine reasons for decline · Find habitats for reintroduction · Improve ditch maintenance · Dam removal 	· No responses	<ul style="list-style-type: none"> · Lack of funding · Lack of public support · Lack of landowner buy-in · Poor understanding of issues

Species	Relevant Actions	Effective Actions	Major Barriers
<i>Rabbitsfoot</i>	<ul style="list-style-type: none"> · Protect current habitats · Improve water quality · Public education · Find habitats for reintroduction · Species monitoring · Genetic modelling 	<ul style="list-style-type: none"> · Listing as federally threatened 	<ul style="list-style-type: none"> · Lack of funding · Lack of public buy-in · Lack of knowledge
<i>Salamander Mussel</i>	<ul style="list-style-type: none"> · Improve water quality · Protect current habitats · Restore riparian buffers · Investigate life history attributes · Determine streams for reintroductions 	<ul style="list-style-type: none"> · No responses 	<ul style="list-style-type: none"> · Lack of funding · Lack of landowner buy-in
<i>Purple Lilliput</i>	<ul style="list-style-type: none"> · No responses 	<ul style="list-style-type: none"> · No responses 	<ul style="list-style-type: none"> · No responses
<i>Ellipse</i>	<ul style="list-style-type: none"> · Improve water quality · Restore riparian buffer zones · Determine watersheds for species restoration 	<ul style="list-style-type: none"> · No responses 	<ul style="list-style-type: none"> · Lack of funding · Lack of landowner buy-in · Lack of public support
<i>Rayed Bean</i>	<ul style="list-style-type: none"> · No responses 	<ul style="list-style-type: none"> · No responses 	<ul style="list-style-type: none"> · No responses
<i>Little Spectaclecase</i>	<ul style="list-style-type: none"> · Reduce point and non-point source pollution · Refine propagation techniques · Determine watershed for species reintroduction · Public education 	<ul style="list-style-type: none"> · Listing as federally endangered 	<ul style="list-style-type: none"> · Lack of funding · Lack of landowner buy-in · Lack of public understanding
<i>Pointed Campeloma</i>	<ul style="list-style-type: none"> · No responses 	<ul style="list-style-type: none"> · No responses 	<ul style="list-style-type: none"> · No responses
<i>Swamp Lymnaea</i>	<ul style="list-style-type: none"> · No responses 	<ul style="list-style-type: none"> · No responses 	<ul style="list-style-type: none"> · No responses