

# **Indiana Comprehensive Wildlife Strategy**

**10/01/2005**

**Developed for:**  
**The State of Indiana, Governor Mitch Daniels**  
**Department of Natural Resources, Director Kyle Hupfer**  
**Division of Fish and Wildlife, Director Glen Salmon**

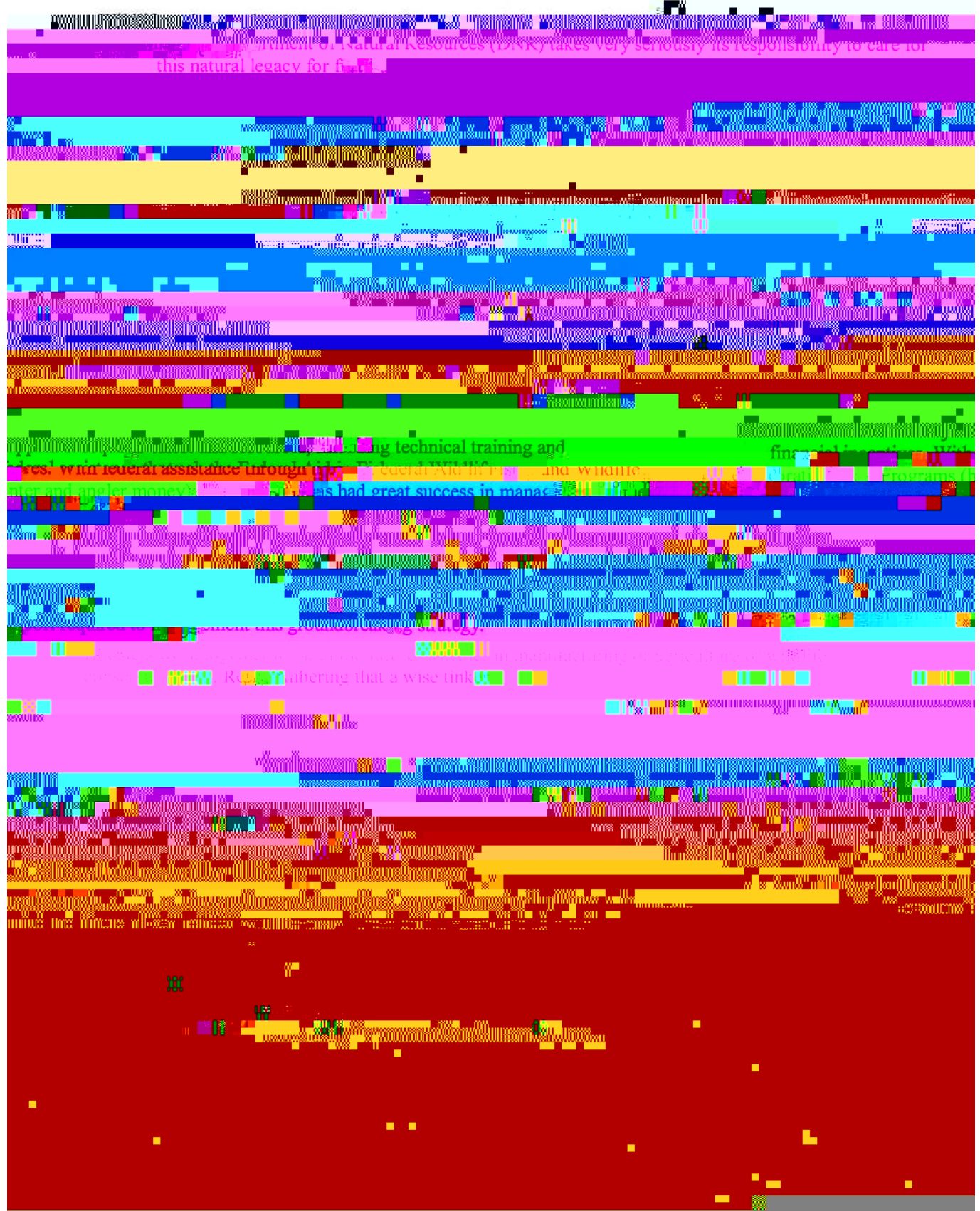
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**With the Technical and Conservation information provided by:**  
**Biologists and Conservation Organizations throughout the state**

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**Funded by:**  
**State Wildlife Grants**  
**U. S. Fish and Wildlife Service**

## I. Foreword





monitoring activities, current conservation efforts, and future conservation needs for representative species and habitats to specifically address the eight elements Congress requires in the CWS.

Technical experts, conservation organizations and the general public each provided input at relevant stages of strategy development. Working through a contractor that specializes in marketing and outreach, the DFW developed a communications plan to aid with partner identification, technical input, public involvement, and coordination with federal, state, and local agencies.

Over 80 technical experts provided input through an extensive online survey form, in accordance with the information requirements in the Congressional guidelines. Each wildlife species has specific habitat requirements for providing appropriate food, water, shelter and other resources to meet survival and reproduction needs. Therefore, conservation of wildlife must start with a focus on habitat. Habitat types such as wetlands, forests and grasslands benefit from specific incentive programs that encourage public and private acquisition and restoration. Habitat degradation and

Indiana wildlife and habitat biologists recognize that conservation practices will evolve and improve with future advances in research techniques and compilation of knowledge through time. Therefore, implementation of this strategy must be flexible and dynamic. To allow for adaptive management, successful survey and monitoring efforts have two necessary components: the technically proficient conduct of monitoring protocols and the effective dissemination of results. The DNR will conduct species and habitat assessment efforts as resources allow and will participate, as appropriate, in regional or national monitoring programs. Along with the results, all aspects of the inventory necessary to the responsible interpretation of the effort will be made available to the partners and other interested parties on an Internet site. Easily accessed, timely inventory information will allow conservation partners and other interested parties to track progress towards conservation goals and to apply adaptive management where appropriate. Information sharing by all partners will facilitate the application of accurate, timely information to the environmental review process.

**Enhancing partnerships and collaboration**

Over 570 partners received a solicitation to provide information regarding current efforts, specific interests and capacity for action among conservation organizations, professional societies, universities, federal, state and local agencies, individuals and major landholders in Indiana. The contractor team and agency staff directly solicited input through e-mail, phone calls and in-person meetings and presentations. A colorful project website facilitated further contact with a range of audiences across the state. The DFW staff and contractors hired to develop this strategy also actively particip

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- E-38: Forested Wetlands
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  - E-64: Aggregated Wetlands
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  - E-67: Ephemeral
  - E-68: Forested
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- F-11: Rivers and Streams Great Lakes Drainage Great River
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- F-13: Rivers and Streams Great Lakes Drainage Wadeable/ Large River
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- Appendix L: Conservation Programs and Resources
- Appendix M: Suggested Wildlife Monitoring
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- Appendix O: Public Cov9gt03.3s2.305 -1.15 T Tf6dinserv0(F-78: Ag0-3r.asPraC/TT4 1 Tf-.335 0 T

# Indiana Comprehensive Wildlife Strategy

ISB: Indiana Soybean Board  
ISC: Indiana Smallmouth Club  
ISGA: Indiana Soybean Growers Association  
ISU: Indiana State University  
LMEC: Lake Maxinkuckee Environmental Council  
MAFWA: Midwest Association of Fish and Wildlife Agencies  
MICRA: Mississippi Interstate Cooperative Resource Association  
NABCI: North American Bird Conservation Initiative  
NIPSCO: Northern Indiana Public Service Company  
NIRPC: Northwestern Indiana Regional Planning Commission  
ORSANCO: Ohio River Valley Water Sanitation Commission  
Reptile DB: Reptile Database  
RFP: Request For Proposal  
SARE: Sustainable Agriculture Research and Education  
SGCN: Species of Greatest Conservation Need  
SWCD: St. Joseph County Soil & Water Conservation District  
USDA: United States Department of Agriculture  
USFWS: United States Fish and Wildlife Service  
USGS: United States Geologic Service  
WCRP: The Wildlife Conservation and Restoration Program  
WRP: Wetland Reserve Program

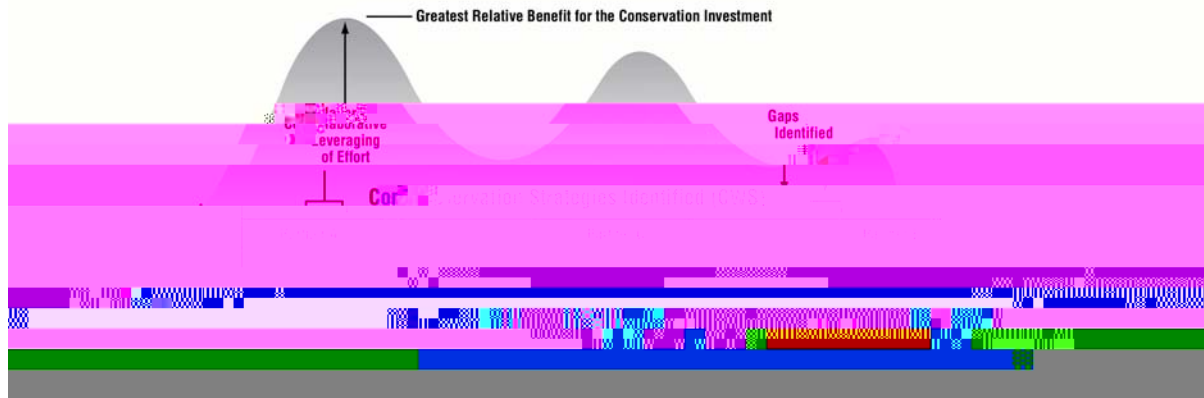
## **IV. Introduction and Purpose**

water areas within the State or administer programs that significantly affect the conservation of identified species and habitats (Chapter XII, page 77-86).

8. Congress also affirmed through this legislation that broad public participation is an essential element of developing and implementing these plans (Chapter V, pages 18-22), the projects that are carried out while these plans are developed, and the Species in Greatest Need of Conservation that Congress has indicated such programs and projects are intended to emphasize.

Congress gave each state the option of organizing its strategy using a species-by-species approach or a habitat-based approach. The DFW selected the habitat-based approach for Indiana's strategy for the following reasons:

- Habitat loss or degradation has traditionally been considered the biggest threat to Indiana wildlife, so a habitat-based strategy was considered the most efficient way to address the needs of the widest variety of species.
- Previous DFW strategic plans have indicated the need to be working on habitats, but a "good way to get there" has never been developed.
- The species focus sometimes tends to polarize or insulate interests and resources. There was a concern that this divide could grow wider as the number of partnerships expands.
- Traditional Federal Aid funding and even Endangered Species funding tends to limit the



The CWS is NOT an operational plan. It does not identify specific tasks, assignments, or schedules for achieving wildlife conservation. However, the intent of Congress and the DFW is that the CWS will guide and encourage development and/or compilation of operational plans from within the Department of Natural Resources (DNR) and from among DNR's many partners in the conservation community. Operational plans and partnerships are the next steps in the process.

**CWS is a *model* for identifying habitat conservation needs**

Generating information on conservation needs for all habitats and all wildlife species within the state is a daunting task, especially when little is known about many of these species. Models can be an efficient and effective way of maximizing limited knowledge by focusing on available research, enhanced by extrapolation from species that are better known, and all informed by best professional judgment. Information used to create recommendations for Indiana's CWS was generated through an information system, or tool, that was developed specifically to link species of greatest conservation need (SGCN) to all wildlife species and the habitats on which they





**Strategy Development Assistance**

In September 2003, DFW distributed an RFP for a contractor to assist with development of the CWS. D.J. Case & Associates (DJ Case), a natural resources communications firm based in Mishawaka, Indiana was selected to provide this assistance.

## **V. Public Involvement and Partnership Solicitation**

The DFW sought broad public and partner participation in the development of the CWS. The

from DFW selected species to serve as representatives of each guild. The species were picked based on biological features and whether constituents would recognize them as representative of the guild. The selected species “painted a reasonable mental picture of the associated habitat type” when presented to a diverse user group including biologists, the public, legislators, grant reviewers and other partners. The focus is on habitat, not individual species. Species were selected that would automatically generate an association with the habitat-related guild and a desire to protect, enhance or somehow improve that habitat as the strategy is implemented. Representative species also were used as mental tools to focus technical expert input on particular relationships between species and their habitats, as they considered research and conservation needs for these associations.

### Step 3: Collect, compile and analyze information on conservation and monitoring

Specific information on the biological components of the CWS was solicited from wildlife experts throughout the state. Members of DNR technical advisory committees and other professionals with expertise in wildlife or habitat science were asked to provide information to help describe the conservation needs and recommendations for wildlife and habitats in Indiana. A web-based survey was developed (See Appendix D) to collect information on current status and trends, threats, and opportunities facing the representative species and their associated habitats. The survey tool also collected information on monitoring activities, current conservation efforts, and future conservation needs for representative species and habitats.

The questionnaire was developed to specifically address the eight elements Congress requires to be included in the CWS. The survey was standardized across major taxonomic groups and habitats to facilitate comparison and identification of critical conservation efforts to be implemented in Indiana. Eighty-six professionals throughout Indiana completed more than 180 questionnaires (See Appendix E 1-78 for questionnaire results).

Data collected on the representative species were aggregated by habitat and sub-habitat type and descriptive statistics allowed the ranking (highest to lowest importance) of the information. This information has been compiled into narrative statements. These efforts were NOT an attempt to prioritize across habitats. Results indicate the most critical threats, species monitoring efforts and techniques, habitat inventory a

**B. Partnership Solicitation**

The contractor hired to assist in CWS development created a communication plan to guide the partnership solicitation process. The DFW and the contractor searched for partners among conservation organizations, professional societies, universities, individuals and major landholders in Indiana. The search was conducted by referencing numerous agency databases, searching the Internet for non-traditional partners and through recommendations from other partners. The contractor followed the process below to invite 570 potential partners to participate in the development process.

**Sent partners an electronic survey to collect information**

An on-line survey (See Appendix G for survey instrument) was distributed to all potential partners in order to gather the following information for inclusion in the CWS:

- Partner name, mission, goals, authority, size (number of employees, members or volunteers), type (non-profit, for profit, local government, state government, federal government), and location (city, county, region or area) of the organization.
- Primary source of funding (foundation grants, state, federal, individual contributions, dues, etc.), and total annual budget.
- Types of habitats where efforts are focused.
- Estimated percent of total time spent on efforts in these habitats.
- Primary wildlife species of interest.
- Specific objectives with this/these species.
- Projects (current or proposed) that could contribute to a local, regional or statewide conservation strategy.
- Available resources or capabilities the organization could contribute to the development of the CWS.
- Developed conservation partnerships.
- Perceived need to improve existing partnerships, resources or programs focused on resource for conservation.
- Best way to communicate with the organization and the general public about the CWS and similar conservation efforts (e.g., member newsletters, email lists, meetings).
- Strategic or operational documents that could be incorporated into the CWS.

**Sent customized e-mails and made calls to encourage partners to complete surveys**

Partners received an e-mail with a link to an electronic survey and were encouraged to complete



# Indiana Comprehensive Wildlife Strategy



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## **VII. Distribution and Abundance of Species of Greatest Conservation Need (1<sup>st</sup> Element)**

The goal of the Indiana Comprehensive Wildlife Strategy is to preserve the native biological diversity of Indiana and thus contribute to the preservation of national and global biological diversity.

The Indiana Nongame and Endangered Species Conservation Act was enacted in 1973 in response to the federal Endangered Species Act. Endangered species is defined by IC 14-22-34-1 as “any species or subspecies of wildlife whose prospects of survival or recruitment within Indiana are in jeopardy or are likely within the foreseeable future to become so due to any of the following factors:

1. The destruction, drastic modification, or severe curtailment of the habitat of the wildlife.
2. The overutilization of the wildlife for scientific, commercial, or sporting purposes.
3. The effect on the wildlife of disease, pollution, or predation.
4. Other natural or manmade factors affecting the prospect of survival or recruitment within Indiana.
5. Any combination of the factors described in subdivisions (1) through (4).”

Additionally, by Indiana Statute “any species or s

subspecies is evaluated in light of prospects for survival in Indiana relative to the species historic occurrence in the state. The status of species newly discovered in Indiana, such as the green salamander and the mole salamander, are especially problematic. Historically systematic surveys were not conducted for all taxa and the historic distribution and population status in Indiana are unknown. However, disjunct populations or populations at the edge of their range may represent distinct gene pools that warrant conservation. For these species recovery is defined by the degree to which the known population is secure from threat rather than a specific population level or distribution.

Insects and other invertebrates, other than mollusks and crustaceans, are not protected by Indiana statute. A list of endangered insects has been developed based on the recommendation of insect experts working in Indiana. Many of these insects occur in rare habitats. To date most conservation efforts for these species consist of conservation of these rare habitats. As resources allow systematic surveys for all insect orders should be conducted to provide a more holistic assessment of the status of Indiana's insect fauna.

Species of special concern have no legal protection. Species are generally placed on the special concern list because the experts suspect the species' population is declining or their distribution is shrinking. Additionally, these species may be difficult to survey. Special concern status raises the survey and monitoring priority of these species and stimulates encounter reports from the scientific community. The status of all species most in need of conservation are reviewed annually by the TACs and additions and deletions are recommended.

In order to conserve the native biological diversity of Indiana the DFW uses all the tools of a modern scientific management program, including survey and monitoring, research, population and habitat management, education, land acquisition, and regulation to conserve all species most in need of conservation. Species are removed from this list when their prospects for survival in the state are known to be secure.

Element 1 of the Congressional guidelines requires that the CWS present information on the distribution and abundance of species of wildlife, including low and declining populations as the State fish and wildlife agency deems appropriate, that are indicative of the diversity and health of the State's wildlife. Therefore, Indiana's Species of Greatest Conservation Need (SGCN) were identified using the published list of federally endangered, threatened or candidate species and Indiana's list of endangered species and species of special concern. These species were cross-referenced with the Indiana Academy of Science *Revised Checklist of the Vertebrates of Indiana* for species range, relative abundance, season and status (Table 1).

The numbers of SGCN are not distributed evenly across major habitat types. There were 7 species associated with agricultural habitat, 75 in aquatic systems, 5 in barren lands, 6 in developed lands, 50 in forestlands, 28 in grasslands, 10 in subterranean habitats, and 51 in wetlands. Some of these species may use different habitat types depending upon life stage and availability. Some habitats are better studied than others or receive more attention due to economic and aesthetic values. Some habitats are naturally smaller in size, widely scattered and may have historically supported low biodiversity.

By virtue of being rare or in remotely accessible habitats, scientific information is limited for many of these species. Other species may even continue to go undetected. Taxonomy is a field of

science that changed dramatically with development of new techniques to detect genetic relationships. Therefore, these lists are subject to change as more knowledge about the species identification, distribution and abundance becomes available. The complete list of species of greatest conservation need in Indiana and their associated habitat types can be found in Appendix J. For additional information on the distribution and status of mammals, birds, amphibians, reptiles, fishes and bi-valve mussels in Indiana see references in Appendix K. In at least the last 50 years no similar reference has been developed for the insects of Indiana.

Although the DNR does not have statutory responsibility or expertise in direct conservation and management practices for most groups of invertebrate wildlife, Table 1 documents the federal or state status of insects listed as threatened or endangered in Indiana. Federally listed insects are predominantly associated with rare habitat types. Management of these species in Indiana has largely consisted of protection of those habitats. These actions are within the purview of the Indiana DNR Division of Nature Preserves, which works closely with DFW on this and other related issues.

**Table 1: Species of Greatest Conservation Need** - species range, relative abundance and status (Source: Indiana’s list of endangered species and species of special concern and the Indiana Academy of Science *Revised Checklist of the Vertebrates of Indiana* or from personal communication with insect experts working in Indiana.)

<p><b>Range (within state):</b> Statewide (I), North (N), South (S), West (W), East (E), Central (C) and various combinations. U=Unknown</p> <p><b>Relative abundance (within state):</b>  <b>Common (C):</b> Don’t have detectably lower populations than historical or expected levels. (Species that are included on this list of greatest conservation need due to identified habitat or ecological disturbances or threats).  <b>Occasional (O):</b> Disjunct populations who’s occurrence is sporadic yet significantly less than historic or expected levels.  <b>Rare (R):</b> Significantly lower populations than historic or expected levels.  <b>U: Unknown</b></p> <p><b>Status</b>  <b>(Federal)</b> Federally Endangered (FE), Federally Threatened (FT), candidates for federal listing (FC)  <b>(State)</b> State Endangered (SE), Special Concern in need of further study (SC)</p>
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Common Name	Scientific name	Range	Relative Abundance	Status
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Common Name	Scientific name		Relative Abundance	Status
Black-Crowned Night-Heron	<i>Nycticorax nycticorax</i>		R	SE
Blanding's Turtle	<i>Emydoidea blandingii</i>		O	SE
Blue-Spotted Salamander	<i>Ambystoma laterale</i>		O	SC
Bobcat	<i>Lynx rufus</i>		R	SC
Broad-Winged Hawk	<i>Buteo platypterus</i>		O	SC
Butler's Garter Snake	<i>Thamnophis butleri</i>		R	SE
Cerulean Warbler	<i>Dendroica cerulea</i>		O	SC
Channel Darter	<i>Percina copelandi</i>		R	SE
Cisco	<i>Coregonus artedi</i>		R	SC
Clubshell	<i>Pleurobema clava</i>		R	SE, FE
Common Moorhen	<i>Gallinula chloropus</i>		R	SE
Common Mudpuppy	<i>Necturus maculosus</i>		O	SC
Common Nighthawk	<i>Chordeiles minor</i>		O	SC
Copperbelly Water Snake	<i>Nerodia erythrogaster neglecta</i>		O	SE, FC
Cottonmouth	<i>Agkistrodon piscivorus</i>		R	SE
Crawfish Frog	<i>Rana areolata</i>		O	SE
Cypress Darter	<i>Etheostoma proeliare</i>		R	SC
Eastern Fanshell	<i>Cyprogenia stegaria</i>		R	SE, FE
Eastern Mud Turtle	<i>Kinosternon subrubrum</i>		R	SE
Eastern Pipistrelle	<i>Pipistrellus subflavus</i>		C	SC
Eastern Red Bat	<i>Lasiurus borealis</i>		A	SC
Eastern Spadefoot Toad	<i>Scaphiopus holbrookii</i>		O	SC
Ellipse	<i>Venustaconcha ellipsiformis</i>		C	SC
Evening Bat	<i>Nycticeius humeralis</i>		O	SE
Fat Pocketbook	<i>Potamilus capax</i>		O	SE, FE
Four-Toed Salamander	<i>Hemidactylium scutatum</i>		R	SE
Franklin's Ground Squirrel	<i>Spermophilus franklinii</i>		R	SE
Gilt Darter	<i>Percina evides</i>		O	SE
Golden-Winged Warbler	<i>Vermivora chrysoptera</i>		R	SE
Gray Myotis	<i>Myotis grisescens</i>		R	SE, FE
Great Egret	<i>Ardea herodias</i>		O	SC
Greater Redhorse	<i>Moxostoma valenciennesi</i>	N	R	SE
		SE	R	SE
	<i>Moxostoma valenciennesi</i>	S	R	SE

Common Name	Scientific name	Range	Relative Abundance	Status
Least Weasel	<i>Mustela nivalis</i>	N	R	SC
Little Brown Myotis	<i>Myotis lucifugus</i>	I	C	SC
Little Spectaclecase	<i>Villosa lienosa</i>	C, S		
Loggerhead Shrike	<i>Lanius ludovicianus</i>	I		
Longnose Dace	<i>Rhinichthys cataractae</i>	N		
Longnose Sucker	<i>Catostomus catostomus</i>	NW		
Longsolid	<i>Fusconaia subrotunda</i>	C		SE

Common Name	<i>Scientific name</i>	Range	Relative Abundance	Status
Sharp-Shinned Hawk	<i>Accipiter striatus</i>	I	O	SC
Sheepnose Short-Eared Owl	<i>Plethobasus cyphus</i>	NC, S	R	SE, FC







Common Name	<i>Scientific name</i>	Range	Relative Abundance	Status
Persius Duskywing	<i>Erynnis persius persius</i>	U	U	SE

## **VIII. Key Habitats and Communities for Species of Greatest Conservation Need (2<sup>nd</sup> Element)**

Element 2 of the Congressional guidelines requires that the CWS describe locations and relative condition of key habitats and community types essential to conservation of SGCN. Recognizing that states varied in the amount of information they had about direct management of SGCN, the FWS reviewers provided states with an option to focus their efforts primarily on the species themselves or to address those species through conservation of their habitats.

The Indiana CWS is a habitat-based model. The intent of the model is to maximize limited knowledge about wildlife species by focusing on available research, enhanced by extrapolation from species that are better known, and all informed by best professional judgment. The model was developed to link species of greatest conservation need (SGCN) to all wildlife species and to the habitats on which they depend by using representative species as mental surrogates for the guilds and habitat needs (see Section V above for a description of model development).

Habitat can be classified in many ways and the classification scheme chosen often depends upon the intended purpose of the classification and the resources available for classification. Conservation organizations and conservation initiatives often result in habitat classifications relative to a particular species of interest for example bird habitat is often classified by flyways, Bird Conservation Regions, and Important Bird Areas. Other conservation organizations such as The Nature Conservancy take an ecoregion approach and identify natural community types representative of the ecoregion. Still other organizations classify lands based on land-use such as the USDA Forest Service Forest Inventory and Analysis (FIA). None of these classification schemes is holistic, measuring both traditional habitat types and human-impacted lands such as developed lands. In order to track habitat changers, that is conversion from one habitat type to another, and the degree of habitat fragmentation a baseline measure of all habitat types is needed. Current technology makes this type of habitat analysis possible and repeatable for future comparisons.

Statewide habitat assessments based on spectral analysis of space-borne thematic or reflection radiometer photographs is now available. Land-use/Land-cover can be tracked by replication of the spectral analysis at reasonable time intervals. However, habitat measures derived from different methodologies may not be directly comparable. Forest cover from spectral analysis is greater than forest cover as measured by the FIA. Unlike the spectral analysis, the FIA does not include forest cover as part of developed lands (i.e. parks and stream corridors through cities, etc.). However, the database resulting from spectral analysis allows multiple parameters to be considered. Additional investigation can further refine habitat identification based on habitat associations. For example, the value of urban forest for wildlife species A may be a function of forest block size and connecting forest cover. Based on species A's refined habitat requirements





<b>Habitat Features</b> <b>Q=Quantitative</b> <b>I=Indices</b>								
					Vegetation			
Habitat Type	Total Acres	Geographic Distribution	Patch Size	Native vs. Non-Native	Diversity	Relative Abundance	Ownership Public/Private	Relative Condition
Mature or high canopy stage	I	I	I	I	I	I	I	
Old forest stage	I	I	I	I	I	I	I	
<b>Species Composition</b>	I	I	I	I	I	I	I	
White pine	Q	Q	Q	Q	Q	Q	Q	
Shortleaf/Virginia pine	Q	Q	Q	Q	Q	Q	Q	
Eastern redcedar	Q	Q	Q	Q	Q	Q	Q	
Eastern redcedar/hardwoods	Q	Q	Q	Q	Q	Q	Q	
Oak/pine	Q	Q	Q	Q	Q	Q	Q	
Oak/hickory	Q	Q	Q	Q	Q	Q	Q	
Oak/gum/cypress	Q	Q	Q	Q	Q	Q	Q	
Elm/ash/cottonwood	Q	Q	Q	Q	Q	Q	Q	
Maple/beech	Q	Q	Q	Q	Q	Q	Q	
Cherry/ash/yellow poplar	Q	Q	Q	Q	Q	Q	Q	
Aspen/birch	Q	Q	Q	Q	Q	Q	Q	

Riparian wooded

<b>Habitat Features</b> <b>Q=Quantitative</b> <b>I=Indices</b>								
					Vegetation			
Habitat Type	Total Acres	Geographic Distribution	Patch Size	Native vs. Non-Native	Diversity	Relative Abundance	Ownership Public/Private	Relative Condition
Early successional areas	I	I	I		I	I	I	
Vegetated dunes and swales								
Savannahs								
Historic grasslands	Q	Q	Q		Q	Q		

etation		
Relative Abundance	Ownership Public/Private	Relative Condition
Q	I	
I	I	

Forests include the following sub-habitats: Deciduous, Early Forest Stage, Evergreen, Floodplain Forests, Forested Wetlands, Mature or High Canopy Stage, Old Forest Stage, Pole Stage, Pre-Forest Stage, Riparian Wooded Corridors/Streams, Shrub/Scrub, Suburban, Upland, and Urban (Figure 6).

*Grasslands* include the following sub-habitats: Early Successional Areas, Farm Bill Programs, Fescue, Haylands, Pasture, Prairies, Reclaimed Minelands, Savannah, and Vegetated Dunes and Swales (Figure 7).

*Subterranean Systems* include both Caves and Cave Entrances. (Figure 8).

*Wetlands* include the following sub-habitats: Emergent, Ephemeral, Forested Wetlands, Herbaceous Marsh, Mudflats, Permanent Wetlands and Shrub/ Scrub Wetlands (Figure 9).

#### **A. Location within the State**

Scientists at ISU will calculate statewide areal coverage of each land use or vegetation type (Table 2). These results are very specific to the classification scheme used by ISU in spectral identification and mapping of the cover types. Therefore, results of this analysis may vary somewhat from other land cover calculations. For example, some old fields may be classified as either grasslands or young forest, depending on the appearance of vegetation, rather than being classified as agriculture. Some species of wildlife may be able to respond favorably to pasture lands that in other classification schemes would have been described as agricultural land use but were herein described as grasslands. In addition to reflecting the potential for use by wildlife, the methodology employed by ISU was selected so that it could be repeated using existing technology, resulting in a long-term trend analysis.

Less than 6 percent of Indiana is in public ownership. Additionally, a review of Table 3 and Figures 2-9 demonstrate that I



**Figure 2: Agriculture Lands** - Over half of Indiana's land area is classified as agriculture. Agriculture is dotted throughout the state.

## Indiana State Agriculture Mapping



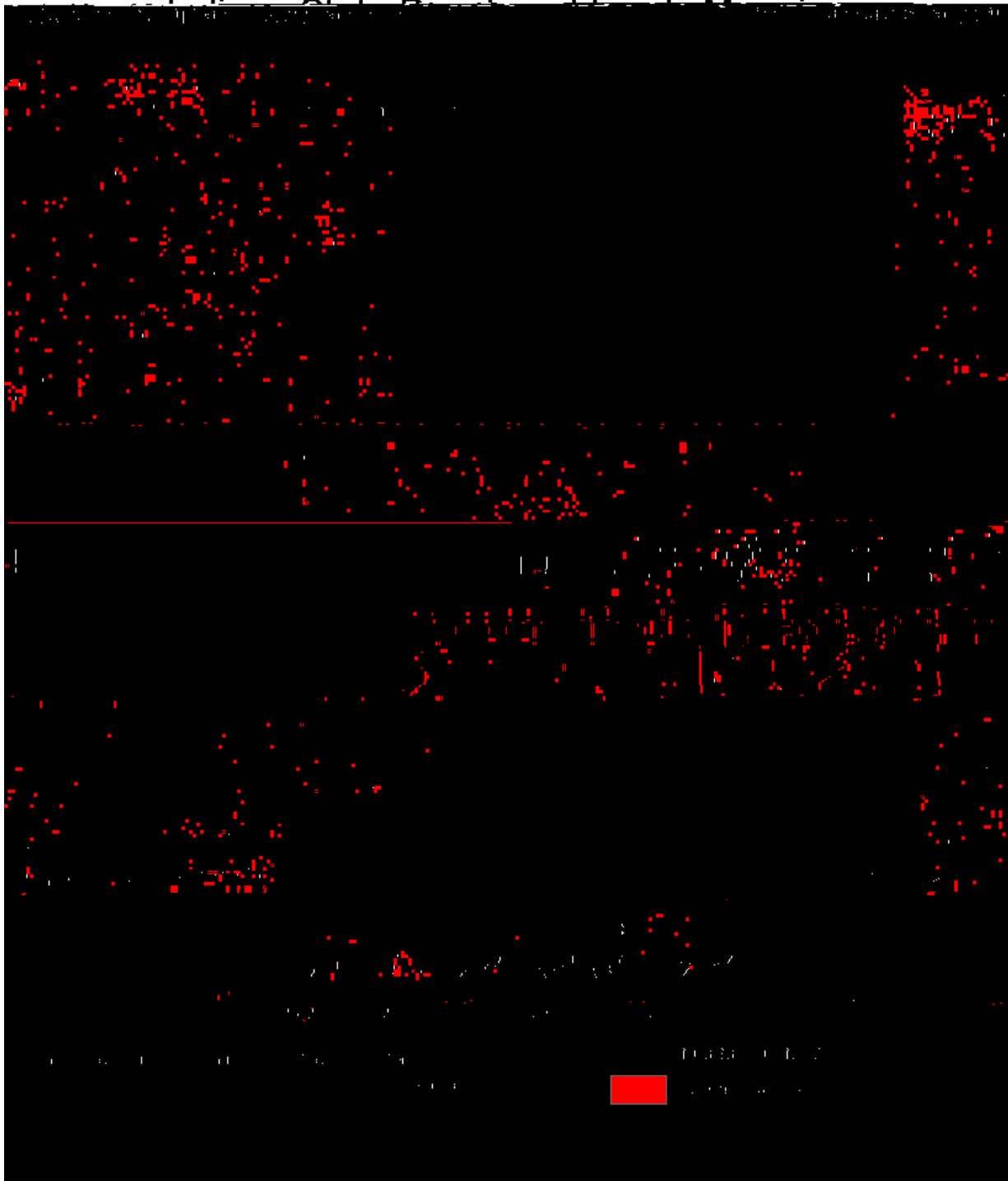
# Indiana Comprehensive Wildlife Strategy

**Figure 4: Barren Lands** - Indiana's barren lands comprise 0.19 percent of Indiana. These lands dominated by exposed rock or minerals with sparse vegetation cover 72 square miles or 46,191 acres.

### Indiana State Barren Lands Mapping



**Figure 5: Developed Lands** - Indiana's developed lands constitute 3.69 percent of Indiana, or 1,404.18 square miles (898,673.81 acres). While developed lands are sprinkled liberally throughout the state, particularly above I-70, they are concentrated in areas that include Gary, South Bend, Fort Wayne, Indianapolis, Evansville, and Louisville, Kentucky. There are fewer developed lands in South Central Indiana.



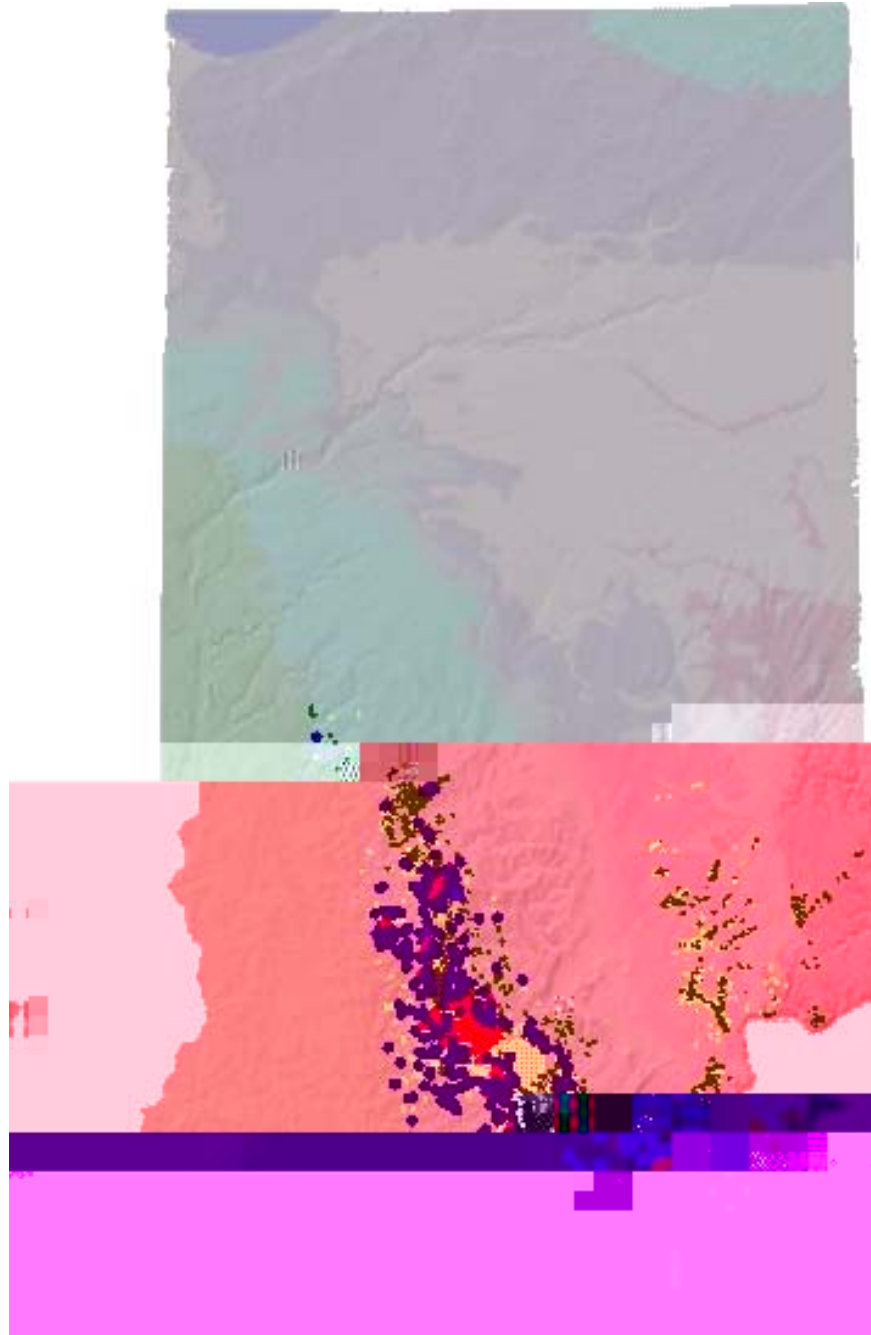
**Figure 6: Forest Lands** - Almost 23 percent of Indiana is forested, comprising 8,686.32 square miles (more than 5.5 million acres). While forest la

**Figure 7: Grasslands** - Over 15 percent of Indiana is in grasslands, constituting prairies and reclaimed mine lands. Those areas are primarily in southern, central and extreme northern parts of the state. Grasslands comprise more than 5,800 square miles or 3.7 million acres.

### Indiana State Grasslands Mapping

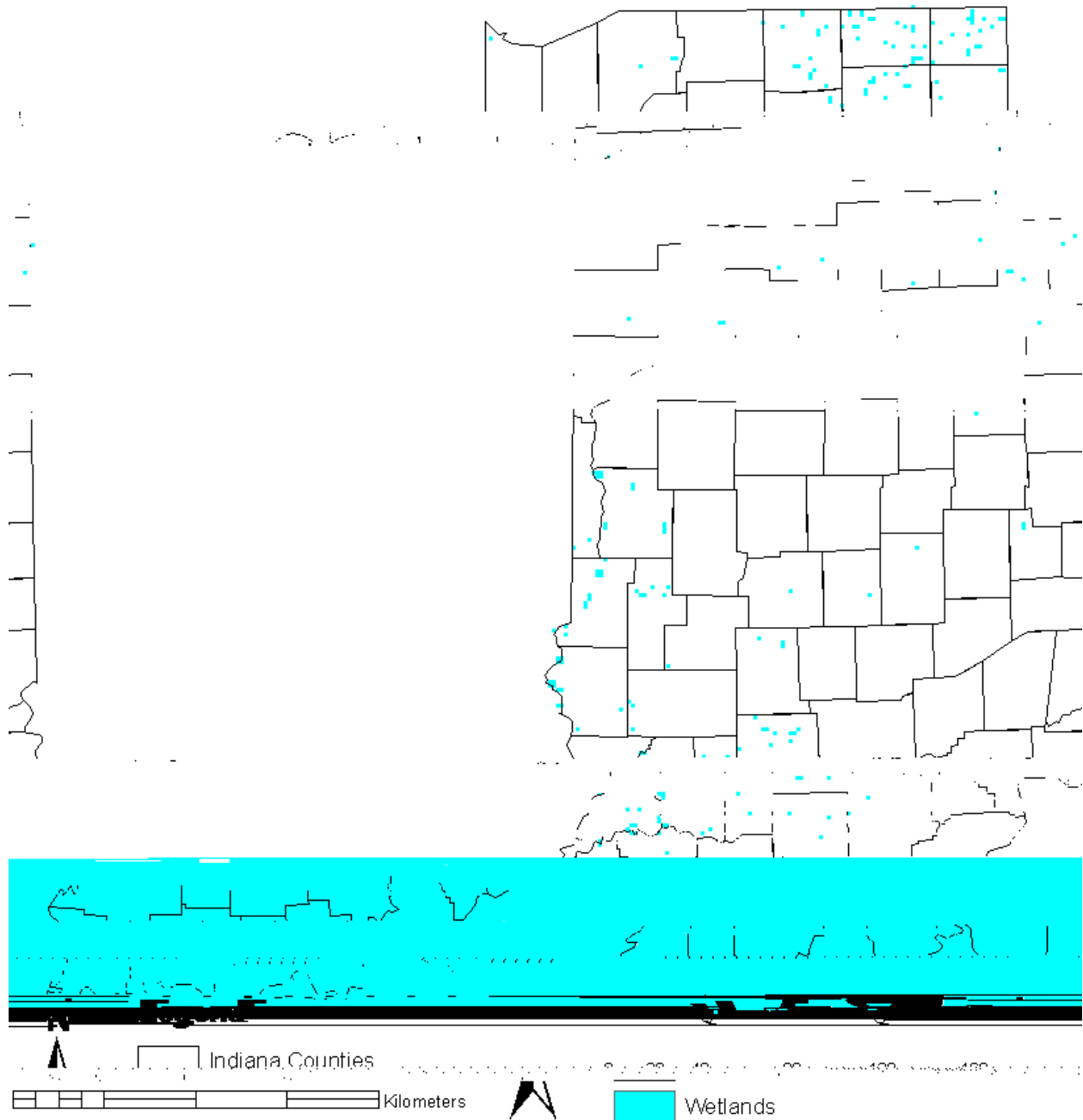


**Figure 8: Subterranean Systems** - the karst region of Indiana is predominantly located in the south central part of the state.



**Figure 9: Wetlands** - Less than 1 percent of Indiana remains in wetlands. Indiana's wetlands comprise 222,549.98 or 347.74 square miles. Today, wetlands are dotted throughout South Central, West Central, and Northeastern Indiana.

### Indiana State Wetlands Mapping





**Table 3. Area and its percentage of each habitat type for Indiana in Year 2000**

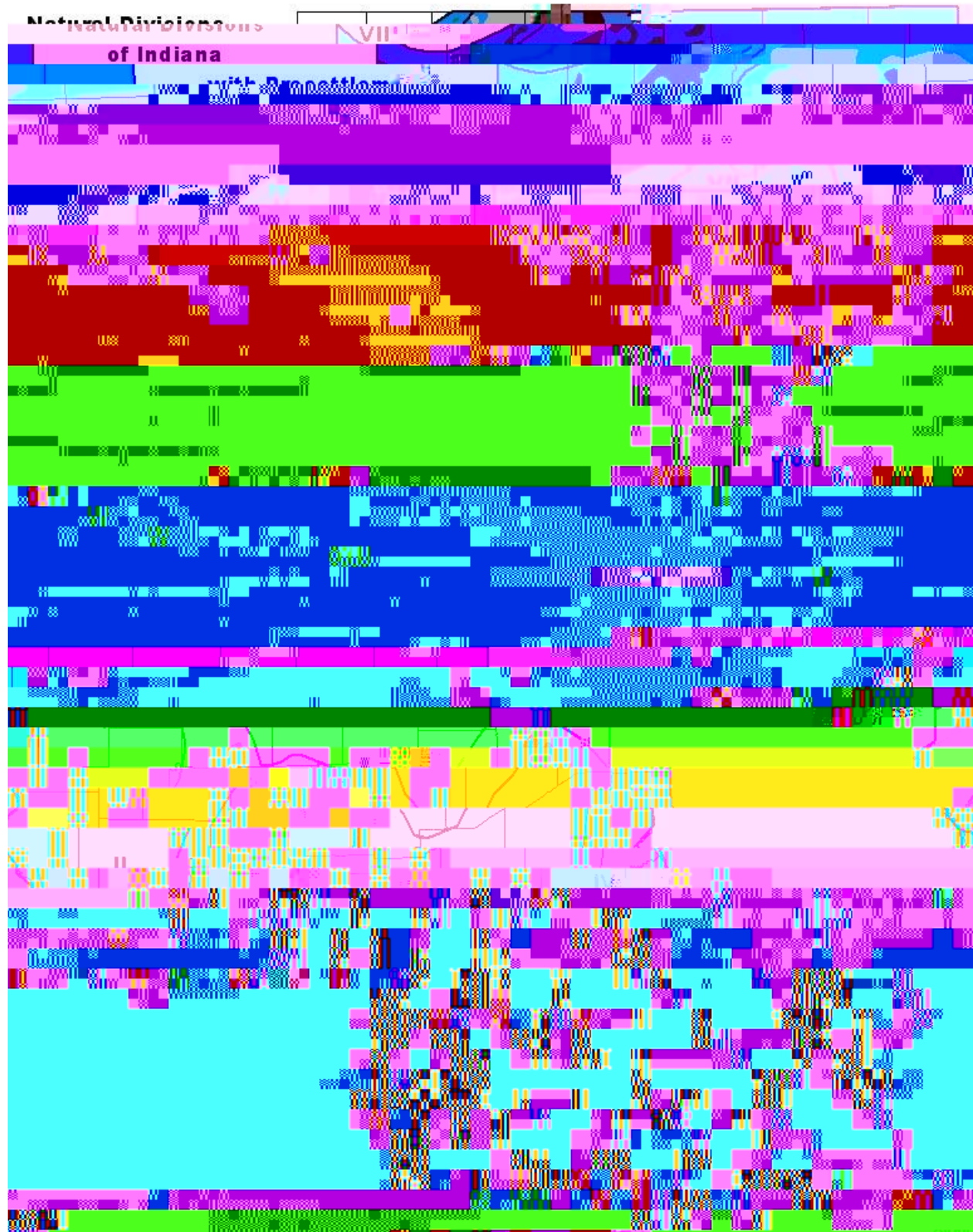
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Area	Area percentage in 2000	Area of High Quality* habitat	Percent of High Quality* Habitat
------	-------------------------------	-------------------------------------	---



well as for mining, urban development, and other industries. As opposed to the dirt paths that

**Figure 10: Presettlement vegetative condition in Indiana** (Source: Lindsey et al 1965)













**Table 5. Problems Affecting Habitats:**

Ranked threats to each major habitat type in Indiana. (See Appendix E-1 to E-78 for responses to sub-habitat expert questionnaires).

Habitat	All habitats combined	Agriculture	Aquatic systems	Barren lands	Developed lands	Forested lands	Grasslands	Subterranean systems	Wetlands
Habitat degradation	1	2	2	1	2 (tie)	3	1	1	1
Commercial or residential development (sprawl)	2	3	5	4	1	1	4	2	4
Agricultural/Forestry practices	3	4	4	5	7	4	3	4	3
Habitat fragmentation	4	1	8	2 (tie)	8	2	5	6	2
Counterproductive financial incentives or regulations	5	7 (tie)	13	2 (tie)	4 (tie)	7	6	13	6 (tie)
Point source pollution (continuing)	6	7 (tie)	6	7 (tie)	5	12	10	5 (tie)	6 (tie)
Invasive/non-native species	7	6 (tie)	11	3	10 (tie)	6	7	11	8
Nonpoint source pollution	8	8 (tie)	3	7 (tie)	9	11 (tie)	12	7	5
Successional change	9	5	14	6	12	5	2	12	6 (tie)
Stream channelization	10		1		2 (tie)	10	15	10 (tie)	10

## **X. Additional Research and Survey Efforts Needed (3<sup>rd</sup> Element-partial)**

Part of Element 3 of the Congressional guidelines requires that the CWS identify priority research and survey efforts needed to identify factors which may assist in restoration and improved conservation of these species and habitats. A section of the online survey solicited input from technical experts to outline research and survey efforts needed for wildlife species within the major habitat types, and then specifically for the habitats themselves.

Respondents were asked to describe how complete the current body of research is. Technical experts and Conservationists were asked to describe how complete the current body of research is. Technical

**Table 6. Research needs for Indiana species**

Ranked research and survey efforts needed for wildlife in each by major habitat types. (See Appendix E-1 to E-78 for responses to sub-habitat expert questionnaires).

Habitat	All Habitats Combined	Agriculture	Aquatic Systems	Barren lands	Developed Lands	Forest lands	Grasslands	Subterranean systems	Wetlands
Threats (predators/competition, contaminants)	1	1		1 (tie)	5	1	2	1	2
Limiting factors (food, shelter, water, breeding sites)	2	3 (tie)	1	1 (tie)	2	5	1	2	1
Relationship and dependence on specific habitats	3	3 (tie)	3	1 (tie)	3	2	3	3	3
Population health (genetic and physical)	4	2	5 (tie)	2	4	4	4	4	4
Distribution and abundance	5	4	4	4 (tie)	1	3	5	5	5
Life Cycle	6	5	5 (tie)	4 (tie)	6	6	6	6	6

is compromised by the “lack of periodic vegetativ



(subterranean and barren lands) or are directly affected by use of conservation practices in commercial harvest and production of natural resources (agriculture and forestry). Several community types occur in Indiana at or near the edge of their range, making these groups particularly susceptible to changes in climate or other factors. Populations on the outskirts of their natural distribution may be particularly useful for genetic study or to deteral d14futioagroanan m



**Table 8. Conservation action needed for species in each of the habitats**

Ranked conservation efforts needed for wildlife by each major habitat type. (See Appendix E-1 to E-78 for responses to sub-habitat expert questionnaires).

Conservation Action	All habitats combined	Agricultural	Aquatic systems	Barren lands	Developed lands	Forest lands	Grasslands	Subterranean systems	Wetlands
Population management (hunting, trapping)	1		2		3 (tie)	2	1		2 (tie)
Protection of migration routes	2		4	2 (tie)	1	1 (tie)	4		3
Habitat protection	3	1	5	1	3 (tie)	1 (tie)	6	1 (tie)	5
Reintroduction (restoration)	4		1	2 (tie)	6 (tie)				1 (tie)
Stocking	5		6		6 (tie)				1 (tie)
Food plots	6		9 (tie)		3 (tie)	3	5		2 (tie)
Regulation of collecting	7		11 (tie)	2 (tie)	2	4	7 (tie)	1 (tie)	6
Translocation to new geographic range	8		3	2 (tie)	6 (tie)				9 (tie)
Public education to reduce human disturbance	9		11 (tie)	2 (tie)	4	6 (tie)	2	3	9 (tie)
Threats reduction	10		8	3	6 (tie)	5		2	8
Exotic/invasive species control	11	2	12 (tie)	2 (tie)	6 (tie)	6 (tie)	3		7
Population enhancement (captive breeding and release)	12		10	2 (tie)	6 (tie)				
Limiting contact with pollutants/contaminants	13		11 (tie)	2 (tie)	5	6 (tie)	7 (tie)	4	9 (tie)
Native predator control	14		9 (tie)	2 (tie)	6 (tie)	6 (tie)	7 (tie)		9 (tie)
Culling/selective removal	15		7		6 (tie)	6 (tie)			9 (tie)





**B. Partnering Agencies and Organizations**

In association with Element 4, guidelines called

matches often can't be realized because matching funds are inadequate or non-existent. Many of the federal programs require state matching funds in excess of 25-50% of the total project amount. When federal funds operate by reimbursing state expenditures, the state must have to total project amount available as a cash outlay at the outset of the project. Federal tax dollars dedicated to habitat conservation programs such as the Conservation Reserve Enhancement Program (CREP) within the Farm Bill programs have gone unused for years due to the lack of state matching funds. Reversion of federal funds to the federal Sport Fish Restoration and Wallop-Breaux programs have also loomed as possibilities in years when state funding came up short.

For state agencies to realize and reap the benefits of programs and partnerships, agency leaders need to look for ways to better tap funding, resources and partnerships heralded through the CWS. A major component of implementation for CWS will be to continue identifying appropriate programs, determining how barriers can be overcome, and linking these programs with conservation needs. As program scope, capacity and resources change, this information will have to be continually updated. For these reasons, Table 10 and Appendix L are not necessarily comprehensive or complete and remain a work in progress.





Program	Funds available	Implementation Constraints				
		Out of state travel	State match	Lack staff	Funding issues or limits	Other
Conservation Reserve Program	Yes	--	--	--	--	X
Lake and River Enhancement Program	Yes	--	--	--	X	X
North American Wetlands Conservation Act Grants	Yes	?	X	?	?	?
Wetland Reserve Program	No	--	--	--	X	--
Wetlands Protection Development Grants Program	Yes	?	?	?	?	?
Wildlife Habitat Incentives Program	Yes	--	?	?	?	X

## 2. Partners for conservation

Appendix H contains listings of conservation organizations, what types of habitat they focus, what types of work they do, and what percent of their time they spend on that work and detailed descriptions of each organization's activities if the respondent provided this requested information. A matrix of conservation partners contains the responses from the CWS Partner Survey (Table 11). Organizations were asked "On which of the following types of habitats does your organization focus its efforts?" and "Percent of your total time spent on efforts in this habitat." Fields with an "X" indicate that the organization responded that they have activities in this habitat but did not include a percentage. All other responses are as completed by the individual completing the form.

Information submitted by potential conservation partners suggests some trends in the amount and kind of attention various habitats and species are currently receiving. The largest number of partners spends at least some time addressing wetlands (84), aquatic systems (83), forest lands (74), and grasslands (60) with the lowest number of partners available to do work in barren lands (21) and subterranean habitats (21). Likewise the largest average percentage of time that partners reported was for aquatic systems (18%), forest lands (17%) and wetlands (15%). The smallest percentage of time spent was reported for barren lands (0.8%), subterranean systems (2%), grasslands (7%) and developed lands (7%).

For the most part, efforts seem to be correlated with the prevalence of some habitat types in presettlement Indiana, such as grasslands, forest lands and wetlands. Grasslands (pasture, hay and abandoned fields) and forest lands are associated with agriculture and timber production. These systems benefit from stable, well-funded nationwide incentive programs such as the Farm Bill and funding for management of game species. Techniques for restoring these habitats may be better developed due to the long-term stable funding and research associated with production systems.

Program and partner attention also reveals a predisposition for working in water-related systems. State and national surveys have repeatedly shown the importance of clean water in the minds of the public. In relation to this interest, wetland conservation and regulation have received a tremendous amount of attention relative to other habitat types. While wetlands may comprise a small land area, their contribution to water quality and quantity is disproportionately significant. Wildlife-related recreation such as waterfowl hunting, fishing and bird-watching also propel an interest and investment in aquatic systems and wetlands that is out of proportion to the land area that they cover. These systems directly benefit from funding provided for the support of game species and fisheries management.

Habitats that are difficult to access, such as cliffs or dunes (barren lands) and below ground (subterranean) habitats, also received relatively little attention. Working in these systems is highly specialized and may include hazardous conditions (e.g., caves and sinking streams). These habitats are also extremely fragile and may not be able to withstand the attention of a very large number of researchers and practitioners. Collecting was identified as one of the serious threats to species in some of these highly sensitive habitats.





	Agricultural	Aquatic systems	Barren lands	Developed lands	Forest lands	Grasslands	Subterranean systems	Wetlands
<b>Conservation Partner</b>	<b>Efforts by habitat type</b>							
Hamilton Lake Conservancy District Hoosier Conservation A		100						

**Agricultural**  
**Aquatic**



	Agricultural	Aquatic systems	Barren lands	Developed lands	Forest lands	Grasslands	Subterranean systems	Wetlands
<b>Conservation Partner</b>	<b>Efforts by habitat type</b>							
Valparaiso Lakes Area Conservancy District		25		10				5
Valparasio Chain of Lakes Watershed Group, Inc.		30		10	10			50
Veolia Water Indianapolis, LLC	10	45		25	5	5	5	5
Wabash River Heritage Corridor Commission	10	40		25	5			20
Wawasee Area Conservancy Foundation, Inc.		10			10	10	27	

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4. Monitoring of known species of greatest conservation need.

As long as appropriate, the Division of Fish and Wildlife will continue the monitoring efforts in Table 12. Monitoring efforts in cat



	Small game license holder survey - bobwhite quail, cottontail rabbits, fox squirrels, gray squirrel, mourning dove, pheasant, woodcock	Annual	Statewide
	Turkey	Annual	Northern Indiana
	Turkey – occurrence	As reported	Recent transplant areas
	Woodcock	Annual <sup>1</sup>	Statewide
	Wood duck - banding	Annual <sup>1</sup>	Statewide
	Wood duck - brood	Annually	Statewide
	Wood duck – nest box survey	Annual	On selected state properties

Sport Fish

Game and commercially valuable fish

Annually

Statewide in selected

6 Tc0 Tw(state )4.12 0.48 0.4



Barn owl \*

Periodic

Statewide,  
some nest  
sites each



	Box turtle *	Annually	Statewide with emphasis on South-central Indiana
	Kirtland Snake *	Annually	Statewide
	Timber rattlesnake *	Periodic (< 5 yr 9	

with Indiana00 Tw[(9 )]TJ1

Species Group	Species	Schedule	Area	Associated database needs
Fish and Mussels	Freshwater mussels	Annually	A subset of Indiana's small streams on a 5-10 year rotation	Yes
Insects	General insect survey	Continuous	Selected rare habitats on a regular cycle	Yes
Mammals	Bats (summer)	Annual	Portions of the state on a regular cycle	Yes
	Bats (winter)	Annual	Known or suspected bat caves on a schedule. (except <i>Myotis sodalists</i> caves)	Yes
	Small mammals (shrews, mice and voles)	Annual -	Statewide - representative habitats, by county on a regular cycle	Yes
	Trapper survey (otter , bobcat, and badger)	Annual	Statewide	Yes
	Lizards	Annual	Statewide or by county on a regular cycle	Yes – part of statewide reptile DB

**B. Habitat Monitoring**

Habitat inventory and monitoring has been less deliberate and frequent than species monitoring.

**Table 15. Habitat monitoring needs and associated database.**

<b>Habitat Type</b>	<b>Habitat Feature</b>	<b>Schedule</b>	<b>Area</b>	<b>Associated database needed</b>
<b>All Habitats</b>	Quantitative or index information on the total acreage, geographic distribution, patch size, native vs. non-native, vegetation diversity and relative abundance, ownership, and relative condition of the habitats.	Once per decade	Statewide	Yes
<b>All Habitats</b>	Invasive animals and plants	Continuous	Statewide	Yes – including treatment information and results
<b>All Habitats</b>	Soil maps	Continuous	Statewide	Yes
<b>All Habitats</b>	Land cover/land use	As available	Statewide	Yes
<b>Agricultural Aquatic Systems</b>	Agricultural statistics Aquatic systems - bottom substrate and contour	Annual	Statewide	Yes

parties. The DNR will conduct species and habitat survey/monitoring efforts as resources allow (including, but not necessarily limited to those identified in Tables 12, 14, & 15) and to participate, as appropriate, in regional or national monitoring programs. Along with the results, all aspects of the inventory necessary to the responsible interpretation of the effort will be made available to the partners and other interested parties on an Internet site. Partners are urged to provide their survey/monitoring efforts in a similar manner. Additionally, the DFW will continue to provide relevant data to the Indiana Heritage Database. Easily accessed, timely inventory information will allow conservation partners and other interested parties to track progress



#### **XIV. Use of New Information to Adapt Conservation Actions During Implementation**

Following the guidance provided in part of Element 5 of the Congressional Guidelines (page 13) conservation actions will be adapted by responding appropriately to new information or changing conditions. The Indiana CWS process and associated electronic tools have been designed from the outset to provide a mechanism for gathering baseline information in a format that can be updated as needed. The system has established an extensive database of contact information that reflects the current knowledge base in the state of Indiana, both in regard to technical expertise and conservation partnership opportunities. It truly lays the groundwork for more expansive collaboration and information sharing as new knowledge, tools, and concepts are developed in the future.

The congressional requirement for the development of Conservation Wildlife Strategies in coordination with all levels of potential conservation partners has firmly established an unprecedented level of responsibility for all conservation partners to share information and to work efficiently toward common goals. This is the first time in history the Indiana has strategically assessed habitats, wildlife species and conservation partners. The sheer magnitude of the conservation needs identified herein underscores the need to coordinated conservation actions based on the best available science.

Implementation of the 2005 CWS will be guided by an action plan to be developed with partner input in early 2006 with the potential for each partner to design coordinated work plans in accordance with the directions set in the state action plan. Conservation minded entities will no longer have the luxury—or limitations—of working in isolation. While they may be exposed to increased scrutiny from conservation colleagues, they will also receive more credit for efforts that may currently go unnoticed.

The DFW is committed to the promotion of communication and information sharing, using the best available communications technology, and urges all our conservation partners to engage in this dialogue. Through web based sharing of habitat and species monitoring efforts, participation in professional organizations, and enactment of the implementation action plan, the DFW will strive to ensure the development of the scientific foundation of adaptive management. Communication between partners, as the implementation of the action plan proceed, will ensure that conservation actions respond appropriately to new information or changes in condition.





**B. Obtaining Public Input and Partner Involvement**

A web site was created and maintained throughout the development of the CWS to facilitate public participation and information sharing about all aspects of this process as required by Element 8 of the Congressional Guidance. News releases, public presentations at professional meetings and web links were used to direct the public to the CWS web site. The public was

## **XVI. Glossary**

**Abundance** - The number of individuals of a particular species.

**Acidification** - To make or become acidic. For example, mine waste can cause acidification of streams by lowering the pH of the water below 7.0.

**Aggregated** - A totaling of all data received relative to a designated factor.

**Agriculture** - Lands devoted to commodity production, including intensively managed nonnative grasses, row crops, fruit and nut-bearing trees.

**Aquatic Systems** - All water habitats (both flowing and stationary) in Indiana, including lakes, reservoirs, rivers, streams and other waterways, but excluding wetlands.

**Barren Lands** - Lands dominated by exposed rock or minerals with sparse vegetation.

**Bioaccumulation** - The accumulation of a substance, such as a toxic chemical, in various tissues of a living organism.

**Biodiversity** - The number and variety of organisms found within a specified geographic region. The variability among living organisms on the earth, including the variability within and between species and within and between ecosystems.

**Bogs** - An area having a wet, spongy, acidic substrate composed chiefly of sphagnum moss and peat in which characteristic shrubs and herbs and sometimes trees usually grow. Bogs are usually acid areas, frequently surrounding a body of open water. Bogs receive water exclusively from rainfall.

**Breeding range** - The geographic region or area in which a species reproduces.

**Buffer zone** - An area maintained in a land use that provides a transition zone between two types of habitat. In conservation, buffer zones are neutral areas between wildlife habitat and areas that have been highly disturbed by humans. An area planted with a variety of grasses may be a buffer zone between a wetland and an urban development.

**Candidate species** - A species of plants or animals classified as a candidate for possible listing as endangered or threatened by a government agency.

**Channelization** - Straightening of a stream or dredging of a new channel to which the stream is diverted, resulting in the removal of its sinuosity (bends).

**Community types** - A group of populations or species that interrelate directly with each other and their specific environment. Characteristics used for identifying community types

Conservation - The protection, preservation, management, or restoration of wildlife and of natural resources such as forests, soil, and water.

Conservation easements - A voluntary binding agreement that permanently limits a particular property to conservation-compatible uses.

Conservation practices - Specific actions taken to protect, preserve, manage or restore wildlife and natural resources. Examples include establishing wind breaks, streambank stabilization, and tree planting. Incentive programs may list the particular kinds of conservation practices for which cost-share funding is available.

Contaminant - A toxin, hazardous substance, or pollutant introduced into the environment through human activity, either directly or as a byproduct.

Culling - Selective removal of particular individuals from a population to achieve an overall improvement in the health of the population. Can be done to reduce overall population size or to remove only individuals with certain undesirable characteristics, such as those that are diseased or of a certain age or size class.

Degradation - A decline in conditio

Fens - A type of wetland ecosystem characterized by peaty soil, dominated by grasslike plants,

John Q. Public - Used as a name to designate a typical member of the general public.

Keystone partners - Organizations or agencies that identified themselves when they completed the conservation partner survey by indicating they wanted to be involved in the development of the CWS and that their organization had a large reach or significant impact on wildlife in Indiana.

Land trusts - A trust created to effectuate a real estate ownership arrangement in which the trustee holds legal title to the property that is significant for wildlife or habitat conservation.

Landholders - One that owns land.

Landscape-level conservation - Conservation of areas large enough to contain functioning ecosystems in which crucial natural processes take place. Processes like fire, flooding, and wildlife migration are essential to the health, biological diversity, and long-term sustainability of an ecosystem.

Mental surrogates - A species that provides a mental picture for the needs of a guild within a particular habitat.

Migration routes - The geographic route along which birds, fish or other species customarily migrate.

Monitoring - To keep track of systematically through collection of information.

Nonpoint source pollution - Pollution that comes from many diffuse sources, caused by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away natural and human-made pollutants, finally depositing them into lakes, rivers, wetlands, coastal waters, and even underground sources of drinking water.

Objectives - Something worked toward or striven for; a goal

Operational documents - Plans that specify particular actions, generally including the timing, cost, and responsible party for the action.

Partners - One that is united or associated with another or others in an activity or a sphere of common interest; organizations or individuals capable of supporting conservation actions.

Point source pollution - Pollution that generally comes from wastewater discharged from the pipes into rivers, streams, lakes, and the ocean. Examples include industrial facilities and municipal sewage treatment plants.

Press kit - A packaged set of promotional materials, such as photographs and background information, for distribution to the press, as at a news conference or before the release of a new product.

Professional societies - A nonprofit, cooperative, voluntary organization of persons joined by their interest and background in a professional, technical, or managerial field of work.

PSA - An announcement for which no charge is made and which promotes programs, activities, or services Federal, State, and Local Governments or the programs, activities or services of non-profit organizations and other announcements regarded as serving community interests.

Range - The geographic region in which a plant or animal normally lives or grows.

Regimes - Trends in the characteristics of a system, such as the hydrologic cycle, seasonal water flow, or the amount of precipitation, that apply to the system.







## **XVII. References and Acknowledgments**

The Indiana Comprehensive Wildlife Strategy (CWS) was completed during the Governance of Mitch Daniels, under the Indiana Department of Natural Resources Director Kyle Hupfer and the Director of the Fish and Wildlife Glen Salmon with funding from The State Wildlife Grants program.

The Indiana CWS development team would like to acknowledge our appreciation to the following individuals and organizations for their contribution during the development process:

Technical experts:

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Division of Fish and Wildlife  
DNR Division of Nature Preserves  
Ducks Unlimited, Inc.  
Dunes-Calumet Audubon Chapter  
Earth Source, Inc.  
EnviroScience Incorporated  
Federal Highway Administration (FHWA)  
Fish Lake Conservancy District  
Four Rivers Resource Conservation & Development Area  
Fur takers of America chapter 7-E North West IN.  
Fur Takers of America, Inc  
Great Lakes Commission  
Hamilton Lake Conservancy District  
Hoosier Conservation Alliance  
Hoosier Environmental Council  
Hoosier Heartland Resource Conservation and Education council  
IDNR- Division of Forestry- Cooperative Forest Management Section (Private Lands)  
Indian Deer Hunters Association  
IN DNR, Division of Stat

Indiana Rural Water Association  
Indiana Smallmouth Club (ISC)  
Indiana Soybean Board (ISB) & Indiana Soybean Growers Association (ISGA)  
Indiana Sportsmen's Roundtable  
Indiana State Trappers Assoc.  
Indiana Watershed Leadership (new initiative) with Purdue University  
Indiana Wildlife Federation  
Indianapolis Flycasters  
Indianapolis Power & Light Co.  
JFNew and Associates  
Kankakee River Basin Commission  
Lake Bruce Conservancy district  
Lake Lemon Conservancy District  
Lake Maxinkuckee Environmental Council (LMEC)  
Lake McCoy Conservancy District  
Law Enforcement Division, Indiana Department of Natural Resources  
Lincoln Hills RC&D  
Little River Wetlands Project, Inc.  
Lost River Conservation Association  
Mason & Hanger Corp. Newport Chemical Depot  
Merry Lea Environmental Learning Center of Goshen College  
Midwest Peregrine Falcon Recovery Project  
Muscatatuck National Wildlife Refuge US FWS  
MWH Americas, Inc.  
National Audubon Society - Indiana Important Bird Areas Program (IBA)  
National Wild Turkey Federation  
Naval Support Activity Crane  
NICHES Land Trust  
Northeast Chapter 7 Furtakers  
Northeastern Indiana Trout Association  
Northern Indiana Public Service Company (NIPSCO) a Subsidiary of NiSource  
Northwestern Indiana Regional Planning Commission (NIRPC)  
Patoka River National Wildlife Refuge & Management Area  
Pheasants Forever Inc.  
Potawatomi Audubon Society  
Red-tail Conservancy, Inc.  
Robert Cooper Audubon Society

Tippecanoe Audubon Society  
Trillium Land Conservancy, Inc.  
U.S. Army Corps of Engineers Regulatory Branch, Louisville District  
U.S. Department of Agriculture, Forest Service, Hoosier National Forest  
U.S. Fish and Wildlife Service - Indiana Private Lands Office  
US Fish and Wildlife Service Ecological Services (does not include national wildlife refuges)  
USDA Natural Resources Conservation Service  
Valparaiso Lakes Area Conservancy District  
Valparasio Chain of Lakes Watershed Group, Inc.  
Veolia Water Indianapolis, LLC  
Wabash River Heritage Corridor Commission  
Wawasee Area Conservancy Foundation, Inc.  
Whitewater Valley Land Trust, Inc.

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## **XVIII. Appendices**

The entire Appendices totals almost 3000 pages and thus are not included in this file. Please see <http://www.djcase.com/incws/appendices/appendices.htm> for access to these documents.







## Appendix A: Complete list of Habitat definitions

River Lowland have been heavily modified for agricultural purposes and many are intermittent.

b. wadeable/large river ( $> 19 < 2,000 \text{ mi}^2$ ) Streams of the Ohio River drainage, Interior River Lowland ecoregion are found in southwestern Indiana. Wadeable/large rivers are those having a drainage area of  $> 19 < 2,000 \text{ mi}^2$ . Streams of the Interior River Lowland ecoregion are heavily impacted by the low, nearly level flood plains associated with the great rivers of the region.

### *Oxbows/Backwaters/Sloughs/Embayments*

The oxbows/backwaters/sloughs/embayments of Indiana are for the most part restricted to the southwest portion of Indiana and along the Ohio River forming Indiana's southern boundary. These habitats vary highly in their structure and permanency, and are all associated with large river habitats. They characteristically have muck bottoms and function as important nursery areas for large river fish species. Although many of these habitats are natural, others are manmade. Embayments along the Ohio River are the result of the series of locks and dams that have been created along the Ohio River. Many

## Appendix A: Complete list of Habitat definitions

**Barren Lands Rock Outcrops:** Large rock surfaces exposed along a predominantly soil covered slope.

**Developed Lands:** Highly impacted lands, intensively modified to support human habitation, transportation, commerce and recreation.

**Developed Lands Golf Courses:** Lands intensively managed, in whole or in part, for human use relative to the game of golf.

**Developed Lands Industrial Lands:** Areas supporting the production of manufactured goods materials and energy, for example, steel mills, petroleum refineries and electricity generating plants.

**Developed Lands Roads/Rails/Bridges:** Corridors, paved strips and connecting structures for the moving of goods, services and people by cars, trucks, and trains.

**Forest Lands,** A plant community extending over a large area and dominated by trees, the crowns of which form an unbroken covering layer or canopy.

*pre-forest-* This is the initial stage as an area begins to revert from a cleared condition to forest. It is typified with annual/ perennial herbs, forbs and grasses with some shrubs and intolerant tree seedlings.

*early forest-* Typified by tree seedlings (less than 1" diameter breast height [dbh]) and tree saplings (greater than 1" dbh but less than 5" dbh). The tree species often occur in combination with non-arborescent woody shrubs and perennial herbs/forbs.

*pole stage-* Typical dominant overstory vegetation is composed of pole sized trees (greater than 5" dbh but less than 9" dbh in softwoods or 11" dbh in hardwoods). Pole Stage forests may contain a higher percentage of intolerant or midtolerant species than later developmental stages. Canopy may be partially or completely closed, but is- often at a lower height than later stages. Older forests that are heavily harvested or damaged by weather or fire will often have a structure that resembles the Pole Stage.

*mature high canopy stage-* Typical dominant overstory vegetation is composed primarily



Appendix A: Complete list of Habitat definitions

Grasslands Vegetated Dunes and Swales: Ridge and valley topography developed by wind blown sand deposits. These deposits are near Lake Michigan. Vegetative cover progresses the further the dunes are from the lakeshore.

Shrub/Scrub: Transitional areas of mixed vegetation (i.e., grasses, small shrubs, trees and forbs) undergoing natural succession to forest.

Subterranean Systems Cave Entrances: Surface openings of subterranean features reaching as far as natural light can penetrate (i.e., twilight zone).

Subterranean Systems Caves: Connected underground rooms and passages beyond natural light penetration.

Wetlands Emergent: Areas shallowly flooded temporarily or permanently to cover the base of plants but not prolonged inundation of the entire plant.

Wetlands Ephemeral: Areas temporarily flooded often supporting aquatic plants and animals.

Wetlands Forested: Area temporarily or permanently flooded with woody vegetation taller than 6 meters.

Wetlands Herbaceous Marsh: Usually shallow wetlands dominated by non-woody plants such as cattail, reeds or rushes.

Wetlands Mudflats: Moist nonvegetated soil, often produced in shallow wetlands by

O B S - 7 advance and retreat of water levels, normally from 15 to 30 cm, with woody plants

## Appendix A: Complete list of Habitat definitions

Kusler, JA. 1983. Our national wetland heritage: A protection guidebook. Environmental Law Institute, Washington, D.C. 167 p.

## Appendix B: Comm

6. DFW will develop or maintain positive relationships with target audiences.
7. Target audiences will understand the role of the DFW Wildlife Diversity Section in developing and implementing the CWS.
8. DFW will begin developing a mechanism for creating and utilizing multi-disciplinary teams to protect and enhance wildlife habitat.

### **Strategic Approach**

It is important to have a communications plan for the development of the CWS, so the audiences involved understand the goals of the CWS, the development process, how the identified audiences can be involved, and how the strategy will conserve Indiana's wildlife.

There are numerous diverse audiences that need to be involved in the development of the CWS. To be successful, each audience needs to know or do different things. DFW/DJCA will use the following strategies to engage audiences:

- Customize communications for each partner or target audience.
- List and define each target audience and the unique objectives, key messages and communications tactics that will be used to reach each audience.
- Survey conservation organizations to gather feedback about how to best communicate with this audience about the CWS **and to** determine how engaged they may be in development and implementation.
- Conduct one-on-one discussions and presentations, as appropriate. This is one of the most effective ways to communicate key messages. Since it is impossible to do this with all target audiences, DJCA and the survey resp -diverse audienenn f .



have listed some example organizations within each target audience. See *Appendix A* for a complete list of identified organizations listed by target audience group.

1. Upper-level government – executive level staff working for the state of Indiana. Audience includes: the governor’s office, the DNR Director and administrators, etc. Support is needed from executive level staff to develop and implement the CWS.
2. IN DFW staff – the Division of Fish and Wildlife staff including but not limited to administrators, field staff and section heads. All staff must support the development of the CWS because the final plan will be a blueprint that guides DFW conservation projects at all levels.
3. Technical experts – wildlife biologists or other experts that have expertise in an IN habitat or species. These experts may work for the IN DNR or outside of the DNR with another conservation organization or institution. These are the experts who conduct “on-the-ground” habitat or species conservation work or research in Indiana.
4. Conservation organizations – any conservation organization that can assist in the development and/or implementation of the CWS. DJCA sent an electronic survey to a broad list of over 500 organizations or representatives from those organizations in the state. Survey responses will be used to place each in one of the following “Conservation organization” categories. Categories are necessary to define the level of involvement of each organization, and to help the DNR better target its communications efforts.
  - I. *Keystone Partners* – these organizations will need to be intricately involved in the development process and have all of the following:
    - Staff experts that will provide technical information through the technical expert survey or by reviewing the draft CWS document. Some staff might have expertise in a species and others might have expertise in a specific habitat. There is potential overlap with the technical expert audience, #3 above.
    - Buy into the development of the CWS so each will be more likely to assist with implementation.
    - Be willing to communicate with their members and other target audiences predisposed to a topic dealing with conservation about the CWS.
    - Mechanisms to communicate with segments of the other public target audience, #5 below.
  - II. *Partners* – these organizations will have all of the following:
    - Buy into the development of the CWS so each will be more likely to assist with implementation.
    - Be willing to communicate with their members and other target audiences predisposed to a topic dealing with conservation about the CWS.
    - Mechanisms to communicate with segments of the Other Publics target audience.

- III. *Stakeholders* – these organizations need to buy into the development of the CWS so each will be more likely to assist with implementation. However, this grouping of organizations will just need to be aware of the CWS effort—there is no need at this point for the organizations to be actively involved with the development of the CWS.

- g. This effort has emerged through the work of a broad national bipartisan wildlife conservation coalition, called Teaming with Wildlife. Teaming With Wildlife includes more than 3000 organizations nationwide.
- h. The task of conserving declining wildlife is challenging but we know success is possible from our history with wildlife conservation successes like the wild turkey, wh
- i. Information about the CWS is on the website. Progress updates will be provided through email correspondence and news articles (WildBulletin, etc). CWS website: <http://www.djcase.com/incws>.
- j. The CWS process incorporates several opportunities for agency and public review. Your continued engagement will ensure that the CWS is an accurate representation of wildlife needs and opportunities and can be implemented effectively thail correccollWt.00erge/P A/CID 2 >>>BDC BT/T60 1 TFO



- g. IN DFW is working with a broad cross section of our state to get this done from wildlife experts to hunters and anglers to other environmentalists to farmers and ranchers.
- h. This effort has emerged through the work of a broad national bipartisan wildlife conservation coalition, called Teaming with Wildlife. Teaming With Wildlife includes more than 3000 organizations nationwide.
- i. The task of conserving declining wildlife is challenging but we know success is possible from our history with wildlife conservation successes like the wild turkey, white-tailed deer, and striped bass.
- j. The CWS will emphasize the importance of habitat conservation, restoration and protection by identifying groups of species into guilds, that are associated with specific habitats, then selecting representative species from each guild. Division staff led and contributed to this effort.

2. Participate in and understand their role in the development of the CWS

- Key Messages
  - a. All key messages from objective #1
  - b. Technical expert information will be collected through an online expert questionnaire. Support of division supervisors will be essential to encourage staff participation in: a) filling out the expert questionnaire; and b) identifying other experts to participate, both within and external to DNR.
  - c. Conservation organization information will be gathered through an on-line survey, focused on agencies and organizations that either conduct land, water and wildlife management or provide technical and financial assistance to those efforts. Agency staff will be instrumental in identifying additional conservation organizations to fill out this survey.

3. Informed consent

- Key Messages
  - a. All key messages from objectives #1 and 2
  - b. Conservation organizations and the general public may request information about the CWS process from DFW staff. Information about the CWS is on the website. Progress updates will be provided through email correspondence and news articles (WildBulletin, etc). CWS website: <http://www.djcase.com/incws>.
  - c. The CWS process incorporates several opportunities for agency and public review. Your continued engagement will ensure that the CWS is an accurate representation of wildlife needs and opportunities and can be implemented effectively through collaborative efforts.

4. Describe multi-disciplinary opportunities for implementing CWS

- Key Messages

- b. DFW can use the CWS development process to integrate long-range internal planning for protecting and enhancing wildlife habitat. The next round of strategic planning may be integrated through the CWS.
5. Staff will have sufficient understanding to be able to broadly explain CWS to agency constituents and conservation organizations.
  - All key messages listed above will be used

### **Tactics**

- 
- Presentations
- One-on-one discussions
- Press kit
- Website
- Electronic newsletter
- Databases
- Poster
- E-mail
- Conservation organization survey
- Technical expert questionnaire
- DNR consultation

### ***Target Audience #3: Technical Experts***

#### **Objectives**

1. Present the CWS development process to **all** identified technical experts.
  - Key Messages
    - a. IN DFW is developing a Comprehensive Wildlife Strategy. The goal is to prevent wildlife from becoming endangered.
    - b. This is not just a planning exercise – the strategies will guide the existing State Wildlife Grants program and should lead to future additional money.
    - c. This is a rigorous science-based process to determine priorities for declining wildlife and habitat.
    - d. This effort is asking: What are the species and habitats in trouble? Why are they in trouble? Most importantly, what are we going to do about it?
    - e. IN DFW is working with a broad cross section of our state to get this done from wildlife experts to hunters and anglers to other environmentalists to farmers and ranchers.
    - f. This effort has emerged through the work of a broad national bipartisan wildlife conservation coalition, called Teaming with Wildlife. Teaming With Wildlife includes more than 3000 organizations nationwide.







- On-line input
- Electronic newsletter
- Databases
- Presentations
- PowerPoint Template
- Press kit
- Articles
- Press release

ii. *Partners*

**Objectives** – All of the Keystone Partner objectives except Objective #1

**Tactics** – All tactics listed for Keystone Partners except technical expert survey.

iii. *Stakeholders*

**Objectives** – Provide periodic communications about the process

**Tactics**

- Electronic newsletter
- E-mail
- Press release

**Key Messages**

Use all key messages throughout the process. Select messages as appropriate to communicate with audiences to reach objectives.

- a. IN DFW is developing a Comprehensive Wildlife Strategy. The goal is to prevent wildlife from becoming endangered.
- b. This is not just a planning exercise – the strategies will guide the existing State Wildlife Grants progr

- h. This is a historic effort: this kind of comprehensive effort have never been done before in our states, and every other state is also doing it the same time.

- d. This is an historic effort: this kind of comprehensive effort has never been done before in our state, and every other state is also doing it at the same time.

Each audience will want different information out of the press kit. Some audiences might want just a one-pager while other will want to review all available information. ID DFW, Keystone Partners and Partners will be taught how to use the Press kit template to communicate with audiences.

- **Indiana CWS website** – During all communications, target audiences will be directed to the CWS website. The website will describe the development process, connect to surveys, electronic newsletters, the drafts of the CWS and other relevant information.
- **Electronic newsletter** – The newsletter will be distributed via e-mail to all target audiences through the developed databases. This tool will be used to keep target audiences informed about the CWS process and how they can help.
- **Poster** – DFW will develop a 2-page legal size poster to display in areas where DFW employees typically have a few moments to review (i.e.: break rooms, bathrooms, etc.). The poster will have an overview explaining the CWS and a section that describes the 8 required elements of the strategy.
- **E-mail** – It would be ideal to have face-to-face discussions with each target audience. However, there are numerous audiences involved in development of the CWS. To gather feedback and to communicate with audiences that we cannot talk with input, we will utilize e-mail.
- **Technical Expert Questionnaire** – identified audiences will receive access to an electronic survey to provide expertise on a specific species or habitat.
- **“Conservation organization” Survey** – identified audiences will receive access and asked to fill-out a “conservation organization” information survey.
- **On-line Input** – Target audiences will have the opportunity to comment on the CWS and development process on-line. The draft CWS will be posted to the CWS website for easy review and input. Target audiences need to understand the value of the CWS and potential opportunities for collaboration. Input is needed from all audiences for successful implementation of the CWS. Target audiences need to know that we are including their input. By including input, target audiences will buy into the CWS development process and support the CWS.
- **Articles** – We will place articles in iden

could allow the sections to work together for the benefit of conserving and protecting Indiana’s fish and wildlife habitat.

**Action Plan**

We need to communicate with target audiences throughout the CWS development process. Each target audience is needed to make the development process of the CWS a success. The following action plan will be used to reach the goals identified in this communications plan.

<b>Date</b>	<b>Action</b>	<b>Assignment</b>
Aug. 2004	DJCA/DFW develop CWS website	Complete
Sept.	DJCA/DFW identify “conservation organizations” and begin to categorize into levels	Complete
	DJCA develop database of technical experts	Complete
	DJCA/DFW select meetings that a large number of IN DFW staff attend	Complete
	DJCA develop “Conservation organizations” and “Technical Expert” surveys	Complete
Sept. 23	DJCA meet with DFW about CWS and the communications plan	Complete
Oct.	DFW hang posters in selected areas for staff to read	Complete
Oct. 12	CWS presentation at DNR Directors meeting	Complete
Oct. 19	CWS briefing at DNR Advisory Council Meeting	Complete
Oct. 25	Announcement “press release” to technical experts describing the CWS and the development and asking them to fill-out an electronic survey	Complete
Oct. 25-Nov. 22	Technical experts fill-out surveys	Complete
	DJCA make presentations to DFW staff and upper-level government at selected meetings	Complete
Oct. –Nov.	DJCA/DFW create PowerPoint template	Complete
Nov. 11	Distribute “Press release”/announcement asking “Conservation organizations” to fill-out information survey.	
Nov. 23	CWS presentation at Landholders meeting.	Complete
Oct. –Dec.	Follow-up with technical experts via e-mail and phone reminders asking them to fill-out survey	Complete

Nov – Feb 2005



TBD	NAAT approves the CWS and is ready for implementation.	
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### **Evaluation**

It will be important to evaluate the effectiveness of this communications plan to see if we reached our goals and should continue communications with target audiences when the CWS is ready for implementation. We will measure the effectiveness of this plan three ways:

1. Assess the objectives for each target audience to see if they were achieved.  
Potential Action: one year after the plan is completed, DFW could review the objectives listed for each target audience and determine if each objective was achieved.
2. Assess database of target audiences and review qualitative information gathered from presentations and discussions.  
Potential Action: Throughout the implementation of the communications plan, we will gather qualitative information from target audiences that will be tracked for each contact. This information could be used to assess developed relationships using qualitative database information.
3. Surveys.  
Potential Action: At DNR's direction, we could send pre-surveys to Conservation organizations to gather information needed for the CWS. These surveys would ask target audiences questions about how to best communicate with them about the CWS, measure how much audiences currently know about CWS and how interested they are in CWS. Once the CWS is finalized, DNR could resurvey the audiences to re-assess their knowledge and solicit their opinion of the CWS development process and the final strategy.

## Appendix A

1. Upper-level government
  - IN DNR Director and other executive level staff
  - IN DNR Division heads (see list of Divisions outlined for target audience #3)
  - State legislature?
  - Governor's Office (Agriculture Advisor/Dept?; Environment/Natural Resources Advisor)
  - Office of Commissioner of Agriculture
  - Indiana State Soil Conservation Board
  - IDEM
  - ISDH
  - State Chemists' Office
2. IN DFW staff
3. Technical experts (Identified previously or IN DNR staff selected because expert information missing for an identified species)
  - Technical experts outside DNR
    - a. Technical Advisory Committees
    - b. Other species and habitat experts outside DFW
    - c. Indiana State University project team
    - d. Professional societies (SAF, AFS, TWS, ASWCD)
    - e. Department of Transportation (biologists)
    - f. Indiana Academy of Sciences
    - g. IN Quail Unlimited
    - h. IN Ducks Unlimited
    - i. National Wild Turkey Federation
    - j. Pheasants Forever
    - k. Airport Animal Dama



I. Keystone Partners

I rs

- Sta rs  
d fishing organizations

ions

TAT and WAG

IASWCD)

- Fed l  
t of Environmental Management (IDEM)  
nagement

fe Service

- Adjacent states connected by water or land management

- Exi n e collaborative partnerships

- National conservation partners  
) – align state communications efforts with national

6. Agricu ra

7. Development org

nt and parks departments

nd Towns

anizations

ations  
mmerce  
ties

15. Natural resources, engineering and environmental law consulting firms  
and water use

Traditional constituents: hunters, trappers, anglers, Hoosier Outdoor Writers





Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
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Appendix C: Guilds by Habitat and Sub-habitat

Habitat Type

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Agriculture					Bird	Brewer's Blackbird	<i>Euphagus cyanocephalus</i>				

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Agriculture					Mammal	Raccoon	<i>Procyon lotor</i>	I	A		
Agriculture					Mammal	Coyote	<i>Canis latrans</i>	I	C		



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Appendix C: Guilds by Habitat and Sub-habitat

Habitat Type  
Level I

Habitat Type  
Level II

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Aquatic Systems	Impoundments				Bird	Common Goldeneye	<i>Bucephala clangula</i>	I	C	W	
Aquatic Systems	Impoundments				Bird	Common Loon	<i>Gavia Immer</i>	I	C	M(*)	
Aquatic Systems	Impoundments				Bird	Herring Gull	<i>Larus argentatus</i>	I	C	R*	
Aquatic Systems	Impoundments				Bird	Lesser Scaup	<i>Aythya Affinis</i>	I	C	W(*)	

Aquatic Systems

## Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type Level I</u>	<u>Habitat Type Level II</u>	<u>Habitat Type Level III</u>	<u>Habitat Type Level IV</u>	<u>Habitat Type Level V</u>	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>
Aquatic Systems	Impoundments				Bird	Caspian Tern	<i>Sterna caspia</i>	I	O	M*	
Aquatic Systems	Impoundments				Bird	Common Merganser	<i>Mergus merganser</i>	I	O	W	
Aquatic Systems	Impoundments				Bird	Common Tern	<i>Sterna hirundo</i>	I	O	M(*)	
Aquatic Systems	Impoundments				Bird	Double-Crested Cormorant	<i>Phalacrocorax auritus</i>	I	O	M	

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type Level I</u>	<u>Habitat Type Level II</u>	<u>Habitat Type Level III</u>	<u>Habitat Type Level IV</u>	<u>Habitat Type Level V</u>	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>
Aquatic Systems	Impoundments				Bird	Red-Breasted Merganser	<i>Mergus serrator</i>	I	O	M*	
Aquatic Systems	Impoundments				Bird	Red-Throated Loon	<i>Gavia stellata</i>	I	O	M	
Aquatic Systems	Impoundments				Bird	Ring-Necked Duck	<i>Aythya collaris</i>	I	O	M*	
Aquatic Systems	Impoundments				Bird						



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Aquatic Systems	Impoundments				Bird	Lesser Black-Backed Gull	<i>Larus fuscus</i>	I	R	A	
Aquatic Systems	Impoundments				Bird	Little Gull	<i>Larus minutus</i>	I	R	A	
Aquatic Systems	Impoundments				Bird	Long-Billed Murrelet	<i>Brachyramphus perdix</i>	I	R	A	
Aquatic Systems	Impoundments				Bird	Long-Tailed Jaeger	<i>Stercorarius longicaudus</i>	N	R	M	
Aquatic Systems	Impoundments				Bird	Ma(a 0.480a0.24 S-1.1504 TD0.0016 Tc-0w((Frigateb759.44 T Tf10.2707 0.5789 TD0.0025 Tc(6ongicaFe)-4ach					



## Appendix C: Guilds by Habitat and Sub-habitat

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Aquatic Systems	Impoundments				Bird	Pomarine Jaeger	<i>Stercorarius pomarinus</i>	N	R	M	
Aquatic Systems	Impoundments				Bird	Red-Necked Grebe	<i>Podiceps grisegena</i>	I	R	A	
Aquatic Systems	Impoundments				Bird	<u>Roseate Tern</u>	<i>Sterna dougallii</i>	I	R	A	FE
Aquatic Systems	Impoundments				Bird	Ross's Goose	<i>Chen rossii</i>	I	R	A	
Aquatic Systems	Impoundments				Bird	Ross's Gull	<i>Rhodostethia rosea</i>	I	R	A	
Aquatic Systems	Impoundments				Bird	Royal Tern	<i>Sterna maxima</i>	I	R	A	
Aquatic Systems	Impoundments				Bird	Sabine's Gull	<i>Xema sabini</i>	I	R	A	
Aquatic Systems	Impoundments				Bird	Slaty-Backed Gull	<i>Larus schistisagus</i>	I	R	A	
Aquatic Systems	Impoundments				Bird	Sooty Tern	<i>Sterna fuscata</i>	I	R	A	
Aquatic Systems	Impoundments				Bird	Surf Scoter	<i>Melanitta perspicillata</i>	N	R	M	
Aquatic Systems	Impoundments				Bird	Thayer's Gull	<i>Larus thayeri</i>	I	R	M	
Aquatic Systems	Impoundments				Bird	Thick-Billed Murre	<i>Uria lomvia</i>	I	R	A	
Aquatic Systems	Impoundments				Bird	Western Grebe	<i>Aechmophorus occidentalis</i>	I	R	A	

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
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Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
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Habitat TypeHabitat TypeHabitat TypeHabitat TypeHabitat Type ScientificName Range StatusLakeXIEERFbXsÔTTQFôLarus argentatus I CR\*

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>
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Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>
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Appendix C: Guilds by Habitat and Sub-habitat

Habitat Type  
Level I

Habitat Type  
Level II

Habitat Type







Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	Relative
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Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u>
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Appendix C: Guilds by Habitat and Sub-habitat

Habitat Type

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u>
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## Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Aquatic Systems	Ohio River drainage	Great river			Fish	Channel Shiner	<i>Notropis wickliffi</i>	S	C		
Aquatic Systems	Ohio River drainage	Great river			Fish	Flathead Catfish	<i>Pylodictis olivaris</i>	I	C		
Aquatic Systems	Ohio River drainage	Great river			Fish	Freshwater Drum	<i>Aplodinotus grunniens</i>	I	C		
Aquatic Systems	Ohio River drainage	Great river			Fish	Longnose Gar	<i>Lepisosteus osseus</i>	I	C		
Aquatic Systems	Ohio River drainage	Great river			Fish	Mississippi Silvery Minnow	<i>Hybognathus nuchalis</i>	SC, SW	C		
Aquatic Systems	Ohio River drainage	Great river			Fish	River Carpsucker	<i>Carpionodes carpio</i>	W, S	C		
Aquatic Systems	Ohio River drainage	Great river			Fish	River Shiner	<i>Notropis blennioides</i>	W, S	C		
Aquatic Systems	Ohio River drainage	Great river			Fish	Silver Chub	<i>Macrhybopsis storeriana</i>	W	C		
Aquatic Systems	Ohio River drainage	Great river			Fish	Silverband Shiner	<i>Notropis shumardi</i>	SW	C		
Aquatic Systems	Ohio River drainage	Great river			Fish	Skipjack Herring	<i>Alosa chrysochloris</i>	W, S	C		
Aquatic Systems	Ohio River drainage	Great river			Fish	Smallmouth Buffalo	<i>Ictiobus bubalus</i>	W, S	C		



## Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type Level I</u>	<u>Habitat Type Level II</u>	<u>Habitat Type Level III</u>	<u>Habitat Type Level IV</u>	<u>Habitat Type Level V</u>	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>
Aquatic Systems	Ohio River drainage	Great river			Fish	Steelcolor Shiner	<i>Cyprinella whipplei</i>	C, S	C		
Aquatic Systems	Ohio River drainage	Great river			Fish	Threadfin Shad	<i>Dorosoma petenense</i>	S	C		X
Aquatic Systems	Ohio River drainage	Great river			Fish	White Bass	<i>Morone chrysops</i>	W	C		
Aquatic Systems	Ohio River drainage	Great river			Fish	Bighead Carp	<i>Hypohthalmichthys nobilis</i>	SW	O	X	
Aquatic Systems	Ohio River drainage	Great river			Fish	Bigmouth Buffalo	<i>Ictiobus cyprinellus</i>	W, S	O		
Aquatic Systems	Ohio River drainage	Great river			Fish	Blue Catfish	<i>Ictalurus furcatus</i>	S	O		
Aquatic Systems	Ohio River drainage	Great river			Fish	Bullhead Minnow	<i>Pimephales vigilax</i>	W, S	O		
Aquatic Systems	Ohio River drainage	Great river			Fish	Freckled Madtom	<i>Noturus nocturnus</i>	W	O		
Aquatic Systems	Ohio River drainage	Great river			Fish	Ghost Shiner	<i>Notropis buchanani</i>	NW, S	O		
Aquatic Systems	Ohio River drainage	Great river			Fish	Goldeye	<i>Hiodon alosoides</i>	S	O		
Aquatic Systems	Ohio River drainage	Great river			Fish	Grass Carp	<i>Ctenopharyngoden idella</i>	NW, C, SE	O		X

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type Level I</u>	<u>Habitat Type Level II</u>	<u>Habitat Type Level III</u>	<u>Habitat Type Level IV</u>	<u>Habitat Type Level V</u>	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>
Aquatic Systems	Ohio River drainage	Great river			Fish	Highfin Carpsucker	<i>Carpionodes velifer</i>	W, S	O		
Aquatic Systems	Ohio River drainage	Great river			Fish	Mooneye	<i>Hiodon tergisus</i>	W, S	O		
Aquatic Systems	Ohio River drainage	Great river			Fish	Mountain Madtom	<i>Noturus eleutherus</i>	W, C	O		
Aquatic Systems	Ohio River drainage	Great river			Fish	Paddlefish	<i>Polydon spathula</i>	W, SE	O		

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u>
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Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	Species
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Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type Level I</u>	<u>Habitat Type Level II</u>	<u>Habitat Type Level III</u>	<u>Habitat Type Level IV</u>	<u>Habitat Type Level V</u>	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>
Aquatic Systems	Ohio River Rivers and Streams	Great river Great Lakes drainage	Wadeable/large river		Mussel	<u>Rough Pigtoe</u>	<i>Pleurobema plenum</i>				FE
Aquatic Systems	Ohio River/E.C.-I.P.	headwater			Fish	Blackstripe Topminnow	<i>Fundulus notatus</i>	I	A		
Aquatic Systems	Ohio River/E.C.-I.P.	headwater			Fish	Bluntnose Minnow	<i>Pimephales notatus</i>	I	A		
Aquatic Systems	Ohio River/E.C.-I.P.	headwater			Fish	Creek Chub	<i>Semolitis atromaculatus</i>	I	A		
Aquatic Systems	Ohio River/E.C.-I.P.	headwater			Fish	Green Sunfish	<i>Lepomis cyanellus</i>	I	A		
Aquatic Systems	Ohio River/E.C.-I.P.	headwater			Fish	Johnny Darter	<i>Etheostoma nigrum</i>	I	A		
Aquatic Systems	Ohio River/E.C.-I.P.	headwater			Fish	White Sucker	<i>Catostomus commersoni</i>	I	A		
Aquatic Systems	Ohio River/E.C.-I.P.	headwater			Fish	Fathead Minnow	<i>Pimephales promelas</i>	N, SE	C		
Aquatic Systems	Ohio River/E.C.-I.P.	headwater			Fish	Grass Pickerel	<i>Esox americanus</i>		C		
Aquatic Systems	Ohio River/E.C.-I.P.	headwater			Fish	Redfin Shiner	<i>head</i>	<i>TD</i>	<i>M</i>	<i>0</i>	<i>ref/BTD</i>



Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type Level I</u>	<u>Habitat Type Level II</u>	<u>Habitat Type Level III</u>	<u>Habitat Type Level IV</u>	<u>Habitat Type Level V</u>	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>			
Aquatic Systems	Ohio River/E.C.-I.P.	headwater			Mussel	<u>Northern Riffleshell</u>	<i>Epioblasma torulosa rangiana</i>				FE			
Aquatic Systems	Ohio River/E.C.-I.P.	headwater			Mussel	Pink Heelsplitter	<i>Potamilus alatus</i>							
Aquatic Systems	Ohio River/E.C.-I.P.	headwater			Mussel	Pistolgrip	<i>Pistolgrip</i>							
Aquatic Systems	Ohio River/E.C.-I.P.	headwater			Mussel	Plain Pocketbook	<i>Lampsilis cardium</i>							
Aquatic Systems	Ohio River/E.C.-I.P.	headwater			Mussel	<u>Purple Lilliput</u>	<i>Toxolasma lividus</i>				SC			
Aquatic Systems	Ohio River/E.C.-I.P.	headwater			Mussel	Purple Wartback <i>Tj/T2</i>	<i>Tj/T2</i>	1	Tf0	0	T7	TD-0	Tc0	Twf

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
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Aquatic



Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type Level I</u>	<u>Habitat Type Level II</u>	<u>Habitat Type Level III</u>	<u>Habitat Type Level IV</u>	<u>Habitat Type Level V</u>	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	Sand Shiner	<i>Notropis stramineus</i>	I	A		
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	Shorthead Redhorse	<i>Moxostoma macrolepidotum</i>	I	A		
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	Spotfin Shiner	<i>Cyprinella spiloptera</i>	I	A		
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	Striped Shiner	<i>Luxilus chrysocephalus</i>	I	A		
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	Yellow Bullhead	<i>Ameiurus natalis</i>	I	A		
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	Banded Darter	<i>Etheostoma zonale</i>	NW, SE	C		
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	Bigeye Chub	<i>Hybopsis amblops</i>	NW	C		
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	Bigeye Shiner	<i>Notropis boops</i>	C	C		
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	Black Redhorse	<i>Moxostoma duquesnei</i>	C	C		
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	Blackside Darter	<i>Percina maculata</i>	I	C		



## Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Aquatic Systems	Ohio River/E.C.- I.P.	wadeable/large			Fish	Silver Redhorse	<i>Moxostoma anisurum</i>	N, C	C		



Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type Level I</u>	<u>Habitat Type Level II</u>	<u>Habitat Type Level III</u>	<u>Habitat Type Level IV</u>	<u>Habitat Type Level V</u>	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	Slenderhead Darter	<i>Percina phoxocephala</i>	C	S		
Aquatic Systems	Ohio River/E.C.-I.P. Rivers and Streams	wadeable/large Ohio River drainage	Eastern corn belt/interior plateau ecoregions	Wadeable/large river	Fish	Northern Hogsucker	<i>Hypentelium nigricans</i>	N, C	C		
Aquatic Systems	Ohio River/E.C.-I.P. Rivers and Streams	wadeable/large Great Lakes drainage	Headwater		Fish	Mottled Sculpin	<i>Cottus bairdi</i>	I	C		
Aquatic Systems	Ohio River/E.C.-I.P. Rivers and Streams	headwater Ohio River drainage	Eastern corn belt/interior plateau ecoregions	Headwater	Fish	Orangethroat Darter	<i>Etheostoma spectabile</i>	C	A		
Aquatic Systems	Ohio River/E.C.-I.P. Rivers and Streams	wadeable/large Ohio River drainage	Eastern corn belt/interior plateau ecoregions	Wadeable/large river	Fish	<u>Eastern Sand Darter</u>					

Appendix C: Guilds by Habitat and Sub-habitat



Appendix C: Guilds by Habitat and Sub-habitat

Habitat Type  
Level I

Habitat Type  
Level II



Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type Level I</u>	<u>Habitat Type Level II</u>	<u>Habitat Type Level III</u>	<u>Habitat Type Level IV</u>	<u>Habitat Type Level V</u>	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>
Aquatic Systems	Ohio River/I.R.L.	wadeable/large			Mussel	Texas Lilliput	<i>Toxolasma texasiensis</i>				
Aquatic Systems	<b>Ohio River/I.R.L. Rivers and Streams</b>	<b>wadeable/large Ohio River drainage</b>	<b>Interior river lowland</b>	<b>Wadeable/large river</b>	Mussel	<b>Yellow Sandshell</b>	<i>Lampsilis teres</i>				
Aquatic Systems	<b>Ohio River/I.R.L. Rivers and Streams</b>	<b>headwater Ohio River drainage</b>	<b>Interior river lowland</b>	<b>Headwater</b>	Fish	<b><u>Spottail Darter</u></b>					

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type Level I</u>	<u>Habitat Type Level II</u>	<u>Habitat Type Level III</u>	<u>Habitat Type Level IV</u>	<u>Habitat Type Level V</u>	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>
Aquatic Systems	Oxbows				Bird	Wood Duck	<i>Aix sponsa</i>	I	C	R*	
Aquatic Systems	Oxbows	Oxbows/backwaters/sloughs/embayments			Amphibian	Western Lesser Siren	<i>Siren intermedia</i>	W	O		
Aquatic Systems	Oxbows, etc.	Oxbows/backwaters/sloughs/embayments			Fish	Flier	<i>Centrarchus macropterus</i>	SW	O		
Aquatic Systems	Oxbows, etc.	Oxbows/backwaters/sloughs/embayments			Fish	Redspotted Sunfish (Formerly Spotted Sunfish)	<i>Lepomis miniatus</i>	SW	R		
Aquatic Systems	Oxbows, etc.	Oxbows/backwaters/sloughs/embayments			Mussel	Flat Floater	<i>Anodonta suborbiculata</i>				
Aquatic Systems	Oxbows, etc.				Fish	Alligator Gar	<i>Atractosteus spatula</i>	S	1976		Ex
Aquatic Systems	Oxbows, etc.				Fish	Banded Pygmy Sunfish	<i>Elassoma zonatum</i>	SW	R		
Aquatic Systems	Oxbows, etc.				Fish	Bantam Sunfish	<i>Lepomis symmetricus</i>	W	R		ST
Aquatic Systems	Oxbows, etc.				Fish	Cypress Darter	<i>Etheostoma proeliare</i>	SW	R		

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	Species
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Appendix C: Guilds by Habitat and Sub-habitat

Habitat Type

Level I

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>
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Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Aquatic Systems					Amphibian	American Toad	<i>Bufo americanus</i>	N, C, SE	C		
Aquatic Systems					Amphibian	Cave Salamander	<i>Eurycea lucifuga</i>	S	C		
Aquatic Systems					Amphibian	Cricket Frog	<i>Acris crepitans</i>	I	C		
Aquatic Systems					Amphibian	Fowler's Toad	<i>Bufo fowleri</i>	I	C		
Aquatic Systems					Amphibian	Green Frog	<i>Rana clamitans</i>	I	C		
Aquatic Systems					Amphibian	Longtail Salamander	<i>Eurycea longicauda</i>	S	C		
Aquatic Systems					Amphibian	<u>Blue-Spotted Salamander</u>	<i>Ambystoma laterale</i>	N	O		SC
<b>Aquatic Systems</b>					<b>Amphibian</b>	<b>Eastern Newt</b>	<i>Notophthalmus viridescens</i>	<b>I</b>	<b>O</b>		
Aquatic Systems					Amphibian	Lesser Siren	<i>Siren intermedia</i>	W	O		
<b>Aquatic Systems</b>					<b>Amphibian</b>	<b><u>Mudpuppy</u></b>	<b><i>Necturus maculosus</i></b>	<b>I</b>	<b>O</b>		<b>SC</b>
Aquatic Systems					Amphibian	Northern Dusky Salamander	<i>Desmognathus fuscus</i>	SE	O		

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type Level I</u>	<u>Habitat Type Level II</u>	<u>Habitat Type Level III</u>	<u>Habitat Type Level IV</u>	<u>Habitat Type Level V</u>	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>
Aquatic Systems					Amphibian	Pickereel Frog	<i>Rana palustris</i>	E, C, WC	O		SC
Aquatic Systems					Amphibian	Four-Toed Salamander	<i>Hemidactylum scutatum</i>	N, C	R		ST
Aquatic Systems					Amphibian	Northern Red Salamander	<i>Pseudotriton ruber</i>	SC	R		SE
Aquatic Systems					Amphibian	Plains Leopard Frog	<i>Rana blairi</i>	W	R		SC
Aquatic Systems					Amphibian	Green Treefrog	<i>Hyla cinerea</i>				
<i>Aquatic Systems</i>					<i>Bird</i>	<i>Red-Winged Blackbird</i>	<i>Agelaius phoeniceus</i>	<i>I</i>	<i>A</i>	<i>R*</i>	
<b>Aquatic Systems</b>					<b>Mammal</b>	<b>Beaver</b>	<i>Castor canadensis</i>	<b>I</b>	<b>C</b>		<b>reintroduced</b>
<i>Aquatic Systems</i>					<i>Mammal</i>	<i>Mink</i>	<i>Mustela vison</i>	<i>I</i>	<i>O</i>		
<b>Aquatic Systems</b>					<b>Mammal</b>	<b>River Otter</b>	<i>Lutra canadensis</i>	<b>I</b>	<b>R</b>		<b>reintroduced</b>

Aquatic Systems

Reptile

Banded Water Snake

*Nerodia sipedon*

I

A

842f431.34 159.1ref.





Appendix C: Guilds by Habitat and Sub-habitat

Habitat Type  
Level I

Habitat Type  
Level II

Habitat Type

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type Level I</u>	<u>Habitat Type Level II</u>	<u>Habitat Type Level III</u>	<u>Habitat Type Level IV</u>	<u>Habitat Type Level V</u>	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>
Barren Lands					Reptile	Black Rat Snake	<i>Elaphe obsoleta</i>	I	C		
Barren Lands					Reptile	Eastern Milksnake	<i>Lampropeltis triangulum</i>	I	C		
Barren Lands					Reptile	Common (Black) Kingsnake	<i>Lampropeltis getula</i>	S	O		
Barren Lands	Active quarries				Bird	Bank Swallow	<i>Riparia riparia</i>	I	O	S*	
Barren Lands	Active quarries				Bird	N. Rough-Winged Swallow	<i>Stelgidopteryx serripennis</i>	I	O	S*	
<i>Barren Lands</i>	<i>Active quarries</i>				<i>Bird</i>	<i>Rough-Winged Swallow</i>	<i>Stelgidopteryx serripennis</i>	<i>I</i>	<i>O</i>	<i>S*</i>	
<b>Barren Lands</b>	<b>Bare dunes</b>				<b>Bird</b>	<b>Lark Sparrow</b>	<i>Chondestes grammacus</i>	<b>I</b>	<b>R</b>	<b>S*</b>	
<b>Barren Lands</b>	<b>Bare dunes</b>				<b>Bird</b>	<b><u>Piping Plover</u></b>					





Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
<i>Developed Lands</i>	<i>Borrow pits</i>				<i>Bird</i>	<i>Canada Goose</i>	<i>Branta canadensis</i>	<i>I</i>	<i>A</i>	<i>R*</i>	
<b>Developed Lands</b>	<i>Borrow pits</i>				<b>Bird</b>	<b>Mallard</b>	<i>Anas platyrhynchos</i>	<b>I</b>	<b>C</b>	<b>R*</b>	
<i>Developed Lands</i>	<i>Golf courses</i>				<i>Bird</i>	<i>American Robin</i>	<i>Turdus migratorius</i>	<i>I</i>	<i>A</i>	<i>R*</i>	



Habitat TypeHabitat TypeHabitat TypeHabitat TypeHabitat TypeSpeciesGroupSpecies ScientificName RangeAbundance StatusForests

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type Level I</u>	<u>Habitat Type Level II</u>	<u>Habitat Type Level III</u>	<u>Habitat Type Level IV</u>	<u>Habitat Type Level V</u>	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>
Forests					Amphibian	Blue-Spotted Salamander	<i>Ambystoma laterale</i>	N	O		SC
Forests					Amphibian	Eastern Newt	<i>Notophthalmus viridescens</i>	I	O		
Forests					Amphibian	Jefferson's Salamander	<i>Ambystoma jeffersonianum</i>	SC	O		
Forests					Amphibian	Northern Dusky Salamander	<i>Desmognathus fuscus</i>	SE	O		
Forests					Amphibian	Ravine Salamander	<i>Plethodon richmondi</i>	SE	O		
<b>Forests</b>					<b>Amphibian</b>	<b>Wood Frog</b>	<b><i>Rana sylvatica</i></b>	<b>I</b>	<b>O</b>		
Forests					Amphibian	Four-Toed Salamander	<i>Hemidactylum scutatum</i>	N, C	R		ST
Forests					Amphibian	Green Salamander	<i>Aneides aeneus</i>	SE	R		SE

Forests

Amphibian

Northern β6(rth)-4.6(e)-0.6 Tw[For]4.9(e)2.9(sts)S480t.985 0 TD-0.0001 Tc3.996

Am8 rE.



Appendix C: Guilds by Habitat and Sub-habitat

Habitat Type

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Forests					Bird	Downy Woodpecker	<i>Picoides pubescens</i>	I	C	R*	
Forests					Bird	Eastern Bluebird	<i>Sialia sialis</i>	I	C	R*	
Forests					Bird	Eastern Kingbird	<i>Tyrannus tyrannus</i>	I	C	S*	
Forests					Bird	Eastern Screech-Owl	<i>Otus asio</i>	I	C	R*	
Forests					Bird	Eastern Wood-Pewee	<i>Contopus virens</i>	I	C	S*	
Forests					Bird	Golden-Crowned Kinglet	<i>Regulus satrapa</i>	I	C	W*	

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Forests					Bird	Ruby-Throated Hummingbird	<i>Archilochus colubris</i>	I	C	S*	
Forests					Bird	Tennessee Warbler	<i>Vermivora peregrina</i>	I	C	M	
Forests					Bird	Turkey Vulture	<i>Cathartes aura</i>	I	C	R*	
Forests					Bird	Warbling Vireo	<i>Vireo gilvus</i>	I	C	S*	
Forests					Bird	White-Breasted Nuthatch	<i>Sitta carolinensis</i>	I	C	R*	
Forests					Bird	Yellow-Rumped Warbler	<i>Dendroica coronata</i>	I	C	W	
Forests					Bird	Acadian Flycatcher	<i>Empidonax virescens</i>	I	O	S*	
Forests					Bird	American Redstart	<i>Setophaga ruticilla</i>	I	O	S*	
Forests					Bird	Barred Owl	<i>Strix varia</i>	I	O	R*	
Forests					Bird	Bay-Breasted Warbler	<i>Dendroica castanea</i>	I	O	M	
Forests					Bird	Black-And-White Warbler	<i>Mniotilta varia</i>	I	O	S*	SC
Forests					Bird	Blackburnian Warbler	<i>Dendroica fusca</i>	I	O	M*	
Forests					Bird	Blackpoll Warbler	<i>Dendroica striata</i>	I	O	M	

Appendix C: Guilds by Habitat and Sub-habitat

Habitat Type  
Level I

Habitat Type  
Level II

Habitat Type

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Forests					Bird	Northern Parula	<i>Parula americana</i>	I	O	S*	
Forests					Bird	Orange-Crowned Warbler	<i>Vermivora celata</i>	I	O	M	
Forests					Bird	Orchard Oriole	<i>Icterus spurius</i>	I	O	S*	
Forests					Bird	Ovenbird	<i>Seiurus aurocapillus</i>	I	O	S*	
Forests					Bird	Palm Warbler	<i>Dendroica palmarum</i>	I	O	M	
Forests					Bird	Pine Siskin	<i>Carduelis pinus</i>	I	O	W*	
Forests					Bird	Purple Finch	<i>Carpodacus purpureus</i>	I	O	W	
Forests					Bird	Red-Headed Woodpecker	<i>Melanerpes erythrocephalus</i>	I	O	R*	
Forests					Bird	Scarlet Tanager	<i>Piranga olivacea</i>	I	O	S*	
Forests					Bird	Summer Tanager	<i>Piranga rubra</i>	S	O	S*	
Forests					Bird	Swainson's Thrush	<i>Catharus ustulatus</i>	I	O	M	
Forests					Bird	Veery	<i>Catharus fuscescens</i>	I	O	S*	

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Forests					Bird	Wild Turkey	<i>Meleagris gallopavo</i>	I	O	R*	
Forests					Bird	Wilson's Warbler	<i>Wilsonia pusilla</i>	I	O	M	
Forests					Bird	Winter Wren	<i>Troglodytes troglodytes</i>	I	O	W	
Forests					Bird	Yellow-Throated Vireo	<i>Vireo flavifrons</i>	I	O	S*	
Forests					Bird	Barn Owl	<i>Tyto alba</i>	I	R	R*	SE
Forests					Bird	Black Vulture	<i>Coragyps atratus</i>	S	R	R*	
Forests					Bird	Black-Backed Woodpecker	<i>Picoides arcticus</i>	N	R	A	
Forests					Bird	Black-Headed Grosbeak	<i>Pheucticus melanocephalus</i>	I	R	A	
Forests					Bird	Bohemian Waxwing	<i>Bombycilla garrulus</i>	N	R	W	
Forests					Bird	Canada Warbler	<i>Wilsonia canadensis</i>	N	R	M*	
Forests					Bird	Chuck-Will's-Widow	<i>Caprimulgus carolinensis</i>	S	R	S*	
Forests					Bird	Common Redpoll	<i>Carduelis flammea</i>	N	R	W	

## Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type Level I</u>	<u>Habitat Type Level II</u>	<u>Habitat Type Level III</u>	<u>Habitat Type Level IV</u>	<u>Habitat Type Level V</u>	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>
Forests					Bird	Evening Grosbeak	<i>Coccothraustes vespertinus</i>	I	R	W	
Forests					Bird	Golden8(Bird)c-0.0504 TD(Spec Tm0 Tc0 Tw( )Tj-1 Tf0 71d9 )Tj-1 T-4 0.78 0 Tw( )Tj/f95.88 302. Sub-habitat					

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u>
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Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Forests					Bird	Yellow-Bellied Flycatcher	<i>Empidonax flaviventris</i>	I	R	M	
Forests					Bird	Yellow-Bellied Sapsucker	<i>Sphyrapicus varius</i>	I	R	M*	
Forests					Mammal	Big Brown Bat	<i>Eptesicus fuscus</i>	I	A		
<b>Forests</b>					<b>Mammal</b>	<b>Eastern Chipmunk</b>	<i>Tamias striatus</i>	<b>I</b>	<b>A</b>		
Forests					Mammal	Eastern Mole	<i>Scalopus aquaticus</i>	I	A		
<b>Forests</b>					<b>Mammal</b>	<b>Fox Squirrel</b>	<i>Sciurus niger</i>	<b>I</b>	<b>A</b>		
Forests					Mammal	House Mouse	<i>Mus musculus</i>	I	A		X
Forests					Mammal	Opossum	<i>Didelphis virginiana</i>	I	A		
Forests					Mammal	Raccoon	<i>Procyon lotor</i>	I	A		
<b>Forests</b>					<b>Mammal</b>	<b>Red Bat</b>	<i>Lasiurus borealis</i>	<b>I</b>	<b>A</b>		
Forests					Mammal	White-Footed Mouse	<i>Peromyscus leucopus</i>	I	A		
<b>Forests</b>					<b>Mammal</b>	<b>White-Tailed Deer</b>	<i>Odocoileus virginianus</i>	<b>I</b>	<b>A</b>		<b>reintroduced</b>

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	Species
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Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u>
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Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Forests					Reptile	Eastern Fence Lizard	<i>Sceloporus undulatus</i>	S	C		
Forests					Reptile	Eastern Milksnake	<i>Lampropeltis triangulum</i>	I	C		
Forests					Reptile	Five-Lined Skink	<i>Eumeces fasciatus</i>	I	C		
Forests					Reptile	Broad-Headed Skink	<i>Eumeces laticeps</i>	C, S	O		
Forests					Reptile	Bull Snake	<i>Pituophis melanoleucus</i>	NW, SW	O		
Forests					Reptile	Common (Black) Kingsnake	<i>Lampropeltis getulus</i>	S	O		
Forests					Reptile	Ground Skink	<i>Scincella lateralis</i>	S	O		
Forests					Reptile	<u>Kirtland's Snake</u>	<i>Clonophis kirtlandii</i>	N, C, SE	O		ST, FC



Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Forests	Early Forest Stage				Bird	Brown Thrasher	<i>Toxostoma rufum</i>	I	C	R*	
Forests	Early Forest Stage				Bird	Common Yellowthroat	<i>Geothlypis trichas</i>	I	C	S*	
Forests	Early Forest Stage				Bird	Gray Catbird	<i>Dumetella carolinensis</i>	I	C	S*	
Forests	Early Forest Stage				Bird	Northern Mockingbird	<i>Mimus polyglottos</i>	I	C	R*	
<b>Forests</b>	<b>Early Forest Stage</b>				<b>Bird</b>	<b>Whip-Poor-Will</b>	<i>Caprimulgus vociferous</i>	<b>I</b>	<b>C</b>	<b>S*</b>	
<b>Forests</b>	<b>Early Forest Stage</b>				<b>Bird</b>	<b>White-Eyed Vireo</b>	<i>Vireo griseus</i>	<b>I</b>	<b>C</b>	<b>S*</b>	
Forests	Early Forest Stage				Bird	Yellow-Breasted Chat	<i>Icteria virens</i>	I	C	S*	
Forests	Early Forest Stage				Bird	American Woodcock	<i>Scolopax minor</i>	I	O	S*	
Forests	Early Forest Stage				Bird	Black-Billed Cuckoo	<i>Coccyzus erythrophthalmus</i>	I	O	S*	
Forests	Early Forest Stage				Bird	Blue-Winged Warbler	<i>Verminvora pinus</i>	I	O	S*	

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Forests	Early Forest Stage				Bird	Chestnut-Sided Warbler	<i>Dendroica pensylvanica</i>	N	O	M*	
Forests	Early Forest Stage				Bird	Prairie Warbler	<i>Dendroica discolor</i>	I	O	S*	
Forests	Early Forest Stage				Bird	Ruffed Grouse	<i>Bonasa umbellus</i>	S	O	R*	
Forests	Early Forest Stage				Bird	Yellow-Billed Cuckoo	<i>Coccyzus americanus</i>	I	O	S*	





Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u> SRang
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Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
<i>Forests</i>	<i>Old forest stage</i>					<i>Bird</i>					
						<i>Pile</i>					



## Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type Level I</u>	<u>Habitat Type Level II</u>	<u>Habitat Type Level III</u>	<u>Habitat Type Level IV</u>	<u>Habitat Type Level V</u>	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>
Forests	Riparian wooded corridors/streams/counties				Bird	<u>Great Egret</u>	<i>Ardea alba</i>	I	O	S*	SC



Appendix C: Guilds by Habitat and Sub-habitat

Habitat Type



<u>Habitat Type</u> Level V	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>
	<i>Plants</i>	<i>Elm/Ash/Cottonwood</i>					
	<i>Plants</i>	<i>Maple/Beech</i>					
	<i>Plants</i>	<i>Oak/Gum/Cypress</i>					
	<i>Plants</i>	<i>Oak/Hickory</i>					
	<i>Plants</i>	<i>Oak/Pine</i>					
	<i>Plants</i>	<i>Shortleaf/Virginia Pine</i>					
	<i>Plants</i>	<i>White Pine</i>	<i>Pinus strobus</i>				

Bird      American Robin   *Turdus migratorius*







C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
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				Bird	Blue Grosbeak					
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Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Grasslands					Bird	<u>Sedge Wren</u>	<i>Cistothorus platensis</i>	I	R	S*	SE
Grasslands					Bird	<u>Short-Eared Owl</u>	<i>Asio flammeus</i>	I	R	R*	SE
Grasslands					Bird	Smith's Longspur	<i>Calcarius pictus</i>	I	R	M	
Grasslands					Bird	Snowy Owl	<i>Nyctea scandiac</i>	N	R	W	
Grasslands					Bird	Swainson's Hawk	<i>Buteo swainsoni</i>	W	R	A	
Grasslands					Bird	<u>Upland Sandpiper</u>	<i>Bartramia longicauda</i>	I	R	S*	SE
Grasslands					Bird	<u>Western Meadowlark</u>					

# Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type Level I</u>	<u>Habitat Type Level II</u>	<u>Habitat Type Level III</u>	<u>Habitat Type Level IV</u>	<u>Habitat Type Level V</u>	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>
Grasslands					Mammal	Raccoon	<i>Procyon lotor</i>	I	A		
Grasslands					Mammal	Coyote	<i>Canis latrans</i>	I	C		
Grasslands					Mammal	Meadow Vole	<i>Microtus</i> <i>I C</i>				

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Grasslands					Mammal	Bobcat	<i>Lynx rufus</i>				





Appendix C

Habitat Type  
Level I

Grasslands



Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Subterranean Systems					Amphibian	Northern Dusky Salamander	<i>Desmognathus fuscus</i>	SE	O		
Subterranean Systems					Amphibian	<u>Pickerel Frog</u>	<i>Rana palustris</i>	E, C, WC	O		SC
Subterranean Systems					Amphibian	<u>Green Salamander</u>	<i>Aneides aeneus</i>	SE	R		SE
Subterranean Systems	Cave aquatic and terrestrial features				Mammal	Big Brown Bat	<i>Eptesicus fuscus</i>	I	A		
<b>Subterranean Systems</b>	<b>Cave aquatic and terrestrial features</b>				<b>Mammal</b>	<b>Eastern Pipistrelle</b>	<i>Pipistrellus subflavus</i>	<b>S</b>	<b>C</b>		
Subterranean Systems	Cave aquatic and terrestrial features				Mammal	Little Brown Myotis	<i>Myotis lucifugus</i>	I	C		
Subterranean Systems	Cave aquatic and terrestrial features				Mammal	Northern Myotis	<i>Myotis septentrionalis</i>	I	C		

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Subterranean Systems	Cave aquatic and terrestrial features				Mammal	<u>Indiana Myotis</u>	<u>Myotis sodalis</u>	I	O		FE

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Wetlands					Bird	Red-Winged Blackbird	<i>Agelaius phoeniceus</i>	I	A	R*	
Wetlands	emergent				Bird	Red-Winged Blackbird	<i>Agelaius phoeniceus</i>	I	A	R*	
Wetlands	emergent				Bird	American Black Duck	<i>Anas rubripes</i>	I	C	R*	
Wetlands	emergent				Bird	Killdeer	<i>Charadrius vociferus</i>	I	C	R*	
Wetlands	emergent				Bird	Pied-Billed Grebe	<i>Podilymbus podiceps</i>	I	C	R*	

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type Level I</u>	<u>Habitat Type Level II</u>	<u>Habitat Type Level III</u>	<u>Habitat Type Level IV</u>	<u>Habitat Type Level V</u>	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>
Wetlands	emergent				Bird	<u>Black Tern</u>	<i>Chlidonias niger</i>	I	O	S*	SE
Wetlands	emergent				Bird	Black-Bellied Plover	<i>Pluvialis squatarola</i>	I	O	M	
Wetlands	emergent				Bird	Blue-Winged Teal	<i>Anas discors</i>	I	O	S*	
Wetlands	emergent				Bird	Dunlin	<i>Calidris alpina</i>	I	O	M	
Wetlands	emergent				Bird	Gadwall	<i>Anas strepera</i>	I	O	M*	
Wetlands	emergent				Bird	<u>Great Egret</u>	<i>Ardea alba</i>	I	O	S*	SC
Wetlands	emergent				Bird	Greater Yellowlegs	<i>Tringa melanoleuca</i>	I	O	M	
Wetlands	emergent				Bird	Green-Winged Teal	<i>Anas crecca</i>	I	O	M*	
Wetlands	emergent				Bird	Horned Grebe	<i>Podiceps auritus</i>	I	O	W(*)	
Wetlands	emergent				Bird	Least Sandpiper	<i>Calidris minutilla</i>	I	O	M	
Wetlands	emergent				Bird	Lesser Yellowlegs	<i>Tringa flavipes</i>	I	O	M	

Wetlands emergent OR\*

Bird

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type Level I</u>	<u>Habitat Type Level II</u>	<u>Habitat Type Level III</u>	<u>Habitat Type Level IV</u>	<u>Habitat Type Level V</u>	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>
Wetlands	emergent				Bird	Northern Pintail	<i>Anas Acuta</i>	I	O	M*	
Wetlands	emergent				Bird	Northern Shoveler	<i>Anas clypeata</i>	I	O	M*	
Wetlands	emergent				Bird	Pectoral Sandpiper	<i>Calidris melanotos</i>	I	O	M	
Wetlands	emergent				Bird	<u>Sandhill Crane</u>	<i>Grus canadensis</i>	I	O	M*	SC
Wetlands	emergent				Bird	Semipalmated Plover	<i>Charadrius semipalmatus</i>	I	O	M	
Wetlands	emergent				Bird	Semipalmated Sandpiper	<i>Calidris pusilla</i>	I	O	M	
Wetlands	emergent				Bird	Short-Billed Dowitcher	<i>Limnodromus griseus</i>	I	O	M	
Wetlands	emergent				Bird	Solitary Sandpiper	<i>Tringa solitaria</i>	I	O	M	
Wetlands	emergent				Bird	Spotted Sandpiper	<i>Actitis macularia</i>	I	O	S*	
Wetlands	emergent				Bird	Swamp Sparrow	<i>Melospiza georgiana</i>	I	O	R*	
Wetlands	emergent				Bird	Tree Swallow	<i>Tachycineta bicolor</i>	I	O	S*	



## Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Wetlands	emergent				Bird	Tundra Swan	<i>Cygnus columbianus</i>				



## Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type Level I</u>	<u>Habitat Type Level II</u>	<u>Habitat Type Level III</u>	<u>Habitat Type Level IV</u>	<u>Habitat Type Level V</u>	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>
Wetlands	emergent				Bird	Nelson's Sharp-Tailed Sparrow	<i>Ammodramus nelsoni</i>	I	R	M	Habitat T

Appendix C: Guilds by Habitat and Sub-habitat

Habitat Type  
Level I





Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u>
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Appendix C: Guilds by Habitat and Sub-habitat

Habitat Type  
Level I

Habitat Type  
Level II

Habitat Type  
Level III



Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>
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Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Wetlands	Herbaceous Marsh				Amphibian	Wood Frog	<i>Rana sylvatica</i>	I	O		
Wetlands	Herbaceous Marsh				Amphibian	<u>Plains Leopard Frog</u>	<u><i>Rana blairi</i></u>	W	R		SC



Appendix C: Guilds by Habitat and Sub-habitat

Habitat Type  
Level I

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Wetlands	Mudflats				Bird	Short-Billed Dowitcher	<i>Limnodromus griseus</i>	I	O	M	
Wetlands	Mudflats				Bird	Solitary Sandpiper	<i>Tringa solitaria</i>	I	O	M	
Wetlands	Mudflats				Bird	Spotted Sandpiper	<i>Actitis macularia</i>	I	O	S*	
Wetlands	Mudflats				Bird	Western Sandpiper	<i>Calidris mauri</i>	I	O	M	
Wetlands	Mudflats				Bird	Wilson's Snipe	<i>Gallinago delicata</i>	I	O	R*	
<b>Wetlands</b>	<b>Mudflats</b> <i>Other</i>	<i>Mudflats</i>			<b>Bird</b>	<b>Least Sandpiper</b>	<i>Calidris minutilla</i>	<b>I</b>	<b>O</b>	<b>M</b>	
Wetlands	Mudflats				Bird	American Avocet	<i>Recurvirostra americana</i>	I	R	M(*)	
Wetlands	Mudflats				Bird	Baird's Sandpiper	<i>Calidris bairdii</i>	I	R	M	
Wetlands	Mudflats				Bird	Black-Necked Stilt	<i>Himantopus mexicanus</i>	I	R	A	
Wetlands	Mudflats				Bird	Buff-Breasted Sandpiper	<i>Tryngites subruficollis</i>	I	R	M	
Wetlands	Mudflats				Bird	Curlew Sandpiper	<i>Calidris ferruginea</i>	I	R	A	



Appendix C: Guilds by Habitat and Sub-habitat

Habitat Type  
Level I

Habitat Type  
Level II

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Wetlands	Permanent				Amphibian	Fowler's Toad	<i>Bufo fowleri</i>	I	C		
Wetlands	Permanent				Amphibian	Green Frog	<i>Rana clamitans</i>	I	C		
Wetlands	Permanent				Amphibian	<u>Northern Leopard Frog</u>	<i>Rana pipiens</i>	N, E	C		SC
Wetlands	Permanent				Amphibian	Southern Leopard Frog	<i>Rana utricularia</i>	S, C	C		
<b>Wetlands</b>	<b>Permanent</b>				<b>Amphibian</b>	<b>Spring Peeper</b>	<i>Pseudacris crucifer</i>	<b>I</b>	<b>C</b>		
Wetlands	Permanent				Amphibian	Eastern Newt	<i>Notophthalmus viridescens</i>	I	O		
Wetlands	Permanent				Amphibian	Eastern Spadefoot	<i>Scaphiopus holbrookii</i>	S	O		
Wetlands	Permanent				Amphibian	Lesser Siren	<i>Siren intermedia</i>	W	O		
Wetlands	Permanent				Amphibian	Wood Frog	<i>Rana sylvatica</i>	I	O		
Wetlands	Permanent				Amphibian	<u>Four-Toed Salamander</u>	<i>Hemidactylum scutatum</i>	N, C	R		ST
Wetlands	Permanent				Amphibian	<u>Plains Leopard Frog</u>	<i>Rana blairi</i>	W	R		SC

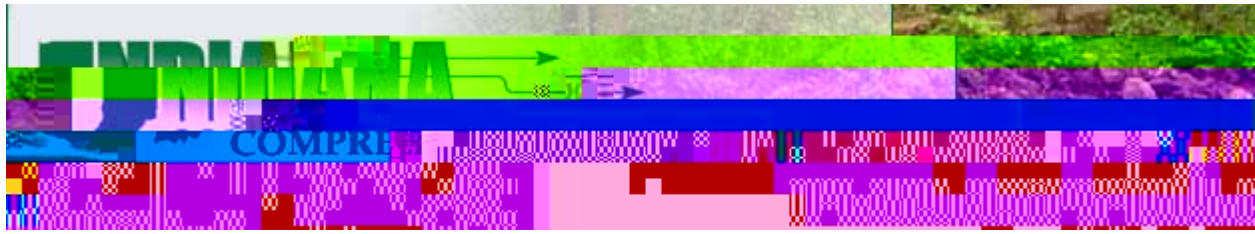


Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type Level I</u>	<u>Habitat Type Level II</u>	<u>Habitat Type Level III</u>	<u>Habitat Type Level IV</u>	<u>Habitat Type Level V</u>	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>
Wetlands	Permanent				Amphibian	*Mole Salamander	<i>Ambystoma talpoideum</i>				
Wetlands	Permanent				Amphibian	Green Treefrog	<i>Hyla cinerea</i>				

## Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type Level I</u>	<u>Habitat Type Level II</u>	<u>Habitat Type Level III</u>	<u>Habitat Type Level IV</u>	<u>Habitat Type Level V</u>	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>
Wetlands	Permanent				Reptile	<u>Copperbelly Water Snake</u>	<i>Nerodia erythrogaster</i>	SW, NE, SC	O		ST, FC



## Welcome to the INCWS Questionnaire

### Habitats and Species

Managing wildlife resources in a state that has experienced intense land use from agriculture, and more recently urban development, is a real challenge. Invasive species are radically changing the vast inland seas of the Great Lakes, including Lake Michigan and its tributaries. We're doing a lot of cutting edge work to keep our options open for the future, both ecologically and economically.

We are restoring a selection of species that were part of our natural and cultural history, including river otters, bald eagles, and osprey. These species uniquely lend themselves to restoration techniques because their populations had declined, but adequate habitat still existed in some parts of Indiana. Once the habitat is gone, restoration of associated wildlife species is no longer possible.

Restoring many of the other 550 species of nongame and endangered animals one at a time would be a daunting task. Therefore, we've chosen to manage for the habitat that they need to thrive. By using this strategy, we can be sure that all species will continue to have a place in the Indiana landscape. This is especially crucial for species that are so rare or unusual that we do not know much about their life history or survival requirements.

#### Habitat Identification

Over 100 specific habitat types have been identified in Indiana, and Indiana State University (ISU) has been contracted to research and compile data on these habitats using GIS databases. Specifically, ISU will be compiling quantitative or index information on the total acreage, geographic distribution, patch size, native vs. non-native, vegetation diversity and relative abundance, ownership, and relative condition of the habitats. Additionally, ISU is compiling historical trends in wildlife species occurrences for each of the habitat types in 1800, 1900, and 2000.

#### Wildlife Guilds and Representative Species

Using the "Indiana Academy of Science Revised Checklist of the Vertebrates of Indiana" as a guide, technical experts listed all vertebrate wildlife species with their associated habitats, forming habitat guilds. Wildlife professionals then selected wildlife species to serve as representatives of each guild. The selected species were identified, in part, to "paint a reasonable mental picture" of the associated habitat type to diverse user groups. One to three representative species were selected for each habitat. Through this process, a total of 210 representative species have been identified.

#### Items 1 through 5

The survey will begin with a request for basic information of name, organization and email. Then you will be asked to select the major taxonomic group of your expertise (e.g. Amphibians, Birds, Fish, Mammals, Mussels or Reptiles). Next you will select both a species and a habitat (to view these lists visit <http://www.djcase.com/incws/habitats-species.htm>). It is pertaining to this specific species/habitat that you complete the following questions:

## Species Population Threats in Indiana

6. Please rank the following threats to the \_\_\_\_\_ SPECIES in the \_\_\_\_\_  
HABITAT in Indiana.

Specialized reproductive behavior or low reproductive rates

---

Degradation of movement/migration routes (overwintering habitats, nesting and staging sites)

---

Genetic pollution (hybridization)

---

Other (please specify below)

---

**8. Other threats to the \_\_\_\_\_ SPECIES in the \_\_\_\_\_ HABITAT in Indiana.**

**9. Please briefly describe the top two threats to the \_\_\_\_\_ SPECIES in the \_\_\_\_\_ HABITAT in Indiana.**

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Note: Until the Next button is clicked, your answers to this page are not saved and will be lost if you click the Back button.

## Habitat Threats in Indiana

10. Please rank the following threats to the \_\_\_\_\_ HABITAT as it pertains to the \_\_\_\_\_ SPECIES in Indiana.

	Critical Threat	Serious Threat	Somewhat of a Threat	Slight Threat	No Threat	Unknown
Commercial or residential development (sprawl)						
Counterproductive financial incentives or regulations						
Invasive/non-native species						
Nonpoint source pollution (sedimentation and nutrients)						
Habitat fragmentation						
Successional change						
Diseases (of plants that create habitat)						
Habitat degradation						
Climate change						
Stream channelization						
Impoundment of water/flow regulation						
Agricultural/forestry practices						
Residual contamination (persistent toxins)						
Point source pollution (continuing)						
Mining/acidification						
Drainage practices (stormwater runoff)						

**11. Other threats to the \_\_\_\_\_ HABITAT as it pertains to the \_\_\_\_\_ SPECIES in Indiana.**

**12. Please briefly describe the top two threats to the \_\_\_\_\_ HABITAT as it pertains to the \_\_\_\_\_ SPECIES in Indiana.**

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## **Current Species Monitoring Efforts in Indiana**



**14. What current monitoring efforts by other organizations are you aware of for the \_\_\_\_\_ SPECIES in the \_\_\_\_\_ HABITAT in Indiana.**

**Yes, these efforts occur**

**Not aware of these efforts occurring**

---

Statewide year-round monitoring conducted by other organizations

---

Statewide once a year monitoring conducted by other organizations

---

Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations

---

Occasional statewide (less than once a year) monitoring conducted by other organizations

---

15. How crucial are these monitoring efforts by state agencies for the conservation of \_\_\_\_\_ SPECIES in the \_\_\_\_\_ HABITAT in Indiana.



**18. Regional or local monitoring by other organizations for \_\_\_\_\_ SPECIES in  
\_\_\_\_\_ HABITAT in Indiana.**

**19. Please list organizations that are monitoring the \_\_\_\_\_ SPECIES in  
\_\_\_\_\_ HABITAT in Indiana.**

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## Current Species Monitoring Techniques in Indiana

20. What are the current monitoring techniques for the \_\_\_\_\_ SPECIES in the \_\_\_\_\_ HABITAT in Indiana.

If a technique is not applicable to the \_\_\_\_\_ SPECIES in the \_\_\_\_\_ HABITAT, do not select a response in that row.

**Frequently**

## 21. Other monitoring tech

### Current Habitat Inventory and Assessment Efforts

23. What current inventory and assessment efforts or activities by state agencies are you aware of for the \_\_\_\_\_ HABITAT as it pertains to the \_\_\_\_\_ SPECIES in Indiana?

	Yes, these efforts occur	No effort that I'm aware of
Statewide annual inventory and assessment conducted by state agencies		
Statewide once a year inventory and assessment conducted by state agencies		
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies		
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies		
Regional or local year-round inventory and assessment conducted by state agencies		
Regional or local once a year inventory and assessment conducted by state agencies		
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies		
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies		

**24. What current inventory and assessment efforts or activities by state agencies are you aware of for the \_\_\_\_\_ HABITAT as it pertains to the \_\_\_\_\_ SPECIES in Indiana?**

**Yes, these efforts occur      No effort that I'm aware of**

---

Statewide annual inventory and assessment conducted by other organizations

---

Statewide once a year inventory and assessment conducted by other organizations

---

Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations

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Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations

---

Regional or local year-round inventory and assessment conducted by other organizations

---

Regional or local once a year inventory and assessment conducted by other organizations

---

Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations

---

Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations

---





**26. How crucial are these efforts by other organizations for the conservation \_\_\_\_\_  
HABITAT as it pertains to the \_\_\_\_\_ SPECIES in Indiana?**

	<b>These efforts are very crucial for this HABITAT</b>	<b>These efforts are somewhat crucial for this HABITAT</b>	<b>These efforts are slightly crucial for this HABITAT</b>	<b>These efforts are not crucial for this HABITAT</b>	<b>Unknown</b>
Statewide annual inventory and assessment conducted by other organizations					
Statewide once a year inventory and assessment conducted by other organizations					
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations					
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations					
Regional or local year-round inventory and assessment conducted by other organizations					
Regional or local once a year inventory and assessment conducted by other organizations					
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations					
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations					

**Please list where the following efforts occur in Indiana:**

**27. Regional or local state agency inventory and assessment for the \_\_\_\_\_ HABITAT as it pertains to the \_\_\_\_\_ SPECIES in Indiana?**

**28. Regional or local inventory and assessment by other organizations for the \_\_\_\_\_ HABITAT as it pertains to the \_\_\_\_\_ SPECIES in Indiana?**

**29. Please list organizations that are monitoring the \_\_\_\_\_ HABITAT as it pertains to the \_\_\_\_\_ SPECIES in Indiana?**

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## Current Body of Science for Species in Indiana

33. What is the current body of science for the \_\_\_\_\_ SPECIES in the \_\_\_\_\_ HABITAT in Indiana?

Complete, up to date and extensive

Adequate

Inadequate

Nonexistent

Other (please explain below)

34. Please provide a citation (title, author, date, publisher) that would give the best overview of the \_\_\_\_\_ SPECIES in the \_\_\_\_\_ HABITAT in Indiana, if available. These resources may be used if further detail is needed.

Title

## Current Body of Science for Habitat in Indiana

36. What is the current body of science for the \_\_\_\_\_ HABITAT as it pertains to the \_\_\_\_\_ SPECIES in Indiana?

Complete, up to date and extensive

Adequate

Inadequate

Nonexistent

Other (please explain below)





## **Habitat Research Needs in Indiana**



**44. Other current conservation practices for the \_\_\_\_\_ SPECIES in the \_\_\_\_\_ HABITAT in Indiana?**

**45. What one or two specific practices would you recommend for more effective conservation of the \_\_\_\_\_ SPECIES in the \_\_\_\_\_ HABITAT in Indiana?**

Suggest both intensive and less intensive practices, especially any methods that are nationally or regionally accepted or funded. Please describe and exw.c1497 TD3(the \_furcu)6(infallyrm)6()5(a).EEMC/P MCID 15 B



47. Other current conservation practices for the \_\_\_\_\_ HABITAT as it pertains to the \_\_\_\_\_ SPECIES in Indiana.

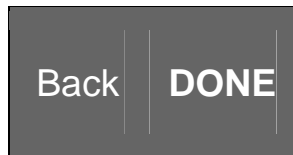
48. What one or two specific practices would you recommend for more effective conservation of the \_\_\_\_\_ HABITAT as it pertains to the \_\_\_\_\_ SPECIES in Indiana?

Suggest both intensive and less intensive practices, especially any methods that are nationally or regionally accepted or funded. Please describe and explain why. Provide a reference or resource for further information.

Back Next

Note: Until the Next button is clicked, your answers to this page are not saved and will be lost if you click the Back button.

**49. Do you have any additional comments or information on the species that you feel would be useful in the development of the Indiana Comprehensive Wildlife Strategy?**



**Survey completed**



## Appendix E-1: Agriculture

7. Please also rank these threats to the Wildlife in Agricultural Habitats in Indiana.





## Appendix E-1: Agriculture

**12.** Please briefly describe the top two HABITAT threats to the W

**14.**

## Appendix E-1: Agriculture

**15.** How crucial are these monitoring efforts by state agencies for the conservation of the Wildlife in Agricultural Habitats in Indiana?

	<b>Very crucial</b>	<b>Somewhat crucial</b>	<b>Slightly crucial</b>	<b>Not crucial</b>	<b>Unknown</b>	<b>Response Total</b>
Statewide year-round monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	<b>2</b>
Statewide once a year monitoring conducted by state agencies	33% (1)	0% (0)	0% (0)	33% (1)	33% (1)	<b>3</b>
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	<b>2</b>
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	<b>2</b>
Regional or local year-round monitoring conducted by state agencies	0% (0)					

## Appendix E-1: Agriculture

**16.** How crucial are these monitoring efforts by other organizations for the conservation of the Wildlife in Agricultural Habitats in Indiana?

	<b>Very crucial</b>	<b>Somewhat crucial</b>	<b>Slightly crucial</b>	<b>Not crucial</b>	<b>Unknown</b>	<b>Response Total</b>				
Statewide year-round monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	<b>2</b>				
Statewide once a year monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	<b>2</b>				
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	<b>2</b>				
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	<b>2</b>				
Regional or local year-round monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	<b>2</b>				
Regional or local once a year monitoring conducted by other organizations	33% (1)	33% (1)	0% (0)	33% (1)	0% (0)	<b>3</b>				

## Appendix E-1: Agriculture

**19.** Please list organizations that are monitoring the Wildlife in Agricultural Habitats in Indiana.

ISU

Chicago Wilderness  
Robert Brodman, Saint Joseph's College

**Total Respondents      2**

## Appendix E-1: Agriculture

**21.** Other monitoring techniques for the Wildlife in Agricultural Habitats in Indiana.

No responses were entered for this question.

<b>Total Respondents</b>	<b>0</b>
(skipped this question)	1

## Appendix E-1: Agriculture

**24.** What current HABITAT inventory and assessment efforts or activities by other organizations are you aware of for the Wildlife in Agricultural Habitats in Indiana?

**Yes, these efforts**



25.



## Appendix E-1: Agriculture

**27.** Regional or local state agency HABITAT inventory and assessment for the Wildlife in Agricultural Habitats in Indiana.

Frog call surveys include rural and agricultural areas throughout the state.

**Total Respondents**      **1**

**28.** Regional or local HABITAT inventory and assessment by





## Appendix E-1: Agriculture

**35.** If possible, please provide a second citation (title, author, date, publisher) that would give another good overview of the Wildlife in Agricultural Habitats in Indiana. This resource may also be used if further detail is needed.

		Response Total	Response Percent
Title	Multivariate analyses of the influences of water chemistry and habitat parameters on the abundances of pond-breeding amphibians.	2	100%
Author	see above for more Robert Brodman et al	1	50%
Date	2003	1	50%
Publisher	Journal of Freshwater Ecology 18: 425-436.	1	50%
<b>Total Respondents</b>		<b>2</b>	

**36.** What is the current HABITAT body of science for the Wildlife in Agricultural Habitats in Indiana?

		Response Total	Response Percent
Complete, up to date and extensive		0	0%
Adequate		0	0%
Inadequate		2	100%
Nonexistent		0	0%

## Appendix E-1: Agriculture

**38.**

If possible, please provide a second citation (title, author, date, publisher) that would give another good HABITAT

41.

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## Appendix E-1: Agriculture

**43.** How well do the following conservation efforts address the threats to the Wildlife in Agricultural Habitats in Indiana?

**Very well      Somewhat      Not at all      Not used**

## Appendix E-1: Agriculture

**45.** What one or two specific practices would you recommend for more effective conservation of the Wildlife in Agricultural Habitats in Indiana?

Protection of fishless breeding habitat, wetland restoration

about the only one that would be effective would be to manage succession such that proper habitat was more abundant and closer together

Protection of ephemeral wetlands and control of purple loosesrife

47.

6.

---

7.

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## Appendix E-2: Aggregated Aquatic Systems

9. Please briefly describe the top two threats to ALL wildlife in all Aquatic Systems Habitats in Indiana identified above.

- Wetland loss and degradation
- Habitat loss mostly related to urban sprawl. Degradation of migration routes, also often related to urban sprawl and other development.
- Urbanization.
- Pollution/degradation of aquatic systems: reproductive performance of otters can be compromised by high levels of
- PCBs, heavy metals, etc. that bio-accumulate in the aquatic food chain. Direct loss of aquatic habitats such as wetlands, marshes, etc. also impact otters... but not to the extent pollutants could.
- Human disturbance.
- Modification/degradation of habitats.
- Over-population.
- Habitat loss (feeding areas) - many reservoirs are getting very old and the once abundant standing timber is now diminishing which is reducing cover for white crappie.
- Dependence on irregular sources - in many reservoirs, shad is the dominant forage base for crappie. If shad are growing extremely fast, crappie can only utilize shad for a short period of time before the shad outgrow the size crappie can consume.
- Competition with invasives, namely gizzard shad.
- Water level control regimes at impoundments.
- Loss or degradation of nesting habitat. Loss or degradation of brood-rearing and foraging areas.
- Habitat loss-urbanization and habitat loss-breeding, feeding, and foraging.
- Habitat loss.
- Degradation of movement/migration routes.
- Year class failure related to low spawner stock abundance. Competition with non native species for limited available food resources.
- Lack of successful spawning, possibly related to bioenergetics. Too much egg predation.
- Long-term declines in water quality associated with lake eutrophication.
- Annual and seasonal variations in habitat availability.
- Cold, clear water is critical for cisco survival; increased runoff and nutrient loading have degraded the habitat for this species in many of the 50+ lakes it once occurred in. Few lakes still have the species, and there is

## Appendix E-2: Aggregated Aquatic Systems

- Loss of undisturbed natural lake habitat.
- Habitat loss & habitat degradation.
- Sediment deposition.
- Habitat loss (loss of large nesting trees).
- Loss of brood rearing habitat.
- Loss of high quality nesting habitat.
- Habitat loss.
- Degradation of movement/migration routes.
- Although not habitat specific, the inability to responsibly and proactively manage mink according to the wildlife conservation model, as opposed to reactive measures through nuisance practices, is a concern regarding the conservation of mink. This concern applies across the landscape, not just in urban and suburban environments.
- Past pollution problems and dams on rivers block migration.
- Exotic species competition, specifically the round goby.
- Habitat degradation, non-point sources runoff resulting from loss of riparian buffers due to development.
- High sediment loads during spring rains.
- The acute effects of toxicants are recognized as a threat to organisms, but there is little knowledge on ecosystems or regional effects on chronic insults. Toxicants are more destructive to the embrolarva stages, but these are poorly documented. Pollution controls do not have definite focus on chronic effects.
- Habitat loss and pollution.
- Siltation- hornyhead chub are sight-feeders and mound builders for spawning; thus, muddy water will hamper their chances of survival and if the silt covers gravel and their nest, chances for successful reproduction will be limited.  
Competition from other species better adapted to muddy and silty stream conditions.
- Runoff, mostly agricultural.
- In-stream modifications.
- Pike have suffered a major loss of spawning habitat due



## Appendix E-2: Aggregated Aquatic Systems

- Dredging of headwater streams.
- Alterations of hydrology from land-use changes.
- Runoff.  
Habitat modification.

-



## Appendix E-2: Aggregated Aquatic Systems

10. Please rank the following threats to the HABITAT of ALL wildlife in all Aquatic Systems Habitats in Indiana.

<b>Critical threat</b>	<b>Serious threat</b>	<b>Somewhat of a threat</b>	<b>Slight threat</b>	<b>No threat</b>	<b>Unknown</b>	<b>Response Total</b>
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## Appendix E-2: Aggregated Aquatic Systems

**Total Respondents**

**3**

**12.** Please briefly describe the top two HABITAT threats to ALL wildlife in all Aquatic Systems Habitats in Indiana identified above.

- Habitat degradation & fragmentation.
- Urban sprawl and regulations that allow loss of habitat. The human/beaver interface usually results with either the habitat being eliminated or the beaver being eradicated.
- Urbanization.
- Water pollution not only impacts otter reproduction (see previous section), but may also impact the quantity/quality of aquatic prey for otters. Loss of wetland habitats reduces amount of suitable habitat for otters.
- Factors that affect food availability.
- Modification of stream shoreline habitats.
- Regulation of impounded water - extreme water fluctuations in mainly the Army Corps reservoirs can negatively effect crappie populations especially if the water fluctuations occur during spawning.
-

## Appendix E-2: Aggregated Aquatic Systems

- Habitat loss & degradation.
  - Stream channelization removing nesting sites and destroying brood habitat. Soil runoff caused by poor agricultural practices and urban development.
  - Channelization removes and/or changes the vegetative and invertebrate communities. Channelization also alters the natural water flow which results in a much degraded habitat.
  - The loss of bottomland hardwoods continues to be a threat. These areas provide a high quality food source and nesting sites for woodies.
- 
- Drainage Practices.
  - Stream channelization.
  - The participant is forced to speculate about the meaning of successional and climate change. Agriculture/Forestry practices have different effects. Grouping these practices as a single category does not appropriately represent the individual practice. Point and non-point pollution may have a positive or negative impact.
  - Sedimentation and dams fragmenting habitat.
  - Invasive species competition, specifically round goby interactions. Stream channelization results in

## Appendix E-2: Aggregated Aquatic Systems

- Top two threats from the list up above are habitat degradation and stream channelization
- Non-point source pollution in the form of sedimentation.
- Destruction of clear shaded waters by forestry/agricultural practices or stream channelization.
- Habitat degradation of streams.
- Instream modifications, runoff, both agricultural and residential, agricultural runoff.
- Impoundment.
- Any significant sedimentation into the stream can become a major threat.  
Any toxins or pollutants are a critical threat.
- Any channelization which reduces the shallow (less than 1.5 feet) sand/gravel substrate can critically reduce or fragment habitat.
- Habitat degradation - sedimentation, channelization, cover removal, riparian removal.
- Point source pollution - waste water treatment plants and confined feeding operations.
- Any practices that create more erosion/sediment deposition and eliminates instream cover is a serious threat.  
Therefore, I'd have to say nonpoint source pollution and habitat degradation are the most serious threats.
- Habitat degradation and stream channelization because this will directly affect the sediment transfer within the
- Breeding and feeding/foraging habitat loss due to sedimentation from farm fields and stream banks as well as the removal of natural riparian vegetation especially thru drainage maintenance activities.
- Habitat degradation by sedimentation, channelization, cover removal, riparian removal.
- Point source pollution - these eco-regions have major threats from large cities causing fish kills from waste water treatment plans. Also confined feeding operations in the rural areas are a major threat to the stream fish

## Appendix E-2: Aggregated Aquatic Systems

- Rowcrop practices: crushing nests during ground insect/weed control; crushing overwinter hatchlings during harvest & early spring plowing
- Pollutants and toxins are major threats.

Habitat degradation may be a factor, since there are large expanses in the Wabash and East Fork White River where relic valves are common, but the living species is absent.

- Habitat degradation and stream channelization as development continues in the Ohio River Drainage Habitat.

**Total Respondents                    56**

## Appendix E-2: Aggregated Aquatic Systems

**13.** What current monitoring efforts by state agencies are you aware of for ALL wildlife in all Aquatic Systems Habitats in Indiana?

**Yes, these efforts occur**

**Not aware of these efforts occurring**

**Response**



## Appendix E-2: Aggregated Aquatic Systems

14.	What current monitoring efforts by other organizations are you aware of for ALL wildlife in all Aquatic Systems Habitats in Indiana?	Yes, these efforts occur	Not aware of these efforts occurring	Response Total
	Statewide year-round monitoring conducted by other organizations	2% (1)	98% (62)	<b>63</b>
	Statewide once a year monitoring conducted by other organizations	8% (5)	92% (59)	<b>64</b>
	Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (62)	<b>62</b>
	Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	2% (1)	98% (61)	<b>62</b>
	Regional or local year-round monitoring conducted by other organizations	8% (5)	94% (58)	

## Appendix E-2: Aggregated Aquatic Systems

monitoring conducted by state agencies

**Total Respondents 493**

**16.** How crucial are these monitoring efforts by other organizations for the conservation of ALL wildlife in all Aquatic Systems Habitats in Indiana?

	<b>Very crucial</b>	<b>Somewhat crucial</b>	<b>Slightly crucial</b>	<b>Not crucial</b>	<b>Unknown</b>	<b>Response Total</b>
Statewide year-round monitoring conducted by other organizations	3% (2)	5% (3)	11% (7)	47% (29)	34% (21)	<b>62</b>
Statewide once a year monitoring conducted by other organizations	6% (4)	2% (1)	15% (9)	44% (27)	34% (21)	<b>62</b>
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	3% (2)	5% (3)	13% (8)	44% (27)	34% (21)	<b>61</b>
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	3% (2)	3% (2)	13% (8)	47% (28)	33% (20)	<b>60</b>
Regional or local year-round monitoring conducted by other organizations	2% (1)	7% (4)	13% (8)	44% (27)	34% (21)	<b>61</b>
Regional or local once a year monitoring conducted by other organizations	8% (5)	8% (5)	19% (12)	37% (23)	27% (17)	<b>62</b>
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	5% (3)					

## Appendix E-2: Aggregated Aquatic Systems

### 17. Regional or local state agency monitoring for ALL wildlife in all Aquatic Systems Habitats in Indiana.

- State and county highway dept. monitor beaver activity only as flooding of roadways occur. IDNR property monitor and attempt to eliminate problems associated with flooding of adjacent private property. State Furbearer Biologist tracks and monitors trapping harvest data.
- IDNR personnel monitor otter mortality (road-kills, trap-related, etc.) at a statewide level. Also, IDNR personnel conduct winter bridge/stream surveys for otter sign. These are conducted on a county basis at a statewide level.
- Breeding Bird Atlas statewide every 20 years.
- Patoka Lake  
Hovey Lake

## Appendix E-2: Aggregated Aquatic Systems

Additionally, Indiana participates in the Harvest Information Program which can provide information about migration, population index and/or trends, as well as information about the amount of hunting pressure.

- Hovey Lake  
Tri-county  
Jasper Pulaski  
Pigeon River  
Winimac  
Willow Slough  
LaSalle
- IDEM annual eco-region sampling.
- IDNR-Fish and Wildlife, Lake Michigan Fisheries office.
- Headwater streams surveys were conducted in 2001 through 2004 by IDNR-Fish and Wildlife, Lake Michigan Fisheries Office.
- IDEM eco-region sampling.
- IDNR periodically conducts fish stream surveys. IDEM conducts stream health surveys using fish and invertebrates.
- IDEM monitors the Great Lakes Drainage once every five years; thus, they may have data available for hornyhead chub captured in the basin as part of the fish community assessments. IDNR may also sample fish communities in this area and have data on the hornyhead chub.
- Maumee system.
- DNR fishery surveys are occasionally conducted on the Iroquois River, the Yellow River, and the Kankakee River. IDEM occasionally samples fish for contaminants analysis for the annual Fish Consumption Advisory.
- IDEM and IDNR collect fish community samples in this area; thus, they may have data on the distribution of Least darters.
- IDEM monitors the Kankakee River basin once every five years to determine if the stream are supporting a well-balanced warmwater aquatic community. Tadpole madtoms may have been captured while sampling headwater streams.
- Random locations within the Kankakee drainage.
- IDEM and IDNR collect fish community samples in this area; thus, they may have data on the distribution of Least darters.
- IDNR non-game biologist does mussel surveys. But, he is only one person and there are thousands of miles of streams in state.
- Wabash system.
- IDEM and the DNR Nongame program also conduct monitoring during the field season, once a year for fish. These above fish surveys are not specific to the Orangethroat Darter, but would include the Orangethroat Darter.; IDEM and the DNR Nongame program also conduct fish monitoring during the field season. These above fish surveys are not specific to the Orangethroat Darter, but would include the Orangethroat Darter.
- IDEM monitors the health of major river basins every 5 years by looking at chemical, physical, and biological data collected at random locations within the watershed. Southern redbelly dace have been captured in the Ohio River Drainage Habitat; however, specific monitoring for the species has not occurred to my knowledge by anyone state or other organization.



## Appendix E-2: Aggregated Aquatic Systems

- Ask Zack Walker, I believe there was an accidental capture near Shoals.
- IDNR non-game biologist continually monitors fishes and mussels throughout the state, including Yellow Sandshell habitat. Two surveys have been done- ten years apart, completed last year - by IDNR biologists in the Wabash, Tippecanoe, and East Fork White Rivers; results are pending. This is in prime Yellow Sandshell habitat.
- Blue River (Harrison County)  
East Fork White River  
West Fork White River

**Total Respondents**

**60**

## Appendix E-2: Aggregated Aquatic Systems

- 18.** Regional or local monitoring by other organizations for ALL wildlife in all Aquatic Systems Habitats in Indiana.

## Appendix E-2: Aggregated Aquatic Systems

- Uncertain.
- None known to occur that specifically target rock bass.
- West Fork White River & tributaries(Muncie area).
-



## Appendix E-2: Aggregated Aquatic Systems

**19.** Please list organizations that are monitoring ALL wildlife in all Aquatic Systems Habitats in Indiana.

- Brodman, Saint Joseph's College.
- Cortwright, IUN.
- IDNR.
- USGS (Breeding Bird Survey) and volunteers with Indiana Audubon Society.
- DNR/DFW.
- None known.
- Not known.
- Audubon Society, Ducks Unlimited, Indiana Division of Fish and Wildlife.
- Unknown.
- BBS.
- IDNR-Fish and Wildlife, Ball State University, University of Michigan through a coastal program grant. USFWS
- Indiana DNR, Division of Fish and Wildlife. Illinois Natural History Survey, USFWS.

## Appendix E-2: Aggregated Aquatic Systems

- USDA Forest Service, Hoosier National Forest; USDI Fish and Wildlife Service; IDEM; IDNR; USDA Forest Service, Hoosier National Forest; USDI Fish and Wildlife Service; IDEM; IDNR.
- Consultant.
- TNC.
- TNC, USFWS.
- Uncertain.
- DNR/DFW.
- None known that specifically target rock bass.
- Muncie Bureau of Water Quality.
- DNR/DFW.
- None known that are specifically targeting smallmouth bass.
- USFWS.
- USFWS.
- Consultants.
- DNR/DFW.
- Electric utilities, Ball State University, Purdue University.
- None.
- IDEM monitors fish communities not particular species; however, the Slough darter has been captured by electrofishing in the Ohio River Drainage Habitat.
- DNR/DFW.

**Total Respondents**

**40**



## Appendix E-2: Aggregated Aquatic Systems

### 21. Other monitoring techniques for ALL wildlife in all Aquatic Systems Habitats in Indiana.

- Techniques currently in use in Indiana appear to be covered by the selections above.
- Unknown.
- Aerial surveys.
- Long term monitoring through gillnets, trawling has been conducted at 3 sites along the lake michigan lakefront since the mid 70's by Ball State University during the summer season. Creel census has been conducted by IDNR-Fish and Wildlife division for approximately 20 years. Commercial monitoring was conducted until the halt of the commercial fishing industry in 1996.
- Nest box survey.
- Nest box surveys.
- Electro-fishing and seining are appropriate methods for monitoring the Orangethroat darter.; Electro-fishing and seining are appropriate methods for monitoring the Orangethroat darter.; Electro-fishing and seining are appropriate monitoring techniques for the Orangethroat Darter.
- Unintentional take could be monitored from fish kill cadaver counts if the officers could be trained to identify norther hog suckers instead of not counting them or just lumping them into the generic class of "round bodied suckers"
- Larval sampling to check for reproduction.

**Total Respondents**

**9**

## Appendix E-2: Aggregated Aquatic Systems

22. What one or two monitoring techniques would you recommend for effective conservation of ALL wildlife in all Aquatic Systems Habitats in Indiana?

- Aquatic surveys and minnow traps.
- Regulated trapping.
- Stream surveys for otter sign.
- Reporting (number, location, etc.) of unintentional take and biological data obtained from recovered specimens (reproductive parameters).

REFERENCE: Melquist, W.E., P.J. Polechla, Jr. & J. Weill. 2003. River Otter. Pages 708-734 in Wild Mammals of North America: biology, management, and conservation. 2nd edition. G.A. Feldhamer, B.C. Thompson & J. A. Mittermeier. 111-112. ISBN 0-8061-3232-5. DOI: 10.1007/978-0-8061-5277-7\_11

## Appendix E-2: Aggregated Aquatic Systems

- Standard DFW creel survey procedures.
- Tournament monitoring by the DFW and bass clubs.
- Minnow trapping and either mark recapture or telemetry.
- Electrofishing.
- Trap nets.
- Brood surveys.
- Continued participation in HIP is perhaps the most cost effective method for monitoring the flyway population.
- Banding operations help in determining the status of populations on a local or statewide level.
- Brood counts.
- Increased banding efforts.
- Radio telemetry or mark & recapture.

picture of changes that occur to habitat, water quality and i1ttll 4TJET1 1u0 TcOied

## Appendix E-2: Aggregated Aquatic Systems

- Intensive quantitative sampling of known populations. Need to understand demography of the clubshell. See Strayer & Smith, 2003. AFS Monogr. 8.
- Less intensive qualitative sampling of new or not recently surveyed areas. Need to determine distribution and status of some wildlife species. See same for protocols.
- Electro-fishing streams. Take a random sampling of streams within a watershed (5th or 6th level HUC) and standardize the stream reach length for the survey...usually 15 times the stream width. Seining is also an appropriate method for sampling, especially in the riffle habitats.; Electro-fishing streams..take a random sampling of streams within a watershed (5th or 6th level HUC) and standardize the stream reach length for the survey...usually 15 times the stream width. Seining is also an appropriate method for sampling, especially in the riffle habitats.; Electro-fishing can be used to sample stream habitats. I suggest de30.95ng ie strstra7(lin)ne

## Appendix E-2: Aggregated Aquatic Systems

- Smallmouth bass population estimates.
- Intensive quantitative sampling of known populations. Need to understand demography of the clubshell. See Strayer & Smith, 2003. AFS Monogr. 8.
- Less intensive qualitative sampling of new or not recently surveyed areas. Need to determine distribution and status of the clubshell. See same for protocols.
- Intensive quantitative sampling of known populations. Need to understand demography of the clubshell. See Strayer & Smith, 2003. AFS Monogr. 8.
- Less intensive qualitative sampling of new or not recently surveyed areas. Need to determine distribution and

-





## Appendix E-2: Aggregated Aquatic Systems

**24.** What current HABITAT inventory and assessment efforts or activities by other organizations are you aware of for ALL wildlife in all Aquatic Systems Habitats in Indiana?

	<b>Yes, these efforts occur</b>	<b>No effort that I'm aware of</b>	<b>Response Total</b>
Statewide year-round inventory and assessment conducted by other organizations	2% (1)	98% (61)	<b>62</b>
Statewide once a year inventory and assessment conducted by other organizations	2% (1)	98% (61)	<b>62</b>

## Appendix E-2: Aggregated Aquatic Systems

25. How crucial are these HABITAT efforts by state agencies for the conservation of ALL wildlife in all Aquatic Systems Habitats in Indiana?

Appendix E-2: Aggregated Aquatic Systems

**26.** How crucial are these HABITAT efforts by other organizations for the conservation of ALL wildlife in all Aquatic Systems Habitats in Indiana?

<b>These efforts are very crucial for this HABITAT</b>	<b>These efforts are somewhat crucial for this HABITAT</b>	<b>These efforts are slightly crucial for this HABITAT</b>	<b>These efforts are not crucial for this HABITAT</b>	<b>Unknown</b>
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## Appendix E-2: Aggregated Aquatic Systems

- |     |  |
|-----|--|
| 27. | Regional or local state agency HABITAT inventory and assessment for ALL wildlife in all Aquatic Systems Habitats in Indiana. |
|-----|--|

## Appendix E-2: Aggregated Aquatic Systems

- IDEM conducts a habitat assessment while sampling stream for fish community assessments using the QHEI (Qualitative Habitat Evaluation Index).
- Wabash system.
- Wabash system.
- Tippecanoe River and Maumee system.
- (Usually species inventories are made, with relevant habitat information)
- Blue River (Harrison County)  
Sugar Creek (Shelby County)  
Indian Creek (Greene County)
- Indiana Department of Natural Resources - Division of Fish and Wildlife.
- Indiana Department of Environmental Management
- IDEM - statewide QHEI.



## Appendix E-2: Aggregated Aquatic Systems

- Unknown.
- USACOE Ohio River.
- USACOE Ohio River.
- If any inventory is occurring, it's for water quality or fish contamination.
- Occasional grants to universities?
- NONE

**Total Respondents**

**31**



## Appendix E-2: Aggregated Aquatic Systems

- IDEM, IDNR, USDA Forest Service, USDI Fish and Wildlife Service.
- IDEM- Qualitative Habitat Evaluations completed at sites where southern redbelly dace may have been captured as part of the fish community sampling program.
- Consultants.
- TNC.
- TNC, USFWS.
- DNR/DFW.
- None known.
- Muncie; Elkhart; USGS/WRD.
- DNR/DFW.
- None known.
- USFWS
- USFWS
- Consultants.
- DNR/DFW.
- Unknown.
- USACOE Ohio River
- USACOE Ohio River
- IDEM performs habitat assessments in this area whoever samples for state water pollution control.
- Fish quality? State board of health??
- IDEM makes assessments of the habitat while doing fish community surveys in the Ohio River Drainage Habitat.

## Appendix E-2: Aggregated Aquatic Systems

- 30.** What are the current HABITAT inventory and/or assessment techniques for ALL wildlife in all Aquatic Systems Habitats in Indiana?

## Appendix E-2: Aggregated Aquatic Systems

**31.** Other HABITAT inventory and assessment techniques for ALL wildlife in all Aquatic Systems Habitats in Indiana.

- None
- Unknown
- Bottom mapping of habitat
- IBI, and QHEI for representative sites.
- Qualitative Habitat Evaluation Index(QHEI); REMAP protocols for Northern Forested Streams; stream channel cross-sections and longitudinal profiles; substrate analysis; descriptions of

## Appendix E-2: Aggregated Aquatic Systems

- Unknown.
- Suvery (intensive) and GIS (less intensive).

## Appendix E-2: Aggregated Aquatic Systems

- QHEI.
- More habitat inventories and assessments.
- QHEI.
- GIS.
- Qualitative Habitat Evaluation Index (QHEI) in conjunction with a stream community survey or sampling specifically for smallmouth bass. This can show which habitat components most strongly correlate with smallmouth bass abundance and or size structure.
- Assess zebra mussel infestations. Contact P. Morrison, USFWS, Parkersburg, WV.
- Zebra mussel assessment. Contact P.

## Appendix E-2: Aggregated Aquatic Systems

- 34.** Please provide a citation (title, author, date, publisher) that would give the best overview of ALL wildlife in all Aquatic Systems Habitats in Indiana, if available. This resource may be used if further detail is needed.

Title = Amphibians and reptiles from 23 counties of Indiana.;

Author = Robert Brodman;

Date = 2003;

Publisher = Proceedings of the Indiana Academy of Science, 112: 43-54.

Title = Ten- to eleven-year population trends of two pond-breeding amphibian species, red-spotted newts and green frogs. In Status & Conservation of Midwestern;

Author = Spencer Cortwright;

Date = 1998;

## Appendix E-2: Aggregated Aquatic Systems

Title = Lake Trout Impediments Document;  
Author = Numerous,;  
Date = 2003;  
Publisher = Lake Trout Task group/LMTC

Title = Cisco population status and management in Indiana  
Author = Jed Pearson  
Date = 2001  
Publisher = Division of Fish and Wildlife

Title = Northern Pike Spawning Habitat Investigations At Two Natural Lake In Indiana  
Author = Cwalinski, Tim A.  
Date = September 2001  
Publisher = Indiana Department of Natural Resources

Title = DFW largemouth bass database  
Author = Jed Pearson  
Date = unpublished  
Publisher = unpublished

Title = Amphibians and reptiles from 23 counties of Indiana.  
Author = Robert Brodman  
Date = 2003  
Publisher = Proceedings of the Indiana Academy of Science, 112: 43-54

Title = Ecology and Management of the Wood Duck  
Author = Bellrose and Holm  
Date = 1994  
Publisher = Stackpole Books

Title = Fisheries Survey of the East Branch of the Little Calumet River Watershed  
Author = Neil Ledet  
Date = 1978  
Publisher = IDNR Fisheries Section

Title = Naiades of Pennsylvania  
Author = Ortmann  
Date = 1919  
Publisher = Carnegie Museum

## Appendix E-2: Aggregated Aquatic Systems

Title = Naiades of Pennsylvania  
Author = Ortmann  
Date = 1919  
Publisher = Carnegie Museum

Title = Federal Recovery Plan  
Author = USFWS  
Date = 1993  
Publisher = USFWS

Title = 'Clubshell'  
Author = USFW, Division of Endangered Species  
Date = 12/1997  
Publisher = Online

Ti997



## Appendix E-2: Aggregated Aquatic Systems

Author = Parmalee & Bogan

Date = 1998

Publisher = U of Tennessee Press

Title = Wabash River Catfish Reports

Author = Rob Columbo

Date = 2002,2003,2004,2005

Publisher = SIU/INDFW

Title = GIS mapping and aerial photography and analysis

Author = ORFMT

Date = annually since 1999

Publisher = ORFMT

Title =

Author = Minton

Date = 2001

Publisher =

Title = (Numerous internet sites, including USF&W)

Author =

Date =

Publisher =

Title = A survey of fish communities and aquatic habitats at Indiana's major streams with emphasis on smallmouth bass distribution and abundance

Author = Stuart Shipman

Date = 12/1997

Publisher = DNR/Fisheries section

## Appendix E-2: Aggregated Aquatic Systems

35.

## Appendix E-2: Aggregated Aquatic Systems

Title = Surveys of the fish communities and aquatic habitats in 16 small streams in Indiana from 1996 through 1997.  
Author = Douglas C. Keller  
Date = 1999  
Publisher = IDNR

Title = fishes of Tennessee  
Author = Etnire and Starnes  
Date =  
Publisher =

Title = FW fishes of Canada  
Author = Scott & Crossman  
Date =  
Publisher =

Title = Surveys of the fish communities and aquatic habitats in 16 small streams in Indiana from 1996 through 1997.  
Author = Douglas C. Keller  
Date = 1999  
Publisher = IDNR

Title = Life history and propagation...  
Author = Jones & Neves  
Date = 2002  
Publisher = JNABS

Title = Freshwater mussels of the Midwest  
Author = Cummings & Mayer  
Date = 1992  
Publisher = INHS

Title = numerous INDFW FMR's  
Author = Numerous  
Date = numerous  
Publisher = INDFW

Title = various INDFW FMR's  
Author = various  
Date = various  
Publisher = INDFW

Title = Freshwater Mussels of the Midwest  
Author = Cummings & Mayer  
Date = 1992  
Publisher = Illinois Natural History Survey

36. What is the current HABITAT body of science for ALL wildlife in all Aquatic Systems Habitats in Indiana?

Response Total	Response Percent
-------------------	---------------------



## Appendix E-2: Aggregated Aquatic Systems

Publisher = Carnegie Museum

Title = Naiades of Pennsylvania

Author = Ortmann

Date = 1919

Publisher = Carnegie Museum

Title = Federal Recovery Plan

Author = USFWS

Date = 1993

Publisher = USFWS

Title = A survey of fish communities and aquatic habitats at Indiana's major streams with emphasis on smallmouth bass distribution and abundance.

Author = Stuart T. Shipman

Date = December 1997

Publisher = IDNR

Title = A survey of fish communities and aquatic habitats at Indiana's major streams with emphasis on smallmouth bass distribution and abundance

Author = Stuart T. Shipman

Date = 12/1997

Publisher = DNR/Fisheries section

Title = A survey of fish communities and aquatic habitats at Indiana's major streams with emphasis on smallmouth bass distribution and abundance

Author = Stuart T. Shipman

Date = December 1997

Publisher = IDNR

Title = Federal Recovery Plan

Author = USFWS

Date = 1991

Publisher = USFWS

Title = Freshwater Mollusca of WI

Author = Baker

Date = 1928

Publisher = WI Geol. Nat. Hist. Surv.

## Appendix E-2: Aggregated Aquatic Systems

**38.** If possible, please provide a second citation (title, author, date, publisher) that would give another good HABITAT overview of ALL wildlife in all Aquatic Systems Habitats in Indiana. This resource may al

## Appendix E-2: Aggregated Aquatic Systems

39. What are the research needs for ALL wildlife in all Aquatic Systems Habitats in Indiana?

<b>Urgently needed</b>	<b>Greatly needed</b>	<b>Needed</b>	<b>Slightly needed</b>	<b>Not needed</b>	<b>Unknown</b>	<b>Response Total</b>
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## Appendix E-2: Aggregated Aquatic Systems

43.

45.

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## Appendix E-2: Aggregated Aquatic Systems

- Habitat protection.
- Eliminate instream modifications, including impoundment.
- Restore riparian corridor.
-

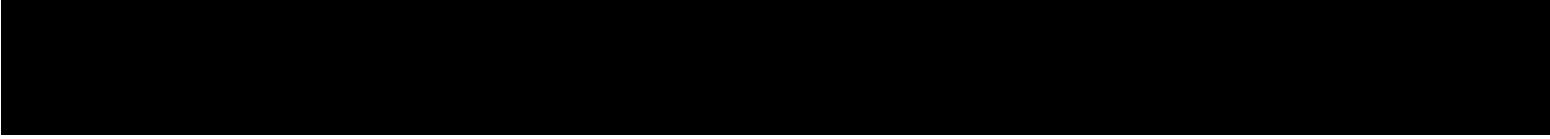
## Appendix E-2: Aggregated Aquatic Systems

- Protection of the habitat against pollutants and toxins.
- Expand and liberalize the taking of raccoons so as to greatly reduce numbers associated with river cooter habitat.
- Raccoon reduction used re. sea turtles in FL and endangered Illinois mud turtle in IA, proposed for alligators. in LA
- Cease any future channelization plans and restore existing oxbow ponds - provide landowner financial incentive.
- Local restocking where raccoons reduced should hasten delisting criteria.
- Habitat protection.



## Appendix E-2: Aggregated Aquatic Systems

47.





## Appendix E-2: Aggregated Aquatic Systems

areas and need to maintain riparian buffer strips.

- Protection and restoration of buffer zones.
- Protection of adjacent buffer zone.
- Non-point Source Pollution reduction.
-



## Appendix E-2: Aggregated Aquatic Systems

## Appendix E-2: Aggregated Aquatic Systems

specimens came from the Whitewater Basin in headwater streams <20 sq. miles with high gradient and high biological integrity.

- Too little is known about some wildlife species, especially Indiana populations.
- N/A
- N/A
- To find out just why the Clubshell depopulated so much of its former range, which once included much of the interior of Indiana. Knowing this "why" should disclose a critical limiting factor, and could lead to its future preservation.
- There is a great potential source for select avocational technical assistance (= volunteers) to undertake monitoring and survey where funding falls short.
- I would definitely search the internet for more information on specific studies done on the Eastern Sand Darter; however, I could not find much on the habitat itself in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage. IDEM has a list of sites of where Eastern Sand Darters have been collected with water chemistry and habitat (QHEI) assessments if interested.
- The length of this survey possibly destroys its usefulness as many/most experts will not have the time and or patience to do this for very many species; some may not even do it at all.
- No.
- N/A
- N/A
- No.
- The blue sucker population is doing well in the Wabash River and parts of the White River. Reintroduction into additional waterbodies is a possible option, but research is needed to determine why the population is healthy in the Wabash/White and not other Great Rivers.
-

## Appendix E-2: Aggregated Aquatic Systems

Vigo Co.

- No.

**Total Respondents**

**35**

## Appendix E-3: Aquatic Systems

**6.** Please rank the following threats to the Wildlife in Aquatic Systems Habitat in Indiana.

	<b>Critical threat</b>	<b>Serious threat</b>	<b>Somewhat of a threat</b>	<b>Slight threat</b>	<b>No threat</b>	<b>Unknown</b>	<b>Response Total</b>
Invasive/non-native species	0% (0)	0% (0)	0% (0)	25% (1)	25% (1)	50% (2)	<b>4</b>
High sensitivity to pollution	0% (0)	25% (1)	50% (2)	0% (0)	0% (0)	25% (1)	<b>4</b>
Bioaccumulation of contaminants	0% (0)	25% (1)	50% (2)	0% (0)	0% (0)	25% (1)	<b>4</b>

## Appendix E-3: Aquatic Systems

**7.** Please also rank these threats to the Wildlife in Aquatic Systems Habitat in Indiana.

**Critical threat    Serious threat**

## Appendix E-3: Aquatic Systems

**10.** Please rank the following threats to the HABITAT of the Wildlife in Aquatic Systems Habitat in Indiana.



## Appendix E-3: Aquatic Systems

**12.** Please briefly describe the top two HABITAT threats to the Wildlife in Aquatic Systems in Indiana identified above.

Habitat degradation & fragmentation

1. Urban sprawl and regulations that allow loss of habitat. The human/beaver interaction results in either the habitat being eliminated or the beaver being eradicated.

2. urbanization

Water pollution not only impacts otter reproduction (see previous section), but may also reduce the quantity/quality of aquatic prey for otters. Loss of wetland habitats reduces amount of prey available to otters.

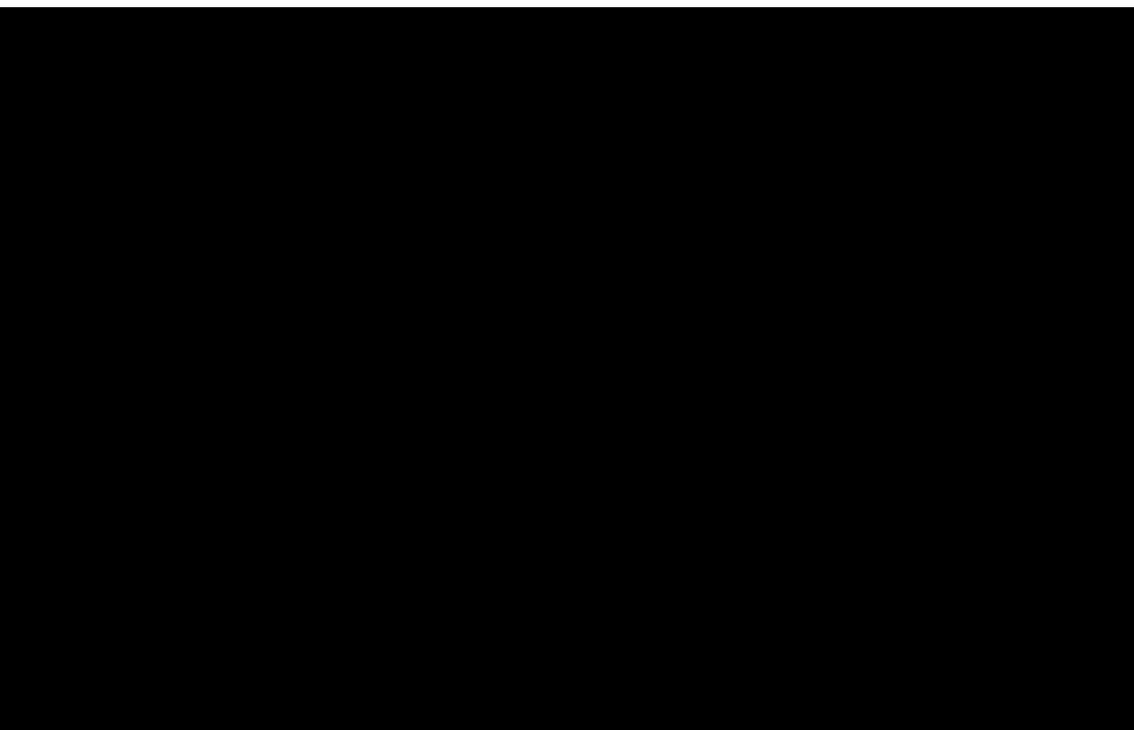
s 4

**13.** What current monitoring efforts by state agencies are you aware of for the Wildlife in Aquatic Systems Habitat in Indiana?

Yes, these efforts occur

Response Total

Statewide yo



**14.**

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## Appendix E-3: Aquatic Systems

monitoring conducted by state agencies

**Total Respondents**     **32**



**16.**

## Appendix E-3: Aquatic Systems

None that I am aware of.

**Total Respondents**

**2**

## Appendix E-3: Aquatic Systems

**19.** Please list organizations that are monitoring the Wildlife in Aquatic Systems Habitat in Indiana.

Brodman, Saint Joseph's College  
Cortwright, IUN

IDNR

**Total Respondents 2**

**20.** What are the current monitoring techniques for the Wildlife in Aquatic Systems Habitat in Indiana?

**Frequently**

## Appendix E-3: Aquatic Systems

**21.** Other monitoring techniques for the Wildlife in Aquatic Systems Habitat in Indiana.

Techniques currently in use in Indiana appear to be covered by the selections above.

**Total Respondents 1**

**22.** What one or two monitoring techniques would you recommend for effective conservation of the Wildlife in Aquatic Systems Habitat in Indiana?

Aquatic surveys and minnow traps

Regulated trapping.



## Appendix E-3: Aquatic Systems

**25.** How crucial are these HABITAT efforts by state agencies for the conservation of the Wildlife in Aquatic Systems Habitat in Indiana?

	<b>These efforts are very crucial for this HABITAT</b>	<b>These efforts are somewhat crucial for this HABITAT</b>	<b>These efforts are slightly crucial for this HABITAT</b>	<b>These efforts are not crucial for this HABITAT</b>	<b>Unknown</b>	<b>Response Total</b>
Statewide annual inventory and assessment conducted by state agencies	0% (0)	0% (0)	25% (1)	0% (0)	75% (3)	<b>4</b>
Statewide once a year inventory and assessment conducted by state agencies	0% (0)	25% (1)	0% (0)	0% (0)	75% (3)	<b>4</b>
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	0% (0)	25% (1)	0% (0)	75% (3)	<b>4</b>
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	25% (1)	0% (0)	0% (0)	75% (3)	<b>4</b>
Regional or local year-round inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)			





## Appendix E-3: Aquatic Systems

**28.** Regional or local HABITAT inventory and assessment by other organizations for the Wildlife in Aquatic Systems Habitat in Indiana.

1. Brodman, Saint Joseph's College in NW Indiana  
Cortwright, IUN in Brown County

**Total Respondents 1**

**29.** Please list organizations that are monitoring this HABITAT for the Wildlife in Aquatic Systems Habitat in Indiana.

See #27.

**Total Respondents 1**

**30.** What are the current HABITAT inventory and/or assessment techniques for the wildlife in Aquatic Systems Habitat in Indiana?

**Frequently  
used**





## Appendix E-3: Aquatic Systems

**36.** What is the current HABITAT body of science for th

## Appendix E-3: Aquatic Systems

**39.** What are the research needs for the Wildlife in Aquatic Systems Habitat in Indiana?

**Urgently  
needed    needed    Needed**



## Appendix E-3: Aquatic Systems

systems would be beneficial. Educational programs aimed to reduce incidental take would also benefit otters especially where population densities are lower.

**Total Respondents 3**

**46.** How well do the following conservation efforts address the HABITAT threats to the Wildlife in Aquatic Systems Habitat in Indiana?



## Appendix E-3: Aquatic Systems

Proper land use planning, at a watershed scale, would not only benefit otters but other aquatic and riparian species. Strict enforcement of existing pollution regulations, and if needed, development of stricter laws would be beneficial.



**Total Respondents**      **2**

## Appendix E-3: Aquatic Systems

- 49.** Do you have any additional comments or information on the Wildlife in Aquatic Systems Habitat that you feel would be useful in the development of the Indiana Comprehensive Wildlife Strategy?

## Appendix E-4: Dunes and Shorelines

**6.** Please rank the following threats to the wildlife in Dunes and Shorelines Habitat in Indiana.

	<b>Critical threat</b>	<b>Serious threat</b>	<b>Somewhat of a threat</b>	<b>Slight threat</b>	<b>No threat</b>	<b>Unknown</b>	<b>Response Total</b>	
Invasive/non-native species	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	<b>1</b>	
High sensitivity to pollution	0% (0)	0% (0)						

## Appendix E-4: Dunes and Shorelines

7. Please also rank these threats to the Wildlife in Dunes and Shorelines Habitat in Indiana.

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total
Habitat <del>is</del> (reedabig range)at							

## Appendix E-4: Dunes and Shorelines

**10.** Please rank the following threats to the HABITAT of the Wildlife in Dunes and Shorelines Habitat in Indiana.

**Critical  
threat**

## Appendix E-4: Dunes and Shorelines

<b>Total Respondents</b>	<b>1</b>
--------------------------	----------

<b>13.</b>	What current monitoring efforts by state agencies are you aware of for the Wildlife in Dunes and Shorelines Habitat in Indiana?
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Yes, these efforts occur	Not aware of these efforts occurring	Response Total
--------------------------	--------------------------------------	----------------

## Appendix E-4: Dunes and Shorelines

regularly scheduled) monitoring conducted by other organizations

## Appendix E-4: Dunes and Shorelines

**16.** How crucial are these monitoring efforts by other organizations for the conservation of the Wildlife in Dunes and Shorelines Habitat in Indiana?

	<b>Very crucial</b>	<b>Somewhat crucial</b>	<b>Slightly crucial</b>	<b>Not crucial</b>	<b>Unknown</b>	<b>Response Total</b>
Statewide year-round monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	<b>1</b>





## Appendix E-4: Dunes and Shorelines

1. Directed surveys (canoe surveys, migration counts) most intensive.  
General breeding bird surveys less intensive

**Total Respondents**

## Appendix E-4: Dunes and Shorelines

Periodic regional or local (less than once a year but still

## Appendix E-4: Dunes and Shorelines

2

How crucial are these HABITAT efforts by other organizations for the conservation of the Wildlife in Dunes and Shorelines Habitat in Indiana?

## Appendix E-4: Dunes and Shorelines

**Total Respondents**

**1**

**29.** Please list organizations that are monitoring this HABITAT for the Wildlife in Dunes and Shorelines Habitat in Indiana. [.hdi](#)

## Appendix E-4: Dunes and Shorelines

**32.** What one or two HABITAT inventory and assessment techniques would you recommend for effective conservation of the Wildlife in Dunes and Shorelines Habitat in Indiana?

1. aerial imagery to identify and quantify habitat.

**Total Respondents**      **1**

**33.** What is the current body of science for the Wildlife in Dunes and Shorelines Habitat in Indiana?

Complete, up to date and extensive

**Response Total**      **Response Percent**

**0**

## Appendix E-4: Dunes and Shorelines

**36.** What is the current HABITAT body of science for the

## Appendix E-4: Dunes and Shorelines

**39.** What are the research needs for the Wildlife in Dunes and Shorelines Habitat in Indiana?

**Urgently  
needed**   **Greatly  
needed**   **Needed**   **Slightly  
needed**   **Not  
needed**   **Unknown**





## Appendix E-4: Dunes and Shorelines

42. Other HABITAT research needs for the Wildlife in Dunes and Shorelines Habitat in Indiana.

No responses were entered for this question.

<b>Total Respondents</b>	<b>0</b>
(skipped this question)	1

43. How well do the following conservation efforts address the threats to the Wildlife in Dunes and Shorelines Habitat



## Appendix E-4: Dunes and Shorelines

**48.** What one or two specific HABITAT practices would you recommend for more effective conservation of the Wildlife

6.

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## Appendix E-5: Impoundments

7. Please also rank these threats to the Wildlife in Aquatic Systems Impoundments Habitat in Indiana.

## Appendix E-5: Impoundments

**10.** Please rank the following threats to the HABITAT of the Wildlife in Aquatic Systems Impoundments Habitat in Indiana.

<b>Critical threat</b>	<b>Serious threat</b>	<b>Somewhat of a threat</b>	<b>Slight threat</b>	<b>No threat</b>	<b>Unknown</b>	<b>Response Total</b>
------------------------	-----------------------	-----------------------------	----------------------	------------------	----------------	-----------------------

Commercial or residential

## Appendix E-5: Impoundments

**12.** Please briefly describe the top two HABITAT threats to the Wildlife in Aquatic Systems Impoundments Habitat in Indiana identified above.

1. (1) regulation of impounded water - extreme water fluctuations in mainly the Army Corps reservoirs can negatively effect crappie populations especially if the water fluctuations occur during spawning  
 (2) habitat degradation - the natural decomposition of flooded timber and woody debris is lessening the available cover for crappie. Also, siltation covers root wads left in the bottom of an impoundment which eliminates useable crappie cover.

2. habitat loss/degradation due to a variety of circumstances

**Total Respondents 2**

**13.** What current monitoring efforts by state agencies are you aware of for the Wildlife in Aquatic Systems Impoundments Habitat in Indiana?

Yes, these efforts occur	Not aware of these efforts occurring	Response Total
--------------------------	--------------------------------------	----------------

## Appendix E-5: Impoundments

14.	What current monitoring efforts by other organizations are you aware of for the Wildlife in Aquatic Systems Impoundments Habitat in Indiana?	Yes, these efforts occur	Not aware of these efforts occurring	Response Total
	Statewide year-round monitoring conducted by other organizations	0% (0)	100% (3)	<b>3</b>
	Statewide once a year monitoring conducted by other organizations	0% (0)	100% (3)	<b>3</b>
	Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (3)	<b>3</b>
	Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (3)	<b>3</b>
	Regional or local year-round monitoring conducted by other organizations			



## Appendix E-5: Impoundments

monitoring conducted by state agencies

**Total Respondents 24**

**16.** How crucial are these monitoring efforts by other organizations for the conservation of the Wildlife in Aquatic Systems Impoundments Habitat in Indiana?

	<b>Very crucial</b>	<b>Somewhat crucial</b>	<b>Slightly crucial</b>	<b>Not crucial</b>	<b>Unknown</b>	<b>Response Total</b>
Statewide year-round monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	<b>3</b>
Statewide once a year monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	<b>3</b>
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	<b>3</b>
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	<b>3</b>
Regional or local year-round monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	<b>3</b>
Regional or local once a year monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	<b>3</b>

## Appendix E-5: Impoundments

**18.** Regional or local monitoring by other organizations for the Wildlife in Aquatic Systems Impoundments Habitat in Indiana.

1. none
2. none known
3. not aware of any

**Total Respondents 3**

**19.** Please list organizations that are monitoring the Wildlife in Aquatic Systems Impoundments Habitat in Indiana.

1. DNR/DFW
2. none known
3. NA

**Total Respondents 3**

20.

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## Appendix E-5: Impoundments

**24.** What current HABITAT inventory and assessment efforts or activities by other organizations are you aware of for the Wildlife in Aquatic Systems Impoundments Habitat in Indiana?

<b>Yes, these efforts occur</b>	<b>No effort that I'm aware of</b>	<b>Response Total</b>
---------------------------------	------------------------------------	-----------------------

## Appendix E-5: Impoundments

**25.** How crucial are these HABITAT efforts by state agencies for the conservation of the Wildlife in Aquatic Systems Impoundments Habitat in Indiana?

**These efforts are very crucial for this HABITAT**

**These efforts are**

## Appendix E-5: Impoundments

**26.** How crucial are these HABITAT efforts by other organizations for the conservation of the Wildlife in Aquatic

## Appendix E-5: Impoundments

Regional or local HABITAT inventory and assessment by other organizations for the Wildlife in Aquatic Systems Impoundments Habitat in Indiana.

ie

ie known

**Total Respondents 2**

Please list organizations that are monitoring this HABITAT for the Wildlife in Aquatic Systems Impoundments Habitat in Indiana.

ie

ie known

**Total Respondents 2**



## Appendix E-5: Impoundments

**31.** Other HABITAT inventory and assessment techniques for the Wildlife in Aquatic Systems Impoundments Habitat in Indiana.

none

**Total Respondents 1**

**32.** What one or two HABITAT inventory and assessment techniques would you recommend for effective conservation of the Wildlife in Aquatic Systems Impoundments Habitat in Indiana?

Systematic sampling would probably be best to determine the abundance of cover that is available, but could be very difficult as most of the habitat is hidden under the surface of the water.

**Total Respondents 1**

**33.** What is the current body of science for the Wildlife in Aquatic Systems Impoundments Habitat in Indiana?

		Response Total	Response Percent
Complete, up to date and extensive		0	0%
Adequate		3	100%
Inadequate		0	0%
Nonexistent		0	0%

35.

**38.**

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43.

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Appendix E-5: Impoundments

**46.** How well do the following conservation efforts address the HABITAT threats to the Wildlife in Aquatic Systems Impoundments Habitat in Indiana?

**Very well   Somewhat   Not at all   Not used   Unknown**



e

## Appendix E-5: Impoundments

<b>Total Respondents</b>	<b>2</b>
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**49.**



## Appendix E-6: Kettle Lakes

6. Please rank the following threats to the Wildlife in Kettle Lakes Habitat in Indiana.



## Appendix E-6: Kettle Lakes

**7.** Please also rank these threats to the Wildlife in Kettle Lakes Habitat in Indiana.

	<b>Critical threat</b>	<b>Serious threat</b>	<b>Somewhat of a threat</b>	<b>Slight threat</b>	<b>No threat</b>	<b>Unknown</b>	<b>Response Total</b>
Habitat loss (breeding range)	67% (2)	33% (1)	0% (0)	0% (0)	0% (0)	0% (0)	<b>3</b>
Habitat loss (feeding/foraging areas)	0% (0)	100% (3)	0% (0)	0% (0)	0% (0)	0% (0)	<b>3</b>
Small native range (high endemism)	0% (0)	0% (0)					

## Appendix E-6: Kettle Lakes



## Appendix E-6: Kettle Lakes

**12.** Please briefly describe the top two HABITAT threats to the



## Appendix E-6: Kettle Lakes

once a year and not regularly scheduled)  
 monitoring conducted by state agencies

**Total Respondents 17**



**16.** How crucial are these monitoring efforts by other organizations for the conservation of the Wildlife in Kettle Lakes Habitat in Indiana?

	<b>Very crucial</b>	<b>Somewhat crucial</b>	<b>Slightly crucial</b>	<b>Not crucial</b>	<b>Unknown</b>	<b>Response Total</b>
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## Appendix E-6: Kettle Lakes

## Appendix E-6: Kettle Lakes

**19.** Please list organizations that are monitoring the Wildlife in Kettle Lakes Habitat in Indiana.

1. Audubon Society, Ducks Unlimited, Indiana Division of Fish and Wildlife
2. Unknown
3. BBS

**Total Respondents 3**

**20.**

## Appendix E-6: Kettle Lakes

**21.** Other monitoring techniques for the Wildlife in Kettle Lakes Habitat in Indiana.

1. Unknown
2. aerial surveys

**Total Respondents 2**

**22.** What one or two monitoring techniques would you recommend for effective conservation of the Wildlife in Kettle Lakes Habitat in Indiana?

1. Professional surveys or counts on F&W areas during migration periods (tracks annual migration trends and is index to population levels). Harvest surveys on F&W areas (tracks annual numbers taken) "Wildlife Investigational Techniques" by The Wildlife Society.

2.



## Appendix E-6: Kettle Lakes

**24.** What current HABITAT inventory and assessment efforts or activities by other organizations are you aware of for the Wildlife in Kettle Lakes Habitat in Indiana?

	<b>Yes, these efforts occur</b>	<b>No effort that I'm aware of</b>	<b>Response Total</b>
Statewide year-round inventory and assessment conducted by other organizations	0% (0)	100% (3)	<b>3</b>
Statewide once a year inventory and assessment conducted by other organizations	0% (0)	100% (3)	<b>3</b>

Appendix E-6: Kettle Lakes

**25.** How crucial are these HABITAT efforts by state agencies for the conservation of the Wildlife in Kettle Lakes Habitat in Indiana?

**These efforts are very crucial for this HABITAT**

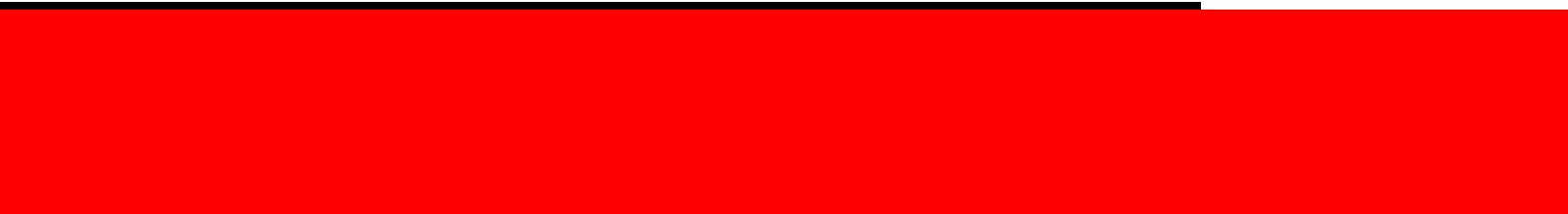
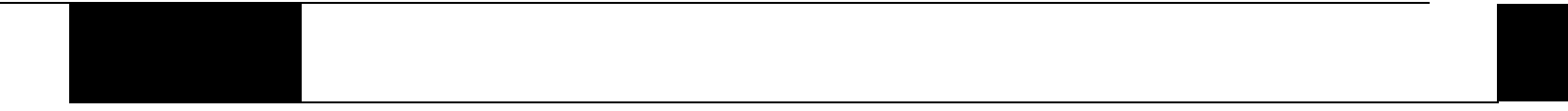
**These efforts are somewhat crucial for this HABITAT**

**These efforts are slightly crucial for this HABITAT**

**These efforts**

## Appendix E-6: Kettle Lakes

**26.** How crucial are these HABITAT efforts by other organizations for the conservation of the Wildlife in Kettle Lakes Habitat in Indiana?



## Appendix E-6: Kettle Lakes

## Appendix E-6: Kettle Lakes

- 32.** What one or two HABITAT inventory and assessment techniques would you recommend for effective conservation of the Wildlife in Kettle Lakes Habitat in Indiana?

## Appendix E-6: Kettle Lakes

**35.** If possible, please provide a second citation (title, author

## Appendix E-6: Kettle Lakes





Appendix E-6: Kettle Lakes

**Total Respondents 17**



**42.** Other HABITAT research needs for the Wildlife in Kettle Lakes Habitat in Indiana.

Unknown

**Total Respondents 1**

**43.** How well do the following conservation efforts address the threats to the Wildlife in Kettle Lakes Habitat in Indiana?

Very well	Somewhat	Not at all	Not used	Unknown	Response Total
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## Appendix E-6: Kettle Lakes

**45.** What one or two specific practices would you recommend for more effective conservation of the Wildlife in Kettle Lakes Habitat in Indiana?

1. Habitat protection (without habitat the Mallard won't do well) Population management (makes use of surplus numbers and reg6n

## Appendix E-6: Kettle Lakes

Unknown

**Total Respondents**

**1**

**48.** What one or two specific HABITAT practices would you recommend for more effective conservation of the Wildlife in Kettle Lakes Habitat in Indiana?

1. Habitat protection through regulation (only sure way to protect habitat without public ownership) Purchase more public land.
2. Habitat protection through regulation, (less intensive)cover a large geographic area. Ducks, Geese & Swans of North America, Bellrose

Appendix E-7: Lake Michigan

**6.** Please rank the following threats to the Wildlife in Lake Michigan Habitat in Indiana.

**Critical threat   Serious threat   Somewhat of a threat   Slight threat   No threat   Unknown**

## Appendix E-7: Lake Michigan

**7.** Please also rank these threats to the Wildlife in Lake Michigan Habitat in Indiana.

	<b>Critical threat</b>	<b>Serious threat</b>	<b>Somewhat of a threat</b>	<b>Slight threat</b>	<b>No threat</b>	<b>Unknown</b>	<b>Response Total</b>						
Habitat loss (breeding range)	0% (0)	0% (0)	50% (1)	50% (1)	0% (0)	0% (0)	<b>2</b>						
Habitat loss (feeding/foraging areas)	0% (0)	0% (0)	50% (1)	50% (1)	0% (0)	0% (0)	<b>2</b>						
Small native range (high endemism)	0% (0)	0% (0)	50% (1)	50% (1)	0% (0)	0% (0)	<b>2</b>						
Near limits of natural geographic range	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	0% (0)	<b>2</b>						
Large home range requirements	0% (0)	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	<b>2</b>						
Viable reproductive population size or availability	50% (1)	0% (0)	50% (1)	0% (0)	0% (0)	0% (0)	<b>2</b>						

## Appendix E-7: Lake Michigan

**10.** Please rank the following threats to the HABITAT of the Wildlife in Lake Michigan Habitat in Indiana.

<b>Critical threat</b>	<b>Serious threat</b>	<b>Somewhat of a threat</b>	<b>Slight threat</b>
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Appendix E-7: Lake Michigan

**Total Respondents**

**2**





## Appendix E-7: Lake Michigan

organizations

**Total Respondents**     **3**



## Appendix E-7: Lake Michigan

- 16.** How crucial are these monitoring efforts by other organizations for the conservation of the Wildlife in Lake Michigan Habitat in Indiana?

## Appendix E-7: Lake Michigan

Appendix E-7: Lake Michigan

**19.** Please list organizations that are monitoring the Wildlife in Lake Michigan Habitat in Indiana.

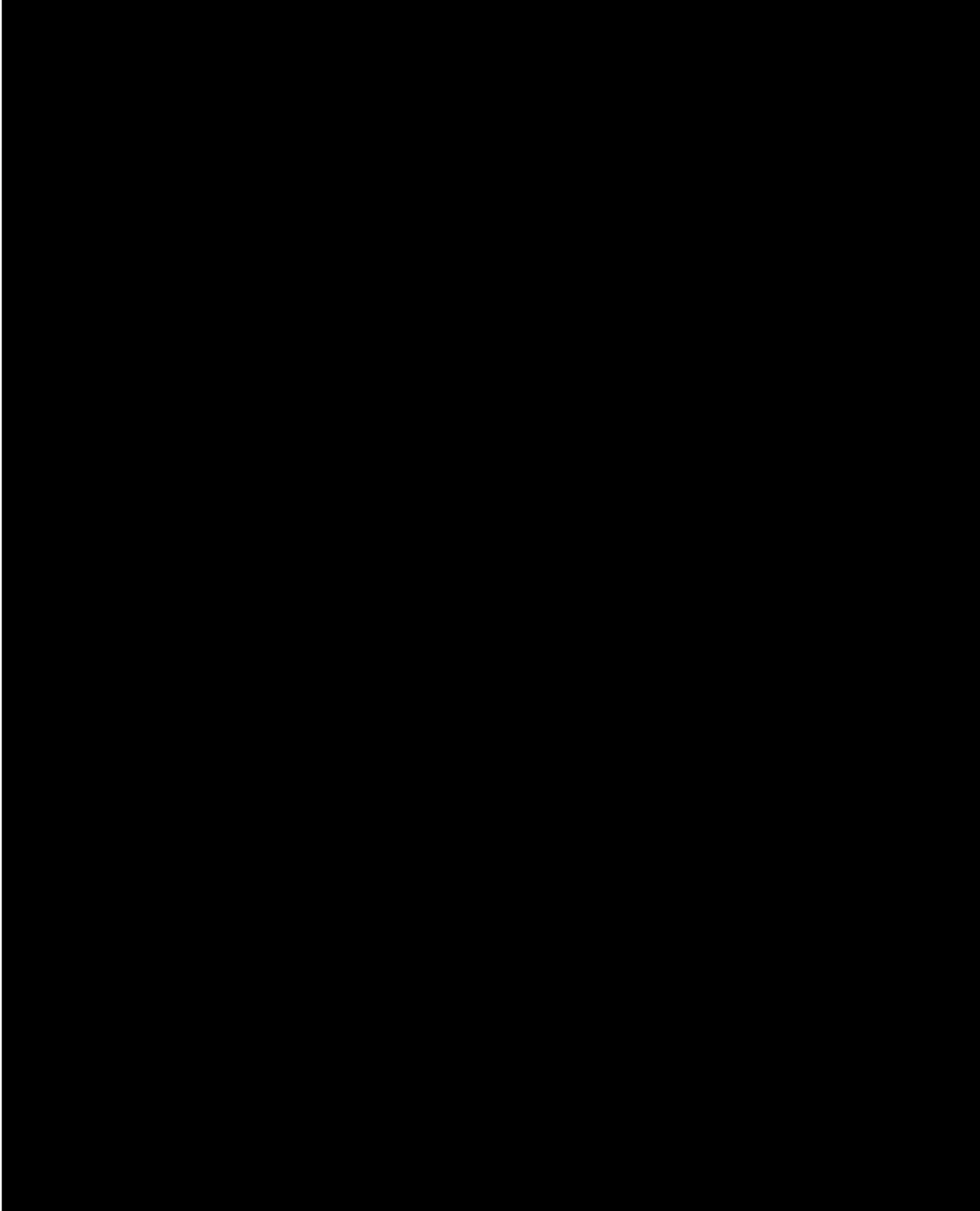
IDNR-Fish and Wildlife, Ball State University, University of Michigan through a coastal program grant. USFWS

Indiana DNR, Division of Fish and Wildlife. Illinois Natural History Survey, USFWS>

**Total Respondents 2**

**20.** What are the current monitoring techniques for the Wildlife in Lake Michigan Habitat in Indiana?

<b>Frequently used</b>	<b>Occasionally used</b>	<b>Not used but possible with existing technology and data</b>	<b>Not used and not possible with existing technology and data</b>	<b>Not economically</b>
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Appendix E-7: Lake Michigan

**24.** What current HABITAT inventory and assessment efforts or activities by other organizations are you aware of for the Wildlife in Lake Michigan Habitat in Indiana?

	Yes, these efforts occur	No effort that I'm aware of	Response Total
Statewide year-round inventory and assessment conducted by other organizations	0% (0)	100% (1)	1
Statewide once a year inventory and assessment conducted by other organizations	0% (0)	100% (1)	1
[REDACTED]	0% (0)	100% (1)	1
[REDACTED]			

Appendix E-7: Lake Michigan

**25.** How crucial are these HABITAT efforts by state agencies for the conservation of the Wildlife in Lake Michigan Habitat in Indiana?

	These efforts are very crucial for this HABITAT	These efforts are somewhat crucial for this HABITAT	These efforts are slightly crucial for this HABITAT	These efforts are not crucial for this HABITAT	Unknown	Response Total
Statewide annual inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Statewide once a year inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Regional or local year-round inventory and assessment conducted by state agencies	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	1
Regional or local once a year inventory and assessment conducted by state agencies	0% (0)	50% (1)	0% (0)	50% (1)	0% (0)	2









## Appendix E-7: Lake Michigan

35.

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41.

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## Appendix E-7: Lake Michigan

**49.** Do you have any additional comments or information on the Wildlife in Lake Michigan Habitat that you feel would be useful in the development of the Indiana Comprehensive Wildlife Strategy?

Much research work has been done on the the yellow perch by Ball State University since the mid 1970's. This works serves as the framework for the management of the population in Indiana's waters of Lake Michigan. It is critical that funding for this project continue to maintain the dataset. It is the largest and longest dataset for yellow perch on all of Lake Michigan and has served as the foundation for many management decisions on sport and commerical harvest

## Appendix E-8: Natural Lakes

**6.**

## Appendix E-8: Natural Lakes

7. Please also rank these threats to the Wildlife in Natural Lakes Habitat in Indiana.

**Critical  
threat**   **Serious  
threat**   **Somewhat  
of a threat**

## Appendix E-8: Natural Lakes

Total Respondents

4

10. Pl .727.1(ease rank the fol.727.1(owi727.1(n)-1(g t)4 m(h)-1(reats tra2Uuv8TAT of )J6.7 0.TD00.0001Tc0.00238w[Pra2

## Appendix E-8: Natural Lakes

**12.** Please briefly describe the top two HABITAT threats to the Wildlife in Natural Lakes Habitat in Indiana identified above.

Habitat degradation  
Successional change

Water quality degradation that leads to cloudy water is the key threat.

1. Emergent bulrush and wetland habitat loss. It has been well documented in northern states that northern pike prefer flooded vegetation for spawning during the spring. Loss of this habitat from boating and wildlife (waterfowl and muskrat feeding) may reduce reproductive habitat for northern pike in some natural lakes.

2. Bulkhead seawall development reduces emergent vegetation used by northern pike for reproduction and for cover during feeding.

Shoreline and labeled alterations

**Total Respondents 4**

**13.**

## Appendix E-8: Natural Lakes

**14.** What current monitoring efforts by other organizations are you aware of for the Wildlife in Natural Lakes Habitat in Indiana?

	Yes, these efforts occur	Not aware of these efforts occurring	Response Total
Statewide year-round monitoring conducted by other organizations	0% (0)	100% (4)	<b>4</b>
Statewide once a year monitoring conducted by other organizations	0% (0)		
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)		

## Appendix E-8: Natural Lakes

**16.** How crucial are these monitoring efforts by other organizations for the conservation of the Wildlife in Natural Lakes Habitat in Indiana?

**Very**   **Somewhat**  
**crucial**   **crucial**

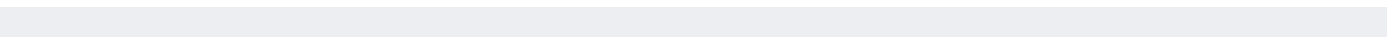


## Appendix E-8: Natural Lakes

- 19.** Please list organizations that are monitoring the Wildlife in Natural Lakes Habitat in Indiana.

Appendix E-8: Natural Lakes

	<b>Total Respondents</b>	<b>0</b>
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22. 

## Appendix E-8: Natural Lakes

Appendix E-8: Natural Lakes

**25.** How crucial are these HABITAT efforts by state agencies for the conservation of the Wildlife in Natural Lakes Habitat in Indiana?

These efforts are very crucial for this HABITAT	These efforts are somewhat crucial for this HABITAT	These efforts are slightly crucial for this HABITAT	These efforts are not crucial for this HABITAT	Unknown	Response Total
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## Appendix E-8: Natural Lakes

**26.** How crucial are these HABITAT efforts by other organizations for the conservation of the Wildlife in Natural Lakes

Appendix E-8: Natural Lakes

**28.** Regional or local HABITAT inventory and assessment by other organizations for the Wildlife in Natural Lakes Habitat in Indiana.

Not aware of any

**Total Respondents 1**

**29.** Please list organizations that are monitoring this HABITAT for the Wildlife in Natural Lakes Habitat in Indiana.

Not aware of any

**Total Respondents 1**

**30.** What are the current monitoring techniques for the Wildlife in Natural Lakes Habitat in Indiana.

If a technique is not applicable to the Wildlife in Natural Lakes Habitat, do not select a response in that row.

	Frequently used	Occasionally used	Not used but possible with existing technology and data	Not used and not possible with existing technology and data	Not economically feasible	Unknown	Response Total
GIS mapping	0% (0)	25% (1)	25% (1)	0% (0)	0% (0)	50% (2)	4
Aerial	0% (0)	33% (1)	0% (0)	0% (0)			

Appendix E-8: Natural Lakes

**31.** Other HABITAT inventory and assessment techniques for the Wildlife in Natural Lakes Habitat in Indiana.

No responses were entered for this question.

**Total Respondents 0**

**32.** What one or two HABITAT inventory and assessment techniques would you recommend for effective conservation

- 1. Emergent bulrush and wetland monitoring and protection via ecozones
- 2. Evaluate land and water use practices to reduce in lake and upstream degradation of vegetation and shoreline.

Unknown

**Total Respondents 2**

## Appendix E-8: Natural Lakes

**34.** Please provide a citation (title, author, date, pub



Appendix E-8: Natural Lakes

**Response  
Total**



Appendix E-8: Natural Lakes

**40.** Other research needs for the Wildlife in Natural Lakes Habitat in Indiana.

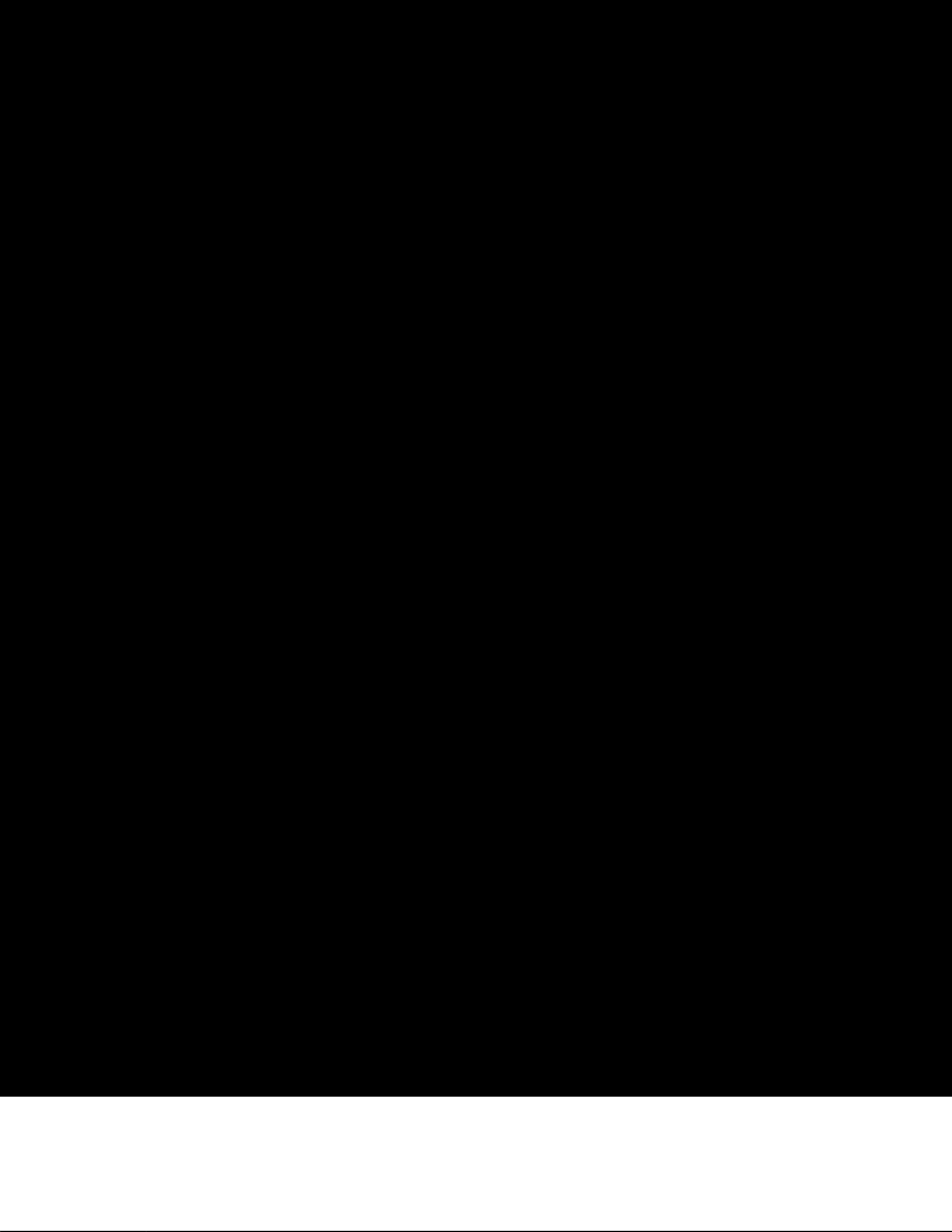
Limiting factors and impacts of competition and predation

**Total Respondents 1**

**41.** What are the HABITAT research needs for the Wildlife in Natural Lakes Habitat in Indiana?

Urgently needed	Greatly needed	Needed	Not needed	Unknown	Response Total
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## Appendix E-9: Oxboxes/Backwaters/Sloughs/Embayments

7.

## Appendix E-9: Oxboxes/Backwaters/Sloughs/Embayments

**10.** Please rank the following threats to the HABITAT of the Wildlife in Oxbows/Backwaters/Sloughs/Embayments Habitat in Indiana.

**Critical threat      Serious threat**



## Appendix E-9: Oxboxes/Backwaters/Sloughs/Embayments

**Total Respondents**

**1**

- 13.** What current monitoring efforts by state agencies are you aware of for the Wildlife in Oxbows/Backwaters/Sloughs/Embayments Habitat in Indiana?



Appendix E-9: Oxboxes/Backwaters/Sloughs/Embayments

**16.** How crucial are these monitoring efforts by other organizations for the conservation of the Wildlife in Oxbows/Backwaters/Sloughs/Embayments Habitat in Indiana?

	<b>Very crucial</b>	<b>Somewhat crucial</b>	<b>Slightly crucial</b>	<b>Not crucial</b>	<b>Unknown</b>	<b>Response Total</b>
Statewide ground monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)			



## Appendix E-9: Oxboxes/Backwaters/Sloughs/Embayments

**21.** Other monitoring techniques for the Wildlife in Lake Michigan Habitat in Indiana.

No responses entered for this question.

**Total Respondents**      **0**

## Appendix E-9: Oxboxes/Backwaters/Sloughs/Embayments

What one or two monitoring techniques would you recommend for effective conservation of the Wildlife in Oxbows/Backwaters/Sloughs/Embayments Habitat in Indiana?

know trapping and either mark recapture or telemetry

electrofishing

trap nets

**Total Respondents** 2

What current HABITAT inventory and assessment efforts or activities by state agencies are you aware of for the Wildlife in Oxbows/Backwaters/Sloughs/Embayments Habitat in Indiana?

**Yes, these  
efforts  
occur**

**No effort that  
I'm aware of**



response

## Appendix E-9: Oxboxes/Backwaters/Sloughs/Embayments

24. What current HABITAT inventory and assessment efforts or activities by other organizations are you aware of for the Wildlife in Oxbows/Backwaters/Sloughs/Embayments Habitat in Indiana?

Appendix E-9: Oxboxes/Backwaters/Sloughs/Embayments

**25.** How crucial are these HABITAT efforts by state agencies for the conservation of the Wildlife in Oxbows/Backwaters/Sloughs/Embayments Habitat in Indiana?

These efforts are very crucial for this HABITAT	These efforts are somewhat crucial for this HABITAT	These efforts are slightly crucial for this HABITAT	These efforts are not crucial for this HABITAT	Unknown	Response Total
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90-56956e2







32.



Appendix E-9: Oxboxes/Backwaters/Sloughs/Embayments

**36.** What is the current HABITAT body of science for the Wildlife in Oxbows/Backwaters/Sloughs/Embayments Habitat in Indiana?

	Response Total	Response Percent
Complete, up to date and extensive	0	0%
Adequate	0	0%
Inadequate	1	100%
Nonexistent	0	0%
Other (please explain below)	0	0%
<b>Total Respondents</b>		<b>1</b>

**37.** Please provide a citation (title, author, date, publisher) that would give the best HABITAT overview of the Wildlife in Oxbows/Backwaters/Sloughs/Embayments Habitat in Indiana, if available. This resource may be used if further detail is needed.

Title = Amphibians and reptiles from 23 counties of Indiana.  
 Author = Robert Brodman  
 Date = 2003  
 Publisher = Proceedings of the Indiana Academy of Science, 112: 43-54

Response Total	Response Percent
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Appendix E-9: Oxboxes/Backwaters/Sloughs/Embayments

**38.** If possible, please provide a second citation (title, author, date, publisher) that would give another good HABITAT overview of the Wildlife in Oxboxes/Backwaters/Sloughs/Embayments Habitat in Indiana. This resource may also be used if further detail is needed.

	Response Total	Response Percent
Title	0	0%
Author	0	0%
Date	0	0%
Publisher	0	0%
<b>Total Respondents</b>	<b>0</b>	<b>0</b>

**39.** What are the research needs for the Wildlife in Oxboxes/Backwaters/Sloughs/Embayments Habitat in Indiana?

	Urgently needed	Greatly needed	Needed	Slightly needed	Not needed	Unknown	Response Total
Life cycle	0% (0)	0% (0)	50% (1)	0% (0)	50% (1)	0% (0)	2
Distribution and abundance	50% (1)	0% (0)	50% (1)	0% (0)	0% (0)	0% (0)	2
Limiting factors (food, shelter, water, breeding sites)	50% (1)	0% (0)	0% (0)	50% (1)	0% (0)	0% (0)	2
Threats (predators/competition, contamination)	50% (1)	0% (0)	0% (0)	0% (0)	50% (1)	0% (0)	2
Relationship/dependence on specific habitats	50% (1)	0% (0)	0% (0)	0% (0)	50% (1)	0% (0)	2
Population health (genetic and physical)	0% (0)	50% (1)	0% (0)	50% (1)	0% (0)	0% (0)	2
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
<b>Total Respondents</b>							<b>12</b>

**40.**



## Appendix E-9: Oxboxes/Backwaters/Sloughs/Embayments

- 43.** How well do the following conservation efforts address the threats to the Wildlife in Oxbows/Backwaters/Sloughs/Embayments Habitat in Indiana?

Appendix E-9: Oxboxes/Backwaters/Sloughs/Embayments

46.	How well do the following conservation efforts address the HABITAT threats to the Wildlife in Oxbows/Backwaters/Sloughs/Embayments Habitat in Indiana?						
	Very well	Somewhat	Not at all	Not used	Unknown	Response Total	
Habitat protection through regulation	50% (1)	50% (1)	0% (0)	0% (0)	0% (0)	2	
Habitat protection on public lands	50% (1)	50% (1)	0% (0)	0% (0)	0% (0)	2	
Habitat protection incentives (financial)	0% (0)	100% (2)	0% (0)	0% (0)	0% (0)	2	
Habitat restoration through regulation	0% (0)	50% (1)	0% (0)	0% (0)	50% (1)	2	
Habitat restoration on public lands	0% (0)	50% (1)					



## Appendix E-9: Oxboxes/Backwaters/Sloughs/Embayments

## Appendix E-9: Oxboxes/Backwaters/Sloughs/Embayments

**49.** Do you have any additional comments or information on the Wildlife in Oxbows/Backwaters/Sloughs/Embayments Habitat that you feel would be useful in the development of the Indiana Comprehensive Wildlife Strategy?

We need to learn a lot more about lesser sirens

## Appendix E-10: Rivers and Streams

6. Please rank the following threats to the Wildlife in Rivers and Streams Habitat in Indiana.



## Appendix E-10: Rivers and Streams

Appendix E-10: Rivers and Streams

**10.** Please rank the following threats to the HABITAT of the Wildlife in Rivers and Streams Habitat in Indiana.

**Critical threat    Serious threat    Somewhat of a threat**

## Appendix E-10: Rivers and Streams

**12.** Please briefly describe the top two HABITAT threats to th

## Appendix E-10: Rivers and Streams

**13.** What current monitoring efforts by state agencies are you aware of for the Wildlife in Rivers and Streams Habitat in Indiana?

	<b>Yes, these efforts occur</b>	<b>Not aware of these efforts occurring</b>	<b>Response Total</b>
Statewide year-round monitoring conducted by state agencies	50% (2)	50% (2)	<b>4</b>
Statewide once a year monitoring conducted by state agencies	33% (1)	67% (2)	<b>3</b>
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	100% (3)	<b>3</b>
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	0% (0)	100% (3)	<b>3</b>
Regional or local year-round monitoring conducted by state agencies	33% (1)	67% (2)	



## Appendix E-10: Rivers and Streams

organizations

**Total Respondents**





## Appendix E-10: Rivers and Streams

Appendix E-10: Rivers and Streams

**20.** What are the current monitoring techniques for the Wildlife in Rivers and Streams Habitat in Indiana?

<b>Frequently used</b>	<b>Occasionally used</b>	<b>Not used but possible with existing technology and data</b>	<b>Not used and not possible with existing technology and data</b>	<b>Not economically</b>
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22.

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## Appendix E-10: Rivers and Streams

**26.** How crucial are these HABITAT efforts by other organizations for the conservation of the Wildlife in Rivers and Streams Habitat in Indiana?

	<b>These efforts are very crucial for this HABITAT</b>	<b>These efforts are somewhat crucial for this HABITAT</b>	<b>These efforts are slightly crucial for this HABITAT</b>	<b>These efforts are not crucial for this HABITAT</b>	<b>Unknown</b>	<b>Response Total</b>
Statewide year-round inventory and assessment conducted by other organizations	25% (1)	0% (0)	0% (0)	0% (0)	75% (3)	<b>4</b>
Statewide once a year inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	0% (0)	100% (4)	<b>4</b>



## Appendix E-10: Rivers and Streams

regard to land use patterns within these habitats.

**Total Respondents 1**

**29.** Please list organizations that are monitoring this HABITAT for the Wildlife in Rivers and Streams Habitat in Indiana.

IDNR  
USFWS  
USDA  
IDEM  
USACE  
EPA  
local government entities (area plan commissions, zoning boards etc..)

**Total Respondents 1**

**30.**

## Appendix E-10: Rivers and Streams

**31.** Other HABITAT inventory and assessment techniques for the Wildlife in Rivers and Streams Habitat in Indiana.

No responses were entered for this question.

Total Respondents

**32.** What one or two HABITAT inventory and assessment techniques would you recommend for effective conservation of the Wildlife in Rivers and Streams Habitat in Indiana?

35.

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## Appendix E-10: Rivers and Streams

**38.** If possible, please provide a second citation (title, author, date, publisher) that would give another good HABITAT overview of the Wildlife in Rivers and Streams Habitat in Indiana. This resource may also be used if further detail is needed.

Title = Southern Forested Wetlands

Author = Messina & Conner

Date = 1998

Publisher = CRC Press LLC

Response Total	Response Percent
-------------------	---------------------

## Appendix E-10: Rivers and Streams

**41.** What are the HABITAT research needs for the Wildlife in Rivers and Streams Habitat in Indiana?

## Appendix E-10: Rivers and Streams

**43.** How well do the following conservation efforts address the threats to the Wildlife in Rivers and Streams Habitat in Indiana?

	<b>Very well</b>	<b>Somewhat</b>	<b>Not at all</b>	<b>Not used</b>	<b>Unknown</b>	<b>Response Total</b>	
Habitat protection (use below for details)	75% (3)	0% (0)	25% (1)	0% (0)	0% (0)	<b>4</b>	

45.

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## Appendix E-10: Rivers and Streams

- 47.** Other current HABITAT conservation practices for the **Wildlife in rivers and streams** habitat in Indiana.

No responses were entered for this question.

<b>Total Respondents</b>	<b>0</b>
(skipped this question)	3



## Appendix E-10: Rivers and Streams

**48.** What one or two specific HABITAT practices would you recommend for more effective conservation of the Wildlife in Rivers and Streams Habitat in Indiana?

1. Elimination of, or at the very least, reducing, the amount of stream channelization that occurs.
2. Restoration of bottomland hardwoods through the farmbill and other incentive type programs is also very good.  
Elimination of ditches and stream channelization

**Total Respondents 2**

**49.** Do you have any additional comments or information on the Wildlife in Rivers and Streams Habitat that you feel

## Appendix E-11: Rivers and Streams Great Lakes Drainage Great River

6. Please rank the following threats to the Wildlife in Great Rivers of the Great Lakes Drainage Habitat in Indiana.

Appendix E-11: Rivers and Streams Great Lakes Drainage Great River

Appendix E-11: Rivers and Streams Great Lakes Drainage Great River

**10.** Please rank the following threats to the HABITAT of the Wildlife in Great Rivers of the Great Lakes Drainage Habitat in Indiana.

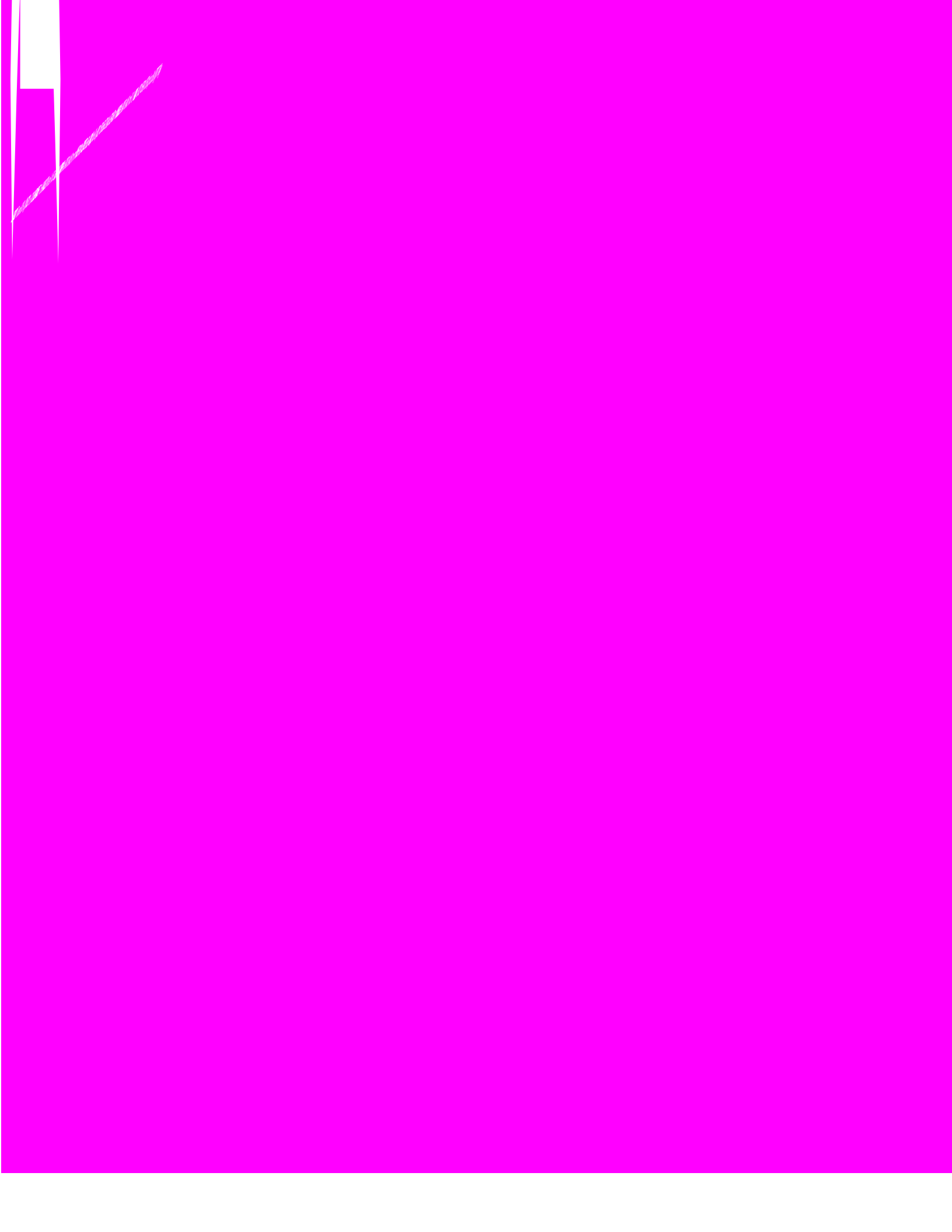
	<b>Critical threat</b>	<b>Serious threat</b>	<b>Somewhat of a threat</b>	<b>Slight threat</b>	<b>No threat</b>	<b>Unknown</b>	<b>Response Total</b>						
Commercial or residential development (sprawl)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	<b>1</b>						
Counterproductive financial incentives or regulations	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	<b>1</b>						
Invasive/non-native species	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	<b>1</b>						
Nonpoint source pollution (sedimentation and nutrients)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	<b>1</b>						
Habitat fragmentation	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	<b>1</b>						
Successional change	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)							



## Appendix E-11: Rivers and Streams Great Lakes Drainage Great River

Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (1)	1
		<b>Total Respondents</b>	<b>8</b>

**15.**



Appendix E-11: Rivers and Streams Great Lakes Drainage Great River

						<b>Total Respondents</b>	<b>1</b>
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**20.** What are the current monitoring techniques for the Wildlife in Great Rivers of the Great Lakes Drainage Habitat in Indiana?

Frequently used	Occasionally used	Not used but possible with existing technology and data	Not used and not possible with existing technology and data	Not economically feasible	Unknown	Response Total





## Appendix E-11: Rivers and Streams Great Lakes Drainage Great River

Regional or local once a year inventory and assessment conducted by other organizations	0% (0)	100% (1)	<b>1</b>
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)		<b>1</b>

onal rg i onal or l onal l(ess than nnce a year andnoty



Appendix E-11: Rivers and Streams Great Lakes Drainage Great River

No responses were entered for this question.

<b>Total Respondents</b>	<b>0</b>
(skipped this question)	1

Drainage Habitat in Indiana.

**31.**

## Appendix E-11: Rivers and Streams Great Lakes Drainage Great River

Title

# Appendix E-11: Rivers and Streams Great Lakes Drainage Great River

Publisher

0

0%

Appendix E-11: Rivers and Streams Great Lakes Drainage Great River

**39.** What are the research needs for the Wildlife in Great Rivers of the Great Lakes Drainage Habitat in Indiana?

**Urgently  
needed    Greatly  
needed**



Appendix E-11: Rivers and Streams Great Lakes Drainage Great River

**42.** Other HABITAT research needs for the Wildlife in Great Rivers of the Great Lakes Drainage Habitat in Indiana.

No responses were entered for this question.

**Total Respondents 0**

(skipped this question) 1

**43.** How well do the following conservation efforts address the threats to the Wildlife in Great Rivers of the Great Lakes Drainage Habitat in Indiana?

	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
Habitat protection (use below for details)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Population management (hunting, trapping)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Population enhancement (captive breeding and release)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1

Appendix E-11: Rivers and Streams Great Lakes Drainage Great River

## Appendix E-11: Rivers and Streams

Appendix E-11: Rivers and Streams Great Lakes Drainage Great River

**48.** What one or two specific HABITAT practices would you recommend for more effective conservation of the Wildlife in Great Rivers of the Great Lakes Drainage Habitat in Indiana?

## Appendix E-12: Rivers and Streams Great Lakes Drainage Headwater

**6.** Please rank the following threats to the Wildlife in Headwaters of the Great Lakes Drainage Habitat in Indiana.

	<b>Critical threat</b>	<b>Serious threat</b>	<b>Somewhat of a threat</b>	<b>Slight threat</b>	<b>No threat</b>	<b>Unknown</b>	<b>Response Total</b>						
Invasive/non-native species	67% (2)	0% (0)	0% (0)	0% (0)	33% (1)	0% (0)	<b>3</b>						
High sensitivity to pollution	0% (0)	67% (2)	33% (1)	0% (0)	0% (0)	0% (0)	<b>3</b>						
Bioaccumulation of contaminants	0% (0)	0% (0)	0% (0)	67% (2)	33% (1)	0% (0)	<b>3</b>						



## Appendix E-12: Rivers and Streams Great Lakes Drainage Headwater

<b>10.</b>	Please rank the following threats to the HABITAT of the Wildlife in Headwaters of the Great Lakes Drainage Habitat in Indiana.						
	<b>Critical threat</b>	<b>Serious threat</b>	<b>Somewhat of a threat</b>	<b>Slight threat</b>	<b>No threat</b>	<b>Unknown</b>	<b>Response Total</b>
Commercial or residential development (sprawl)	33% (1)	0% (0)	33% (1)	33% (1)	0% (0)	0% (0)	<b>3</b>
Counterproductive financial							

Appendix E-12: Rivers and Streams Great Lakes Drainage Headwater

Invasive species, non-point source pollution

Sedimentation

Loss of habitat due to development in headwater areas

**Total Respondents 3**

**13.** What current monitoring efforts by state agencies are you aware of for the Wildlife in Headwaters of the Great Lakes Drainage Habitat in Indiana?

	<b>Yes, these efforts occur</b>	<b>Not aware of these efforts occurring</b>	<b>Response Total</b>
Statewide year-round monitoring conducted by state agencies	0% (0)	100% (3)	<b>3</b>
Statewide once a year monitoring conducted by state agencies	0% (0)	100% (3)	<b>3</b>
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	100% (3)	<b>3</b>
		100% (3)	



## Appendix E-12: Rivers and Streams Great Lakes Drainage Headwater

organizations			
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	33% (1)	67% (2)	<b>3</b>
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (3)	<b>3</b>
		<b>Total Respondents</b>	<b>24</b>

**15.** How crucial are these monitoring efforts by state agencies for the conservation of the Wildlife in Headwaters of the Great Lakes Drainage Habitat in Indiana?

Very crucial	Somewhat crucial	Slightly crucial	Not crucial	Unknown	Response Total
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Appendix E-12: Rivers and Streams Great Lakes Drainage Headwater

**16.** How crucial are these monitoring efforts by other organizations for the conservation of the Wildlife in Headwaters of the Great Lakes Drainage Habitat in Indiana?

<b>Very crucial</b>	<b>Somewhat crucial</b>	<b>Slightly crucial</b>	<b>Not crucial</b>	<b>Unknown</b>	<b>Response Total</b>
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Appendix E-12: Rivers and Streams Great Lakes Drainage Headwater

**Total Respondents**



Appendix E-12: Rivers and Streams Great Lakes Drainage Headwater

**24.** What current HABITAT inventory and assessment efforts or activities by other organizations are you aware of for the Wildlife in Headwaters of the Great Lakes Drainage Habitat in Indiana?

<b>Yes, these efforts occur</b>	<b>No effort that I'm aware of</b>	<b>Response Total</b>
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25.

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## Appendix E-12: Rivers and Streams Great Lakes Drainage Headwater

- 26.** How crucial are these HABITAT efforts by other organizations for the conservation of the Wildlife in Headwaters of the Great Lakes Drainage Habitat in Indiana?



## Appendix E-12: Rivers and Streams Great Lakes Drainage Headwater

**28.** Regional or local HABITAT inventory and assessment by other organizations for the Wildlife in Headwaters of the Great Lakes Drainage Habitat in Indiana.

City of Elkhart

**Total Respondents**



## Appendix E-12: Rivers and Streams Great Lakes Drainage Headwater

**32.** What one or two HABITAT inventory and assessment techniques would you recommend for effective conservation of the Wildlife in Headwaters of the Great Lakes Drainage Habitat in Indiana?

Sampling.

Sampling using electrofishing and seining in headwater areas. Completing IBI and QHEI and water quality analysis for these sites.

**Total Respondents      2**

## Appendix E-12: Rivers and Streams Great Lakes Drainage Headwater

Inadequate		1	33%
Nonexistent		1	33%
Other (please explain below)	 Unknown on the larger scale	1	33%
<b>Total Respondents</b>			<b>3</b>

**37.** Please provide a citation (title, author, date, publisher) that would give the best HABITAT overview of the Wildlife in Headwaters of the Great Lakes Drainage Habitat in Indiana, if available. This resource may be used if further detail is needed.

Title = Fisheries Survey of the East Branch of the Little Calumet River Watershed

Author = Neil Ledet

Date = 1978

Publisher = IDNR Fisheries Section

**Response Total    Response Percent**

**38.** If possible, please provide a second citation (title, author, date, publisher) that would give another good HABITAT overview of the Wildlife in Headwaters of the Great Lakes Drainage Habitat in Indiana. This resource may also be used if further detail is needed.

Title = Stream Survey of the East Arm of the Little Calumet River

Author = Edward Braun

Date = 1974

Publisher = IDNR Division of Fish and Wildlife

**ResponsevrHL8.5 4416.41.18**

**39.**

## Appendix E-12: Rivers and Streams Great Lakes Drainage Headwater

No responses were entered for this question.

**Total Respondents**      **0**

(skipped this question)      1

**43.** How well do the following conservation efforts address the threats to the Wildlife in Headwaters of the Great Lakes Drainage Habitat in Indiana?

	<b>Very well</b>	<b>Somewhat</b>	<b>Not at all</b>	<b>Not used</b>	<b>Unknown</b>	<b>Response Total</b>
Habitat protection (use below for details)	0% (0)	67% (2)	0% (0)	0% (0)	33% (1)	<b>3</b>
Population management (hunting, trapping)	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	<b>3</b>
Population enhancement (captive						

## Appendix E-12: Rivers and Streams Great Lakes Drainage Headwater

Land use planning and education.







Appendix E-13: Rivers and Streams Great Lakes Drainage Wadeable/Large River

**6.** Please rank the following threats to the Wildlife in Wadeable/ Large Rivers of the Great Lakes Drainage Habitat in Indiana.

**Critical threat    Serious threat    Somewhat of a threat**

## Appendix E-13: Rivers and



## Appendix E-13: Rivers and Streams Great Lakes Drainage Wadeable/Large River

Nonpoint source pollution- sedimentation  
 Agricultural practices- again sedimentation

1. Loss of riparian corridor
2. Runoff

**Total Respondents      3**

**13.** What current monitoring efforts by state agencies are you aware of for the Wildlife in Wadeable/ Large Rivers of the Great Lakes Drainage Habitat in Indiana?

	<b>Yes, these efforts occur</b>	<b>Not aware of these efforts occurring</b>	<b>Response Total</b>
Statewide year-round monitoring conducted by state	0% (0)	100% (3)	<b>3</b>
Statewide once a year monitoring conducted by state agencies	0% (0)	100% (3)	<b>3</b>
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies			

## Appendix E-13: Rivers and Streams Great Lakes Drainage Wadeable/Large River

Regional or local once a year monitoring conducted by other organizations

## Appendix E-13: Rivers and Streams Great Lakes Drainage Wadeable/Large River

Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	33% (1)	33% (1)	33% (1)
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## Appendix E-13: Rivers and Streams Great Lakes Drainage Wadeable/Large River

20. What are the current monitoring techniques for the Wildlife in Wadeable/ Large Rivers of the Great Lakes Drainage Habitat in Indiana?



## Appendix E-13: Rivers and Streams Great Lakes Drainage Wadeable/Large River

**22.** What one or two monitoring techniques would you recommend for effective conservation of the Wildlife in Wadeable/ Large Rivers of the Great Lakes Drainage Habitat in Indiana?

Professional Fish Surveys and Creel Surveys

IDEM, IDNR, and Elkhart use electrofishing equipment to sample fish communities; however, a seine could probably be used as well as tagging and radio telemetry to track the species movement.

1. Intensive quantitative sampling of known populations. Need to understand demography of wildlife species. See Strayer & Smith, 2003. AFS Monogr. 8.

## Appendix E-13: Rivers and Streams Great Lakes Drainage Wadeable/Large River

**24.** What current HABITAT inventory and assessment efforts or activities by other organizations are you aware of for the Wildlife in Wadeable/ Large Rivers of the Great Lakes Drainage Habitat in Indiana?

	<b>Yes, these efforts occur</b>	<b>No effort that I'm aware of</b>	<b>Response Total</b>
Statewide year-round inventory and assessment conducted by other organizations	0% (0)	100% (3)	<b>3</b>
Statewide once a year inventory and assessment conducted by other organizations	0% (0)	100% (3)	<b>3</b>

25.

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Appendix E-13: Rivers and Streams Great Lakes Drainage Wadeable/Large River

**26.** How crucial are these HABITAT efforts by other organizations for the conservation of the Wildlife in Wadeable/ Large Rivers of the Great Lakes Drainage Habitat in Indiana?

	<b>These efforts are very crucial for this HABITAT</b>	<b>These efforts are somewhat crucial for this HABITAT</b>	<b>These efforts are slightly crucial for this HABITAT</b>	<b>These efforts are not crucial for this HABITAT</b>	<b>Unknown</b>	<b>Response Total</b>
Statewide year-round inventory and assessment conducted by other organizations	0% (0)	0% (0)	33% (1)	0% (0)	67% (2)	<b>3</b>
Statewide once a year inventory and assessment conducted by other organizations	0% (0)	0% (0)	33% (1)	0% (0)	67% (2)	<b>3</b>
Periodic statewide (less than once a year but still regularly scheduled) inventory and						

## Appendix E-13: Rivers and Streams Great Lakes Drainage Wadeable/Large River

**28.** Regional or local HABITAT inventory and assessment by other organizations for the Wildlife in Wadeable/ Large Rivers of the Great Lakes Drainage Habitat in Indiana.

St. Joseph River

Maumee system

## Appendix E-13: Rivers and

## Appendix E-13: Rivers and Streams Great Lakes Drainage Wadeable/Large River

35.

If possible, please provide a second citation (title, author, date, publisher) that would give another good overview

Appendix E-13: Rivers and Streams Great Lakes Drainage Wadeable/Large River

contamination)





## Appendix E-13: Rivers and Streams Great Lakes Drainage Wadeable/Large River

Population management (hunting, trapping)	0% (0)	50% (1)	0% (0)	50% (1)	0% (0)	<b>2</b>
Population enhancement (captive breeding and release)	0% (0)	0% (0)	0% (0)	100% (2)	0% (0)	<b>2</b>
Reintroduction (restoration)	0% (0)	0% (0)	0% (0)	100% (2)	0% (0)	<b>2</b>
Food plots	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	<b>2</b>
Threats reduction	0% (0)	50% (1)	0% (0)	50% (1)	0% (0)	<b>2</b>
Native predator control	0% (0)	0% (0)	0% (0)	100% (2)	0% (0)	<b>2</b>
Exotic/invasive species control	0% (0)	0% (0)	50% (1)	50% (1)	0% (0)	<b>2</b>
Regulation of collecting	0% (0)	50% (1)	50% (1)	0% (0)	0% (0)	<b>2</b>
Disease/parasite management	0% (0)	0% (0)	0% (0)	100% (2)	0% (0)	<b>2</b>
range	0% (0)	0% (0)	0% (0)	100% (2)	0% (0)	<b>2</b>



## Appendix E-13: Rivers and Streams Great Lakes Drainage Wadeable/Large River

**45.** What one or two specific practices would you recommend for more effective conservation of the Wildlife in Wadeable/ Large Rivers of the Great Lakes Drainage Habitat in Indiana?

Habitat protection and Public Education

Habitat protection - erosion controls

Exotic species - possession of exotic species illegal (must dispose of fish properly and not release back to stream)

1. Intensive quantitative sampling of known populations. Need to understand demography of wildlife species. See Strayer & Smith, 2003. AFS Monogr. 8.
2. Less intensive qualitative sampling of new or not recently surveyed areas. Need to determine distribution and status of wildlife species. See same for protocols.

**Total Respondents 3**

**46.**

Appendix E-13: Rivers and Streams Great Lakes Drainage Wadeable/Large River



Appendix E-14: Rivers and Streams Kankakee River (Illinois River) Drainage Headwater

7.	Please also rank these threats to the Wildlife in Headwaters of the Kankakee River (Illinois River) Drainage Habitat in Indiana.	<b>Critical threat</b>	<b>Serious threat</b>	<b>Somewhat of a threat</b>	<b>Slight threat</b>	<b>No threat</b>	<b>Unknown</b>	<b>Response Total</b>	
	Habitat loss (breeding range)	67% (2)	0% (0)	33% (1)	0% (0)	0% (0)	0% (0)	<b>3</b>	
	Habitat loss (feeding/foraging areas)	67% (2)	0% (0)	0% (0)	33% (1)	0% (0)	0% (0)	<b>3</b>	

## Appendix E-14: Rivers and Streams Kankakee River (Illinois River) Drainage Headwater

which will remove the tadpole madtom's preferred current-free, quiet habitat.

**Total Respondents**

**3**

## Appendix E-14: Rivers and Streams Kankakee River (Illinois River) Drainage Headwater

- 10.** Please rank the following threats to the HABITAT of the Wildlife in Headwaters of the Kankakee River (Illinois River) Drainage Habitat in Indiana.

Appendix E-14: Rivers and Streams Kankakee River (Illinois River) Drainage Headwater

Non-point source pollution (sedimentation resulting in smothering of substrates and turbidity)  
 Habitat degradation (removal of vegetation and shallow water)

Stream channelization (straightening the channels to move water faster) and Habitat degradation (removal of debris in the stream to speed up the transfer of water off of the land and into the receiving stream)

**Total Respondents 3**

**13.** What current monitoring efforts by state agencies are you aware of for the Wildlife in Headwaters of the Kankakee River (Illinois River) Drainage Habitat in Indiana?

	<b>Yes, these efforts occur</b>	<b>Not aware of these efforts occurring</b>	<b>Response Total</b>
Statewide year-round monitoring conducted by state agencies	0% (0)	100% (3)	<b>3</b>
Statewide once a year monitoring conducted by state agencies	0% (0)	100% (3)	<b>3</b>
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies		100% (3)	<b>3</b>
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	0% (0)		





Appendix E-14: Rivers and Streams Kankakee River (Illinois River) Drainage Headwater

**16.** How crucial are these monitoring efforts by other organizations for the conservation of the Wildlife in Headwaters of the Kankakee River (Illinois River) Drainage Habitat in Indiana?

<b>Very crucial</b>	<b>Somewhat crucial</b>	<b>Slightly crucial</b>	<b>Not crucial</b>	<b>Unknown</b>	<b>Response Total</b>
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Appendix E-14: Rivers and Streams Kankakee River (Illinois River) Drainage Headwater

**19.** Please list organizations that are monitoring the Wildlife in Headwaters of the Kankakee River (Illinois River) Drainage Habitat in Indiana.

DNR and IDEM

**Total Respondents 1**

**20.** What are the current monitoring techniques for the Wildlife in Headwaters of the Kankakee River (Illinois River) Drainage Habitat in Indiana?

**Frequently  
used**

Appendix E-14: Rivers and Streams Kankakee River (Illinois River) Drainage Headwater

Total Respondents

0

22. What one or two monitoring techniques would you recommend for effective conservation of the Wildlife in Headwaters of the Kankakee River (Illinois River) Drainage Habitat in Indiana?

Periodic electrofishing surveys and mark recapture techniqu

## Appendix E-14: Rivers and Streams Kankakee River (Illinois River) Drainage Headwater

organizations

Statewide once a year inventory and assessment conducted by other organizations

0% (0)

100% (3)

**3**



Appendix E-14: Rivers and Streams Kankakee River (Illinois River) Drainage Headwater

**Total Respondents 16**



Appendix E-14: Rivers and Streams Kankakee River (Illinois River) Drainage Headwater

**Total Respondents 3**

**28.** Regional or local HABITAT inventory and assessment by other organizations for the Wildlife in Headwaters of the Kankakee River (Illinois River) Drainage Habitat in Indiana.

No responses were entered for this question.

**Respondents 0**

**29.** Please list organizations that are monitoring this HABITAT for the Wildlife in Headwaters of the Kankakee River (Illinois River) Drainage Habitat in Indiana.

DNR division of Fish and Wildlife



Appendix E-14: Rivers and Streams Kankakee River (Illinois River) Drainage Headwater

**31.** Other HABITAT inventory and assessment techniques for the Wildlife in Headwaters of the Kankakee River (Illinois River) Drainage Habitat in Indiana.

No responses were entered for this question.

**Total Respondents      0**



Appendix E-14: Rivers and Streams Kankakee River (Illinois River) Drainage Headwater

**36.** What is the current HABITAT body of science for the Wildlife in Headwaters of the Kankakee River (Illinois River) Drainage Habitat in Indiana?

**Response Total    Response Percent**

Complete, up to date and





45.

## Appendix E-14: Rivers and Streams Kankakee River (Illinois River) Drainage Headwater

No responses were entered for this question.

**Total Respondents**      **0**





Appendix E-15: Rivers and Streams Kankakee River (Illinois River) Drainage  
Wadeable/Large River

6. Please rank the following threats to the Wildlife in Wadeable/ Large Rivers of the Kankakee River (Illinois River) Drainage Habitat in Indiana.

**Critical**



Appendix E-15: Rivers and Streams Kankakee River (Illinois River) Drainage  
Wadeable/Large River

Degradation of the stream channel will also increase the velocity of the current (if straightened or cleared of debris) which will remove the tadpd of



Appendix E-15: Rivers and Streams Kankakee River (Illinois River) Drainage  
Wadeable/Large River

**14.** What current monitoring efforts by other organizations are you aware of for the Wildlife in Wadeable/ Large Rivers of the Kankakee River (Illinois River) Drainage Habitat in Indiana?

	<b>Yes, these efforts occur</b>	<b>Not aware of these efforts occurring</b>	<b>Response Total</b>
Statewide year-round monitoring conducted by other organizations	0% (0)	100% (1)	<b>1</b>
Statewide once a year monitoring conducted by other organizations	0% (0)	100% (1)	<b>1</b>
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (1)	<b>1</b>
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (1)	<b>1</b>
Regional or local year-round monitoring conducted by other organizations	0% (0)	100% (1)	<b>1</b>

Appendix E-15: Rivers and Streams Kankakee River (Illinois River) Drainage  
Wadeable/Large River

once a year and not regularly scheduled)  
monitoring conducted by state agencies

**Total Respondents 8**

**16.** How crucial are these monitoring efforts by other organizations for the conservation of the Wildlife in Wadeable/  
Large Rivers of the Kankakee River (Illinois River) Drainage Habitat in Indiana?

	<b>Very crucial</b>	<b>Somewhat crucial</b>	<b>Slightly crucial</b>	<b>Not crucial</b>	<b>Unknown</b>	<b>Response Total</b>
Statewide year-round monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	<b>1</b>
Statewide once a year monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	<b>1</b>
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	<b>1</b>
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	<b>1</b>

Appendix E-15: Rivers and Streams Kankakee River (Illinois River) Drainage  
Wadeable/Large River

none		<b>Total Respondents</b>	<b>1</b>
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**19.** Please list organizations that are monitoring the Wildlife in Wadeable/ Large Rivers of the Kankakee River (Illinois River) Drainage Habitat in Indiana.

none		<b>Total Respondents</b>	<b>1</b>
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**20.** What are the current monitoring techniques for the Wildlife in Wadeable/ Large Rivers of the Kankakee River (Illinois River) Drainage Habitat in Indiana?

<b>Frequently used</b>	<b>Occasionally used</b>	<b>Not used but possible with existing technology and data</b>	<b>Not used and not possible</b>
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Appendix E-15: Rivers and Streams Kankakee River (Illinois River) Drainage  
Wadeable/Large River

**24.** What current HABITAT inventory and assessment efforts or activities by other organizations are you aware of for the Wildlife in Wadeable/ Large Rivers of the Kankakee River (Illinois River) Drainage Habitat in Indiana?

	Yes, these efforts occur	No effort that I'm aware of	Response Total
Statewide year-round inventory and assessment conducted by other organizations	0% (0)	100% (1)	1
Statewide once a year inventory and assessment conducted by other organizations	0% (0)	100% (1)	1
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (1)	1
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (1)	1
Regional or local year-round inventory and assessment conducted by other organizations	0% (0)	100% (1)	1
Regional or local once a year inventory and assessment conducted by other organizations	0% (0)	100% (1)	1
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (1)	1
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (1)	1
		<b>Total Respondents</b>	<b>8</b>

Appendix E-15: Rivers and Streams Kankakee River (Illinois River) Drainage  
Wadeable/Large River

25. How crucial are these HABITAT efforts by state agencies for the conservation of the Wildlife in Wadeable/ Large Rivers of the Kankakee River (Illinois River) Drainage Habitat in D3.Bnodnana?

Appendix E-15: Rivers and Streams Kankakee River (Illinois River) Drainage  
Wadeable/Large River

**26.** How crucial are these HABITAT efforts by other organizations for the conservation of the Wildlife in Wadeable/  
Large Rivers of the Kankakee River (Illinois River) Drainage Habitat in Indiana?

**These  
efforts  
are very  
crucial  
for this  
HABITAT**



Appendix E-15: Rivers and Streams Kankakee River (Illinois River) Drainage  
Wadeable/Large River

**28.** Regional or local HABITAT inventory and assessment by other organizations for the Wildlife in Wadeable/ Large Rivers of the Kankakee River (Illinois River) Drainage Habitat in Indiana.

none

**Total Respondents 1**

**29.** Please list organizations that are monitoring this HABITAT for the Wildlife in Wadeable/ Large Rivers of the









Appendix E-15: Rivers and Streams Kankakee River (Illinois River) Drainage  
Wadeable/Large River

**41.** What are the HABITAT research needs for the Wildlife in Wadeable/ Large Rivers of the Kankakee River (Illinois River) Drainage Habitat in Indiana?

	<b>Urgently needed</b>	<b>Greatly needed</b>	<b>Needed</b>	<b>Slightly needed</b>	<b>Not needed</b>	<b>Unknown</b>	<b>Response Total</b>
Successional changes	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	<b>1</b>
Distribution and abundance (fragmentation)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	<b>1</b>
Threats (land use change/competition, contamination/global warming)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	<b>1</b>
Relationship/dependence on specific site conditions	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	<b>1</b>
Growth and development of individual components of the habitat	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	<b>1</b>
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)			

Appendix E-15: Rivers and Streams Kankakee River (Illinois River) Drainage  
Wadeable/Large River

43.



Appendix E-15: Rivers and Streams Kankakee River (Illinois River) Drainage  
Wadeable/Large River

Habitat protection  
Restrict disturbance to habitat (dredging, removal of debris)

**Total Respondents 3**

**49.**

Do you have any additional comments or information on the Wildlife in Wadeable/ Large Rivers of the Kankakee

Appendix E-16: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau Ecoregions Headwater

6.

Appendix E-16: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau Ecoregions Headwater

7. Please also rank these threats to the Wildlife in Headwaters in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio Ri Indiana. JETT2 1 Tf12 0 0 12 425.878679.2 Tm0 Oc0 Tw( )Tj1Tq1 i 57.972 701.76 -220.5 1-258 -ef9.22 601



Appendix E-16: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior  
Plateau Ecoregions Headwater





Appendix E-16: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior  
Plateau Ecoregions Headwater

rior

Runoff, mostly agricultural  
Channelization

Top two threats from the list up above are habitat degradation and stream channelization

Non-point source pollution in the form of sedimentation  
Destruction of clear shaded waters by forestry/agricultural practices or stream channelization.

**Total Respondents 3**

Appendix E-16: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau Ecoregions Headwater

**14.** What current monitoring efforts by other organizations are you aware of for the Wildlife in Headwaters in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana?

	<b>Yes, these efforts occur</b>	<b>Not aware of these efforts occurring</b>	<b>Response Total</b>
Statewide year-round monitoring conducted by other organizations	0% (0)	100% (5)	<b>5</b>
Statewide once a year monitoring conducted by other organizations	0% (0)	100% (5)	<b>5</b>
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (5)	<b>5</b>
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (5)	<b>5</b>
Regional or local year-round monitoring conducted by other organizations	0% (0)	100% (5)	<b>5</b>
Regional or local once a year monitoring conducted by other organizations	40% (2)	60% (3)	

Appendix E-16: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau Ecoregions Headwater

once a year and not regularly scheduled)  
 monitoring conducted by state agencies

**Total Respondents 40**



**16.** How crucial are these monitoring efforts by other organizations for the conservation of the Wildlife in Headwaters in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana?

<b>Very crucial</b>	<b>Somewhat crucial</b>	<b>Slightly crucial</b>	<b>Not crucial</b>	<b>Unknown</b>	<b>Response Total</b>
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Appendix E-16: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior  
Plateau Ecoregions Headwater

**Total Respondents**      **4**

18.

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Appendix E-16: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau Ecoregions Headwater

**20.** What are the current monitoring techniques for the Wildlife in Headwaters in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana?

Frequently used	Occasionally used	Not used but possible with existing technology and data	Not used and not possible with existing technology and data	Not economically feasible	Unknown	Response Total
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Appendix E-16: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau Ecoregions Headwater

**22.** What one or two monitoring techniques would you recommend for effective conservation of the Wildlife in Headwaters in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana?

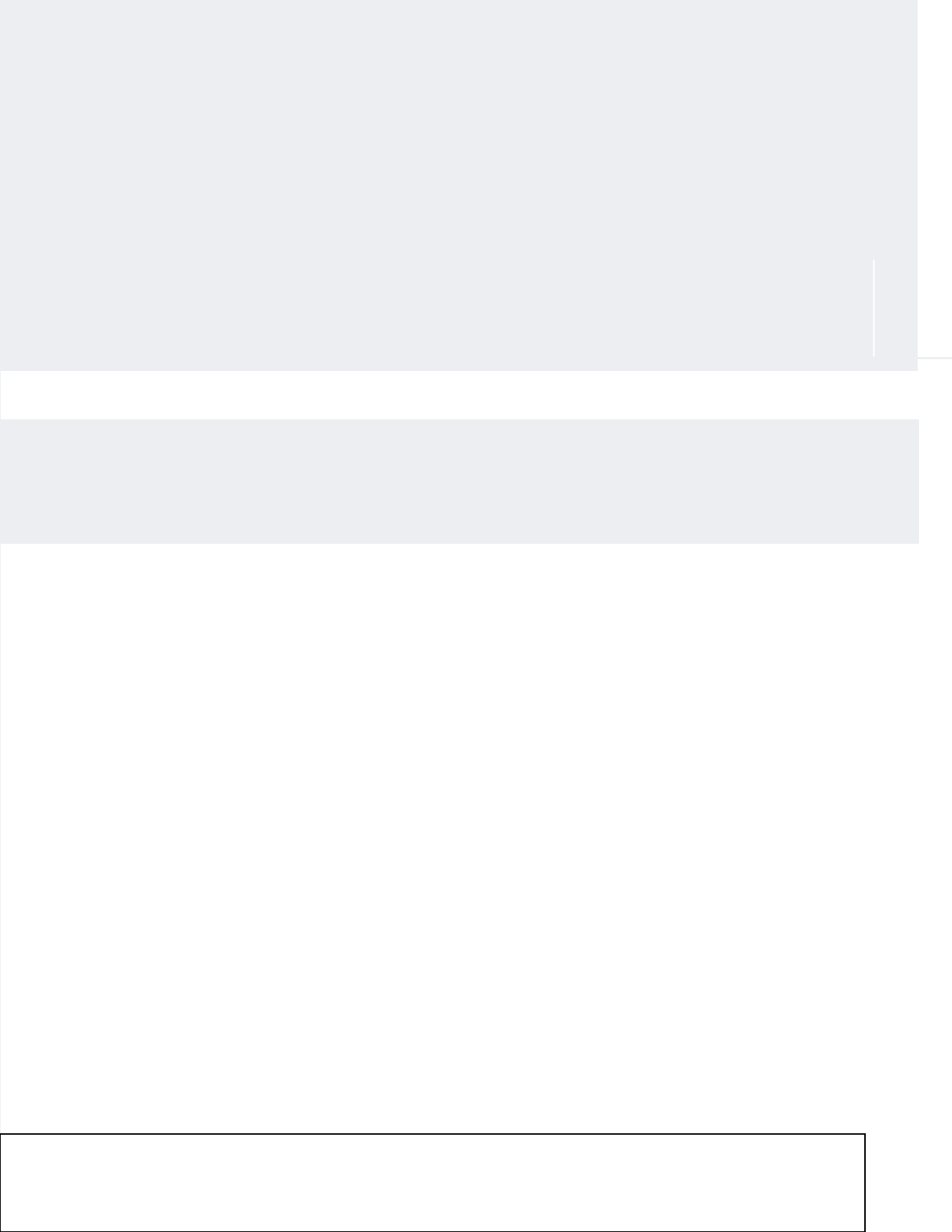
Intensive quantitative sampling of known populations. Need to understand demography of wildlife species. See Strayer & Smith, 2003. AFS Monogr. 8.

2. Less intensive qualitative sampling of new or not recently surveyed areas. Need to determine distribution and status of wildlife species. See same for protocols.

Electro-fishing streams..take a random sampling of streams within a watershed (5th or 6th level HUC)and standardize the stream reach length for the survey...usually 15 times the stream width. Seining is also an appropriate method for sampling, especially in the riffle habitats.; Electro-fishing streams..take a random sampling of streams within a watershed (5th or 6th level HUC)and standardize the stream reach length for the survey...usually 15 times the stream







Appendix E-16: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior  
Plateau Ecoregions Headwater

26.

Appendix E-16: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau Ecoregions Headwater

**28.** Regional or local HABITAT inventory and assessment by other organizations for the Wildlife in Headwaters in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana.

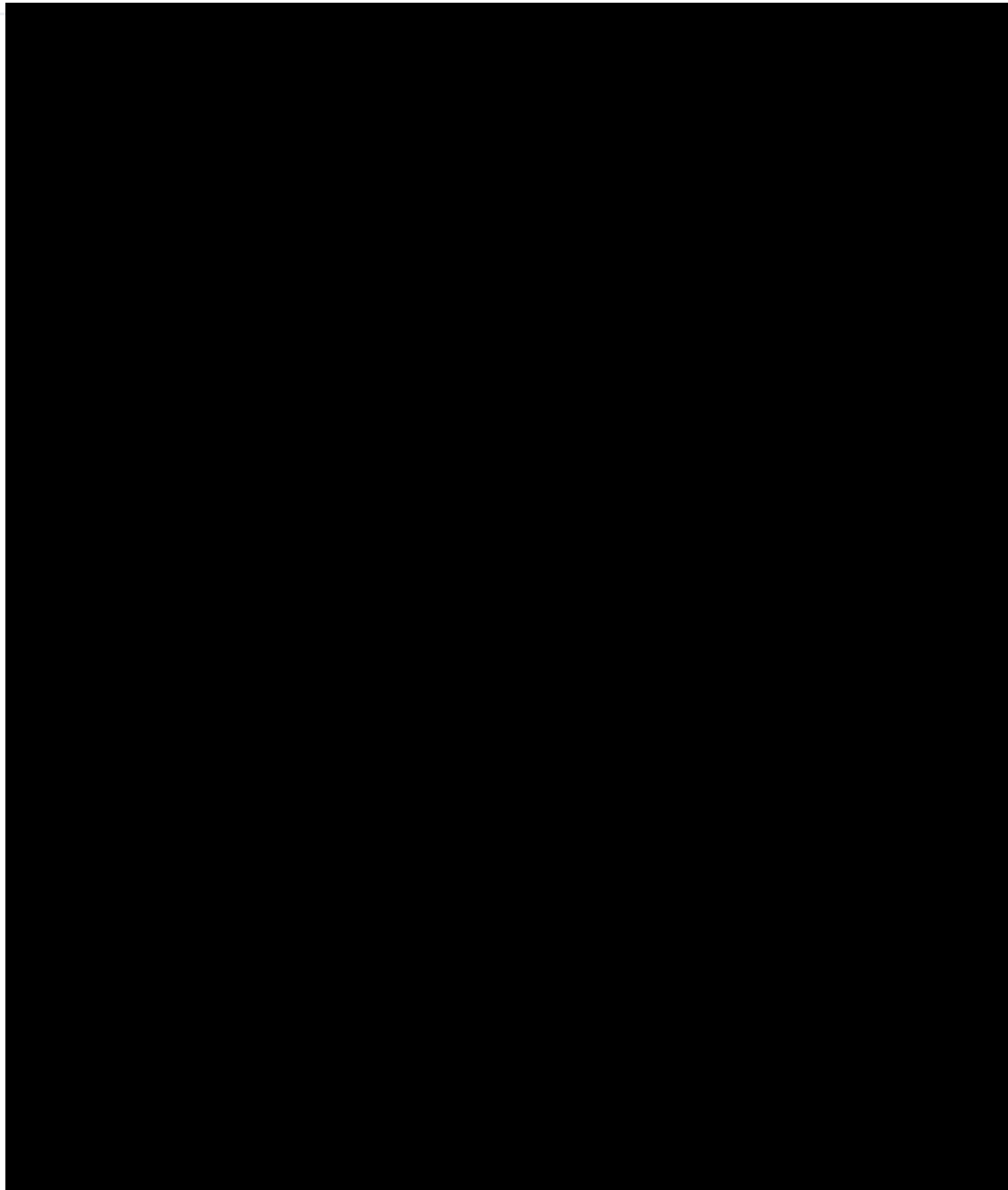
We (Commonwealth Biomonitoring) do habitat evaluations on small streams as part of watershed studies. These evaluations are not specific to mussels, but are Ohio EPA QHEI methods.

? Wabash system

Two or more 5th level HUC watersheds a year that encompass the Hoosier National Forest are sampled; a random sampling of streams found within these 5th level HUCs occurs.

**Total Respondents 3**

F2(i)-6.2(s)0.ddF2(i)- 0.720038 52



Appendix E-16: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau Ecoregions Headwater

**30.** If a technique is not applicable to the Wildlife in Headwaters in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat do not select a response in that row.

**Frequently used    Occasionally used**



Appendix E-16: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior  
Plateau Ecoregions Headwater

**34.** Please provide a citation (title, author, date, publisher) that would give the best overview of the Wildlife in

Appendix E-16: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau Ecoregions Headwater

**37.** Please provide a citation (title, author, date, publisher) that would give the best HABITAT overview of the Wildlife in Headwaters in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana, if available. This resource may be used if further detail is needed.

Title = Naiades of Pennsylvania  
Author = Ortmann  
Date = 1919  
Publisher = Carnegie Museum

**Response** **Response**  
**Total** **Percent**

**38.** If possible, please provide a second citation (title, author, date, publisher) that would give another good HABITAT overview of the Wildlife in Headwaters in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana. This resource may also be used if further detail is needed.

Title = Freshwater Mollusca of WI  
Author = Baker  
Date = 1919  
Publisher = WI Geol. Nat. Hist. Surv.

**Response** **Response**  
**Total** **Percent**

Appendix E-16: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau Ecoregions Headwater

**41.** What are the HABITAT research needs for the Wildlife in Headwaters in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana?

**Urgently needed    Greatly needed    Needed    Slightly needed    Not needed    Unknown    Response**



Appendix E-16: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau Ecoregions Headwater

**43.** How well do the following conservation efforts address the threats to the Wildlife in Headwaters in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana?

**Very well   Somewhat   Not at all   Not used   Unknown   Response**



Appendix E-16: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior  
Plateau Ecoregions Headwater

Appendix E-16: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau Ecoregions Headwater

**48.** What one or two specific HABITAT practices would you recommend for more effective conservation of the Wildlife in Headwaters in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana?

Treat small streams as biological resources and not just drainage ditches. At the very least, require that a mussel survey be done before dredging.

1. Promote riparian corridor
2. Limit habitat modifications

1. Streambank stabilization or stream restoration (reconstructing the channel to reconnect it to its natural floodplain elevation).
2. Culvert or stream crossing structure improvement (replace non-functioning culverts or other crossing structures and replace with ones that function and are at the right elevation/location within the stream's longitudinal profile).
3. Restoration of riparian vegetative communities through tree planting, etc.

Habitat protection and Protection of adjacent buffer zone

e at6storale at6storalth e at6storalHabyu 6ith

**Total Respondents**

**4**

Appendix E-17: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau  
 Ecoregions Wadeable/Large River

**6.** Please rank the following threats to the Wildlife in Wadeable/Large Rivers in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana.

	<b>Critical threat</b>	<b>Serious threat</b>	<b>Somewhat of a threat</b>	<b>Slight threat</b>	<b>No threat</b>	<b>Unknown</b>	<b>Response Total</b>						
Invasive/non-native species	0% (0)	8% (1)	38% (5)	38% (5)	0% (0)	15% (2)	<b>13</b>						
High sensitivity to pollution	23% (3)	69% (9)	8% (1)	0% (0)	0% (0)	0% (0)	<b>13</b>						









12.

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Appendix E-17: Rivers and Streams Ohio River Drainage Easter

Appendix E-17: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau  
Ecoregions Wadeable/Large River

organizations

**Total Respondents 96**

**15.**

Appendix E-17: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau  
Ecoregions Wadeable/Large River

**16.** How crucial are these monitoring efforts by other organizations for the conservation of the Wildlife in Wadeable/Large Rivers in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana?

	<b>Very crucial</b>	<b>Somewhat crucial</b>	<b>Slightly crucial</b>	<b>Not crucial</b>	<b>Unknown</b>	<b>Response Total</b>
Statewide year-round monitoring conducted by other organizations	0% (0)	10% (1)	20% (2)	60% (6)	10% (1)	<b>10</b>
Statewide once a year monitoring conducted by other organizations	0% (0)	10% (1)	20% (2)	60% (6)	10% (1)	<b>10</b>
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	20% (2)	20% (2)	50% (5)	10% (1)	<b>10</b>

Appendix E-17: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau  
Ecoregions Wadeable/Large River

17.



Appendix E-17: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau  
Ecoregions Wadeable/Large River

**20.** What are the current monitoring techniques for the Wildlife in Wadeable/Large Rivers in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana?

<b>Frequently used</b>	<b>Occasionally used</b>	<b>Not used but possible with</b>
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Appendix E-17: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau  
Ecoregions Wadeable/Large River

- 21.** Other monitoring techniques for the Wildlife in Wadeable/Large Rivers in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana.

Unintentional take could be monitored from fish kill cadaver counts if the officers could be trained to identify norther hog suckers instead of not counting them or just lumping them into the generic class of "round bodied suckers"

**Total Respondents**





Appendix E-17: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau  
Ecoregions Wadeable/Large River

**24.** What current HABITAT inventory and assessment efforts or activities by other organizations are you aware of for the Wildlife in Wadeable/Large Rivers in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana?

Yes, these efforts occur	No effort that I'm aware of	Response Total
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Appendix E-17: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau  
Ecoregions Wadeable/Large River

**25.** How crucial are these HABITAT efforts by state agencies for the conservation of the Wildlife in Wadeable/Large Rivers in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana?

	<b>These efforts are very crucial for this HABITAT</b>	<b>These efforts are somewhat crucial for this HABITAT</b>	<b>These efforts are slightly crucial for this HABITAT</b>	<b>These efforts are not crucial for this HABITAT</b>	<b>Unknown</b>	<b>Response Total</b>
Statewide annual inventory and assessment conducted by state agencies	9% (1)	9% (1)	18% (2)	45% (5)	18% (2)	<b>11</b>
Statewide once a year inventory and assessment conducted by state agencies	9% (1)	9% (1)	27% (3)	36% (4)	18% (2)	<b>11</b>
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	18% (2)	45% (5)	9% (1)	18% (2)	9% (1)	<b>11</b>
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	10% (1)	40% (4)	20% (2)	20% (2)		



Appendix E-17: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau  
Ecoregions Wadeable/Large River

27. Regional or local state agency HABITAT inventory and assessment for the Wildlife in Wadeable/Large Rivers in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana.

Appendix E-17: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau  
Ecoregions Wadeable/Large River

- 28.** Regional or local HABITAT inventory and assessment by other organizations for the Wildlife in Wadeable/Large Rivers in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana.

Wabash system

Appendix E-17: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau  
Ecoregions Wadeable/Large River

**30.** What are the current HABITAT inventory and/or assessment techniques for the Wildlife in Wadeable/Large Rivers





Appendix E-17: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau  
Ecoregions Wadeable/Large River

34.

Please provide a citation (title, author, date, publisher)

Appendix E-17: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau  
Ecoregions Wadeable/Large River

Author = Stuart Shipman  
Date = December 1997  
Publisher = IDNR

**Total Respondents**

Appendix E-17: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau  
Ecoregions Wadeable/Large River

**36.** What is the current HABITAT body of science for the Wildlife in Wadeable/Large Rivers in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana?

		<b>Response Total</b>	<b>Response Percent</b>
Complete, up to date and extensive		0	0%
Adequate		6	50%
Inadequate		3	25%
Nonexistent		2	17%
Other (please explain below)		1	8%
<b>Total Respondents</b>		<b>12</b>	

Appendix E-17: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau  
Ecoregions Wadeable/Large River

**37.** Please provide a citation (title, author, date, publisher) that would give the best HABITAT overview of the Wildlife in Wadeable/Large Rivers in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana, if available. This resource may be used if further detail is needed.

Title = Naiades of Pennsylvania  
Author = Ortmann  
Date = 1919  
Publisher = Carnegie Museum

Title = Federal Recovery Plan  
Author = USFWS  
Date = 1993  
Publisher = USFWS

Title = A survey of fish communities and aquatic habitats at Indiana's major streams with emphasis on smallmouth bass distribution and abundance.  
Author = Stuart T. Shipman  
Date = December 1997  
Publisher = IDNR

**Response Response  
Total Percent**

Title = A survey of fish communities and aquatic habitats at Indiana's major streams with emphasis on smallmouth bass distribution and abundance  
Author = Stuart T. Shipman  
Date = 12/1997  
Publisher = DNR/Fisheries section

Title = A survey of fish communities and aquatic habitats at Indiana's major streams with emphasis on smallmouth bass distribution and abundance  
Author = Stuart T. Shipman  
Date = December 1997  
Publisher = IDNR

Appendix E-17: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau  
Ecoregions Wadeable/Large River

- 38.** If possible, please provide a second citation (title, author, date, publisher) that would give another good HABITAT overview of the Wildlife in Wadeable/Large Rivers in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio

Appendix E-17: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau  
Ecoregions Wadeable/Large River

Appendix E-17: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau  
Ecoregions Wadeable/Large River

**41.** What are the HABITAT research needs for the Wildlife in Wadeable/Large Rivers in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana?

	<b>Urgently needed</b>	<b>Greatly needed</b>	<b>Needed</b>	<b>Slightly needed</b>	<b>Not needed</b>	<b>Unknown</b>	<b>Response Total</b>					
Successional changes	0% (0)	8% (1)	0% (0)	42% (5)	42% (5)	8% (1)	<b>12</b>					
Distribution and abundance (fragmentation)	17% (2)	25% (3)	25% (3)	8% (1)	17% (2)	8% (1)	<b>12</b>					
Threats (land use change/competition, contamination/global warming)	25% (3)	42% (5)	17% (2)	17% (2)	0% (0)	0% (0)	<b>12</b>					
Relationship/dependence on specific site conditions	25% (3)	42% (5)	8% (1)	8% (1)	17% (2)	0% (0)	<b>12</b>					
Growth and development of individual components of the habitat	8% (1)	17% (2)	42% (5)	0% (0)	25% (3)	8% (1)						

Appendix E-17: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau  
Ecoregions Wadeable/Large River

**43.** How well do the following conservation efforts address the threats to the Wildlife in Wadeable/Large Rivers in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana?

	<b>Very well</b>	<b>Somewhat</b>	<b>Not at all</b>	<b>Not used</b>	<b>Unknown</b>	<b>Response Total</b>				
Habitat protection (use below for details)	27% (3)	45% (5)	10% (1)	0% (0)	18% (2)	<b>11</b>				
Population management (hunting, trapping)	9% (1)	36% (4)	9% (1)	27% (3)	18% (2)	<b>11</b>				
Population enhancement (captive breeding and release)	0% (0)	18% (2)	0% (0)	73% (8)	9% (1)	<b>11</b>				



## Appendix E-17: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau Ecoregions Wadeable/Large River

See Watters, 2000. Proc. 1st FMCS Symposium

1. Strict enforcement of laws regulating instream modification; incentives to farmers.
2. Propagation

Protect the shallow sand/gravel habitat from siltation and channelization, and keep the waters free of pollutants and toxins.

Appendix E-17: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau  
Ecoregions Wadeable/Large River

46. How well do the following conservation efforts address the HABITAT threats to the Wildlife in Wadeable/Large Rivers in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana?	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
Habitat protection through regulation	18% (2)	45% (5)	10% (1)	0% (0)	27% (3)	

Appendix E-17: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau  
Ecoregions Wadeable/Large River

Appendix E-17: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau  
Ecoregions Wadeable/Large River

**49.** Do you have any additional comments or information on the Wildlife in Wadeable/Large Rivers in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat that you feel would be useful in the development of the Indiana Comprehensive Wildlife Strategy?

Too little is known about this wildlife species, especially Indiana populations.

N/A

N/A

1. To find out just why the Clubshell depopulated so much of its former range, which once included much of the interior of Indiana. Knowing this "why" should disclose a critical limiting factor, and could lead to its future

Appendix E-18: Rivers and Streams Ohio River Drainage Great River

**6.** Please rank the following threats to the Wildlife in Great Rivers of the Ohio River Drainage Habitat in Indiana.

**Critical threat    Serious threat    Somewhat of a threat    Slight threat**

7.

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## Appendix E-18: Rivers and Streams Ohio River Drainage Great River

**10.** Please rank the following threats to the HABITAT of the Wild





Appendix E-18: Rivers and Streams Ohio River Drainage Great River

**14.** What current monitoring efforts by other organizations are you aware of for the Wildlife in Great Rivers of the







Appendix E-18: Rivers and Streams Ohio River Drainage Great River

**20.** What are the current monitoring techniques for the Wildlife in Great Rivers of the Ohio River Drainage Habitat in Indiana?

<b>Frequently used</b>	<b>Occasionally used</b>	<b>Not used but possible with existing technology and data</b>	<b>Not used and not possible with existing technology and data</b>	<b>Not</b>
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## Appendix E-18: Rivers and Streams Ohio River Drainage Great River

- 22.** What one or two monitoring techniques would you recommend for effective conservation of the Wildlife in Great Rivers of the Ohio River Drainage Habitat in Indiana?

Appendix E-18: Rivers and Streams Ohio River Drainage Great River

Appendix E-18: Rivers and Streams Ohio River Drainage Great River

**24.** What current HABITAT inventory and assessment efforts or activities by other organizations are you aware of for the Wildlife in Great Rivers of the Ohio River Drainage Habitat in Indiana?

	<b>Yes, these efforts occur</b>	<b>No effort that I'm aware of</b>	<b>Response Total</b>
Statewide year-round inventory and assessment conducted by other organizations	0% (0)	100% (8)	<b>8</b>
Statewide once a year inventory and assessment conducted by other organizations	0% (0)	100% (7)	<b>7</b>
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (8)	<b>8</b>
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (8)	<b>8</b>
Regional or local year-round inventory and assessment conducted by other organizations	13% (1)	88% (7)	<b>8</b>
Regional or local once a year inventory and assessment conducted by other organizations	14% (1)	86% (6)	<b>7</b>
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	13% (1)	88% (7)	<b>8</b>
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	67% (6)	33% (3)	<b>9</b>
		<b>Total Respondents</b>	<b>63</b>



25.

## Appendix E-18: Rivers and Streams



Appendix E-18: Rivers and Streams Ohio River Drainage Great River

Appendix E-18: Rivers and Streams Ohio River Drainage Great River

**31.** Other HABITAT inventory and assessment techniques for the Wildlife in Great Rivers of the Ohio River Drainage Habitat in Indiana.

OHEI

**Total Respondents 1**

**32.**

## Appendix E-18: Rivers and Streams Ohio River Drainage Great River

Title = Wabash River Catfish Reports  
Author = Rob Columbo  
Date = 2002,2003,2004,2005  
Publisher = SIU/INDFW  
Title = GIS mapping and aerial photography and analysis  
Author = ORFMT  
Date = annually since 1999  
Publisher = ORFMT

**35.** If possible, please provide a second citation (title, author, date, publisher) that would give another good overview of the Wildlife in Great Rivers of the Ohio River Drainage Habitat in Indiana. This resource may also be used if further detail is needed.

Title = Life history and propagation...  
Author = Jones & Neves  
Date = 2002  
Publisher = JNABS

Title = Freshwater mussels of the Midwest  
Author = Cummings & Mayer  
Date = 1992  
Publisher = INHS

Title = numerous INDFW FMR's  
Author = Numerous  
Date = numerous  
Publisher = INDFW

Title = various INDFW FMR's  
Author = various  
Date = various  
Publisher = INDFW

**Response**



Appendix E-18: Rivers and Streams Ohio River Drainage Great River

41.	What are the HABITAT research needs for the Wildlife in Great Rivers of the Ohio River Drainage Habitat in Indiana?	Urgently needed	Greatly needed	Needed	Slightly needed	Not needed	Unknown	Response Total	
Successional changes		██████████	0% (0)	0% (0)	0% (0)	100% (8)	0% (0)	██████████	██████████
Distribution and abundance (fragmentation)		38% (3)	0% (0)						██████████



## Appendix E-18: Rivers and Streams Ohio River Drainage Great River

**43.** How well do the following conservation efforts address the threats to the Wildlife in Great Rivers of the Ohio River Drainage Habitat in Indiana?

	<b>Very well</b>	<b>Somewhat</b>	<b>Not at all</b>	<b>Not used</b>	<b>Unknown</b>	<b>Response Total</b>				
Habitat protection (use below for details)	0% (0)	78% (7)	0% (0)	11% (1)	11% (1)	<b>9</b>				
Population management (hunting, trapping)	0% (0)	33% (3)	0% (0)	56% (5)	11% (1)	<b>9</b>				
Population enhancement (captive breeding and release)	0% (0)	0% (0)	11% (1)	89% (8)	0% (0)	<b>9</b>				
Reintroduction (restoration)	0% (0)	11% (1)	11% (1)	78% (7)	0% (0)	<b>9</b>				
Food plots	0% (0)	0% (0)	11% (1)	56% (5)	22% (2)	<b>8</b>				
Threats reduction	0% (0)	22% (2)	11% (1)	67% (6)	0% (0)	<b>9</b>				
Native predator control	0% (0)	0% (0)	11% (1)	89% (8)	0% (0)	<b>9</b>				

## Appendix E-18: Rivers and Streams Ohio River Drainage Great River

**45.** What one or two specific practices would you recommend for more effective conservation

Appendix E-18: Rivers and Streams Ohio River Drainage Great River

**47.** Other current HABITAT conservation practices for the Wildlife in Great Rivers of the Ohio River Drainage Habitat in Indiana.

No responses were entered for this question.

**Total Respondents      0**

**48.** What one or two specific HABITAT practices would you reco







Appendix E-19: Rivers and Streams Ohio River Drainage Interior River Lowland Headwater

**Total Respondents 1**

**13.** What current monitoring efforts by state agencies are you aware of for the Wildlife in Headwaters in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana?

	<b>Yes, these efforts occur</b>	<b>Not aware of these efforts occurring</b>	<b>Response Total</b>
Statewide year-round monitoring conducted by state agencies	0% (0)	100% (1)	<b>1</b>
Statewide once a year monitoring conducted by state agencies	0% (0)	100% (1)	<b>1</b>
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	100% (1)	<b>1</b>
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	0% (0)	100% (1)	<b>1</b>
Regional or local year-round monitoring conducted by state agencies	0% (0)		

## Appendix E-19: Rivers and Streams Ohio River Drainage Interior River Lowland Headwater

Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (1)	<b>1</b>
<b>Total Respondents</b>			<b>8</b>

**15.** How crucial are these monitoring efforts by state agencies for the conservation of the Wildlife in Headwaters in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana?



Appendix E-19: Rivers and Streams Ohio River Drainage Interior River Lowland  
Headwater

**16.**





## Appendix E-19: Rivers and Streams Ohio River Drainage Interior River Lowland Headwater

conducted by other organizations			
Regional or local once a year inventory and assessment conducted by other organizations	0% (0)	100% (1)	<b>1</b>
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (1)	<b>1</b>
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (1)	<b>1</b>
<b>Total Respondents</b>			<b>8</b>

**25.** How crucial are these HABITAT efforts by state agencies for the conservation of the Wildlife in Headwaters in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana?

<b>These efforts are very crucial for this HABITAT</b>	<b>These efforts are somewhat crucial for this HABITAT</b>
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Appendix E-19: Rivers and Streams Ohio River Drainage Interior River Lowland Headwater

26. How crucial are these HABITAT efforts by other organizations for the conservation of the Wildlife in Headwaters in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana?

These efforts are very crucial for this HABITAT	These efforts are somewhat crucial for this HABITAT	These efforts are slightly crucial for this HABITAT
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Appendix E-19: Rivers and Streams Ohio River Drainage Interior River Lowland  
Headwater

No responses were entered for this question.

**Total Respondents**      **0**

(skipped this question)      1

Appendix E-19: Rivers and Streams Ohio River Drainage Interior River Lowland Headwater

**32.** What one or two HABITAT inventory and assessment techniques would you recommend for effective conservation of the Wildlife in Headwaters in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana?

No responses were entered for this question.

**Total Respondents 0**

(skipped this question) 1

**33.** What is the current body of science for the Wildlife in Headwaters in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana?

	Response Total	Response Percent
Complete, up to date and extensive	0	0%
Adequate	0	0%
Inadequate	1	100%
Nonexistent	0	0%
Other (please explain below)	0	0%
<b>Total Respondents</b>	<b>1</b>	

**34.** Please provide a citation (title, author, date, publisher) that would give the best overview of the Wildlife in Headwaters in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana, if available. This resource may be used if further detail is needed.

**Response  
Total      Response  
Percent**





Appendix E-19: Rivers and Streams Ohio River Drainage Interior River Lowland  
Headwater

Appendix E-19: Rivers and Streams Ohio River Drainage Interior River Lowland Headwater

**39.** What are the research needs for the Wildlife in Headwaters in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana?

	<b>Urgently needed</b>	<b>Greatly needed</b>	<b>Needed</b>	<b>Slightly needed</b>	<b>Not needed</b>	<b>Unknown</b>	<b>Response Total</b>
Life cycle	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	<b>1</b>

Appendix E-19: Rivers and Streams Ohio River Drainage Interior River Lowland Headwater

**42.** Other HABITAT research needs for the Wildlife in Headwaters in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana.

No responses were entered for this question.

**Total Respondents 0**

(skipped this question) 1

**43.** How well do the following conservation efforts address the threats to the Wildlife in Headwaters in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana?

	<b>Very well</b>	<b>Somewhat</b>	<b>Not at all</b>	<b>Not used</b>	<b>Unknown</b>	<b>Response Total</b>				
Habitat protection (use below for details)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	<b>0</b>				
Population management (hunting, trapping)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	<b>0</b>				
Population enhancement (captive breeding and release)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	<b>0</b>				
Reintroduction (restoration)	0% (0)	0% (0)		0% (0)	0% (0)	0)				
Food plots	0% (0)	0% (0)	0% (0)							



Appendix E-19: Rivers and Streams Ohio River Drainage Interior River Lowland  
Headwater

(skipped this question)	1
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<b>Total Respondents</b>	<b>1</b>

**46.** How well do the following conservation efforts address the HABITAT threats to the Wildlife in Headwaters in the Interior River Lowland of the Ohio River Drainage Habitat

Appendix E-19: Rivers and Streams Ohio River Drainage Interior River Lowland  
Headwater

Appendix E-19: Rivers and Streams Ohio River Drainage Interior River Lowland  
Headwater

**48.** What one or two specific HABITAT practices would you recommend for more effective conservation of the Wildlife in Headwaters in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana?

Habitat restoration and protection







Appendix E-20: Rivers and Streams Ohio River Drainage Interior River Lowland  
Wadeable/Large River

9. Please briefly describe the top two threats to All Wildlife in Wadeable/Large Rivers in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana identified above.

1. 1) commercial type fishing devices - trot lines, branch lines, big nets, other passive fishing  
2) extreme depredation by overabundant raccoons (on eggs) - maybe by cayotes, too.  
3) extant population (if any) far below level for unassisted recovery.

2. 1) nest depredation mainly by raccoons = very low recruitment.  
2) nest/embryo/hatchling loss associated with attraction to rowcrop land for nesting.  
3) potential loss of adults to road kill and to rogue raccoons (kill adults for their eggs)

3. 1. Insuring that populations maintain critical larva-host connections.

4. Habitat loss for both breeding and feeding/foraging areas. The slough darter prefers a mud or silt bottom with little current velocity and vegetation to deposit eggs on. They also spawn few eggs so reproduction is lower in places where vegetation is lacking. They also compete with other darters for insects and have a high mortality due to stagnation and freezing in the pools they desire to live in.

**Total Respondents**

**4**

Appendix E-20: Rivers and Streams Ohio River Drainage Interior River Lowland  
Wadeable/Large River

**10.** Please rank the following threats to the HABITAT of All Wi

Appendix E-20: Rivers and Streams Ohio River Drainage Interior River Lowland  
Wadeable/Large River

**12.** Please briefly describe the top two HABITAT threats to All Wildlife in Wadeable/Large Rivers in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana identified above.

- 1) channelization
1. 2) drain/cut off oxbow ponds
- 3) trample sandbars or remove other nesting areas along banks
  
- 1) habitat loss through channelization and draining of oxbow ponds and elimination of flows that create point bars on rivers.
2. 2) rowcrop practices: crushing nests during ground insect/weed control; crushing overwinter hatchlings during harvest & early spring plowing
  
1. Pollutants and toxins are major threats.
  
3. 2. Habitat degradation may be a factor, since there are large expanses in the Wabash and East Fork White River where relic valves are common, but the living species is absent.
  
4. Habitat degradation and stream channelization as development continues in the Ohio River Drainage Habitat.

**Total Respondents**

Appendix E-20: Rivers and Streams Ohio River Drainage Interior River Lowland  
Wadeable/Large River

**14.**

Appendix E-20: Rivers and Streams Ohio River Drainage Interior River Lowland  
Wadeable/Large River

Appendix E-20: Rivers and Streams Ohio River Drainage Interior River Lowland  
Wadeable/Large River

**Total Respondents**

**4**

Appendix E-20: Rivers and Streams Ohio River Drainage Interior River Lowland  
Wadeable/Large River

**18.** Regional or local monitoring by other organizations for All Wildlife in Wadeable/Large Rivers in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana.

1. I'm unaware of any.
2. none

**Total Respondents 2**

**19.** Please list organizations that are monitoring All Wildlife in Wadeable/Large Rivers in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana.

1. None?
2. IDEM monitors fish communities not particular species; however, the Slough darter has been captured by electrofishing in the Ohio River Drainage Habitat
3. DNR/DFW

**Total Respondents 3**

**20.** What are the current monitoring techniques for All Wildlife in Wadeable/Large Rivers in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana?

Frequently used    Occasionally used    **Not used but with existing technology**



Appendix E-20: Rivers and Streams Ohio River Drainage Interior River Lowland  
Wadeable/Large River

survey/census

Trapping (by any  
technique) 0% (0) 0% (0) 0% (0) 0%



Appendix E-20: Rivers and Streams Ohio River Drainage Interior River Lowland  
Wadeable/Large River

scheduled) inventory and assessment conducted by state agencies			
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	100% (5)	5
Regional or local year-round inventory and assessment conducted by state agencies	0% (0)	100% (5)	5
Regional or local once a year inventory and assessment conducted by state agencies	20% (1)	80% (4)	5
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	60% (3)	40% (2)	5
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	40% (2)	60% (3)	5
		<b>Total Respondents</b>	<b>40</b>

24. What current HABITAT inventory and assessment efforts or activities by other organizations are you aware of for All Wildlife in Wadeable/Large Rivers in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana?

Appendix E-20: Rivers and Streams Ohio River Drainage Interior River Lowland  
Wadeable/Large River

**25.** How crucial are these HABITAT efforts by state agencies for the conservation of All Wildlife in Wadeable/Large Rivers in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana?

<b>These efforts are very crucial for this HABITAT</b>	<b>These efforts are somewhat crucial for this HABITAT</b>	<b>These efforts are slightly crucial for this HABITAT</b>	<b>These efforts are not crucial for this HABITAT</b>	<b>Unknown</b>	<b>Response Total</b>
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Appendix E-20: Rivers and Streams Ohio River Drainage Interior River Lowland  
Wadeable/Large River

**26.** How crucial are these HABITAT efforts by other organizations for the conservation of All Wildlife in Wadeable/Large Rivers in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana?

<b>These efforts are very crucial for this HABITAT</b>	<b>These efforts are somewhat crucial for this HABITAT</b>	<b>These efforts are slightly crucial for this HABITAT</b>	<b>These efforts are not crucial for this HABITAT</b>
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Unknownar7e766 5907 5304 795

Appendix E-20: Rivers and Streams Ohio River Drainage Interior River Lowland  
Wadeable/Large River

27.

Appendix E-20: Rivers and Streams Ohio River Drainage Interior River Lowland  
Wadeable/Large River

**30.** What are the current monitoring techniques for All Wildlife in the Wadeable/Large Rivers in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana.  
If a technique is not applicable to the Alligator snapping turtle (*Macrochelys temmincki*) do not select a response in that row.

	Frequently used	Occasionally used	Not used but possible with existing technology and data	Not used and not possible with existing technology and data	Not economically feasible	Unknown	Response Total
GIS mapping	0% (0)	50% (2)	25% (1)	0% (0)	0% (0)	25% (1)	4
Aerial photography and analysis	0% (0)	25% (1)	0% (0)	0% (0)	0% (0)	75% (3)	4
Systematic sampling	0% (0)	0% (0)	0% (0)	25% (1)	0% (0)	75% (3)	4

Appendix E-20: Rivers and Streams Ohio River Drainage Interior River Lowland  
Wadeable/Large River

**32.** What one or two HABITAT inventory and assessment techniques would you recommend for effective conservation of All Wildlife in Wadeable/Large Rivers in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana?

- High resolution aerial photography DURING LOW WATER - digitized for GIS. locate:
1.
    - 1) Deep river holes with woody debris (favored by adults)
    - 2) health/permanence of oxbow ponds
    - 3) nesting habitat
  2.
    - 1) high resolution aerial photography during low water periods - digitize and use in GIS - re. how lasting are oxbow ponds during droughts.
    - 2) occasional site visits to assess vegetation quality for this herbivorous turtle.
  3.
    1. To look at saturation of potential habitat: with GIS construction of existing potential habitat(based upon known factors)and overlaying the current distribution of the Yellow Sandshell.
  4. QHEI

Appendix E-20: Rivers and Streams Ohio River Drainage Interior River Lowland  
Wadeable/Large River

**34.** Please provide a citation (title, author, date, publisher) that would give the best overview All Wildlife in Wadeable/Large Rivers in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana, if available. This resource may be used if further detail is needed.

Title =

Author = Minton

Date = 2001

Publisher =

Title = (Numerous internet sites, including USF&W)

Author =

Date =

Publisher =

<b>Response Total</b>	<b>Response Percent</b>
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Title = A survey of fish communities and aquatic habitats at Indiana's major streams with emphasis on smallmouth bass distribution and abundance

Author = Stuart Shipman

Date = 12/1997

Publisher = DNR/Fisheries section



Appendix E-20: Rivers and Streams Ohio River Drainage Interior River Lowland  
Wadeable/Large River

- 36.** What is the current HABITAT body of science for All Wildlife in Wadeable/Large Rivers in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana?

Appendix E-20: Rivers and Streams Ohio River Drainage Interior River Lowland  
Wadeable/Large River

**39.** What are the research needs for All Wildlife in Wadeable/Large Rivers in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana?

	<b>Urgently needed</b>	<b>Greatly needed</b>	<b>Needed</b>	<b>Slightly needed</b>	<b>Not needed</b>	<b>Unknown</b>	<b>Response Total</b>
Life cycle	0% (0)	0% (0)	60% (3)	20% (1)	20% (1)	0% (0)	<b>5</b>
Distribution and abundance	20% (1)	20% (1)	40% (2)	0% (0)	20% (1)	0% (0)	<b>5</b>
Limiting factors (food, shelter, water, breeding sites)	0% (0)	80% (4)	0% (0)	0% (0)	20% (1)	0% (0)	<b>5</b>

Appendix E-20: Rivers and Streams Ohio River Drainage Interior River Lowland  
Wadeable/Large River

**Total Respondents 26**



**42.** Other HABITAT research needs for All Wildlife in Wadeable/Large Rivers in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana.

1. Same as on previous panel

**Total Respondents 1**

**43.**

Appendix E-20: Rivers and Streams Ohio River Drainage Interior River Lowland  
Wadeable/Large River

**Total Respondents**

Appendix E-20: Rivers and Streams Ohio River Drainage Interior River Lowland  
Wadeable/Large River

**45.** What one or two specific practices would you recommend for more effective conservation of All Wildlife in Wadeable/Large Rivers in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana?

- 1) restock, as too few if any turtles remain
  - 2) end use of commercial fishing equipment
  - 3) Do periodic local removal of raccoons
2. 1. Protection of the habitat against pollutants and toxins.
- 1) Expand and liberalize the taking of raccoons so as to greatly reduce numbers associated with river cooter habitat. Raccoon reduction used re. sea turtles in FL and endangered Illinois mud turtle in IA, proposed for alligator s. in LA
3. 2) Cease any future channelization plans and restore existing oxbow ponds - provide landowner financial incentive.  
3) local restocking where raccoons reduced should hasten delisting criteria.
4. Habitat protection  
Threats Reduction

**Total Respondents 4**

**46.** How well do the following conservation efforts address the HABITAT threats to All Wildlife in Wadeable/Large Rivers in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana?

**Very  
well**

**Somewhat**

**Not at all**

**Not used**

**Unknown**



Appendix E-20: Rivers and Streams Ohio River Drainage Interior River Lowland  
Wadeable/Large River

Appendix E-20: Rivers and Streams Ohio River Drainage Interior River Lowland  
Wadeable/Large River

4. IDEM has captured slough darters on the following streams: Turkey Cr (Clay Co.), Patoka R and N Fk Little Pigeon Cr (Dubois Co.), Patoka R and Yellow Cr as well as Smith Fk Pigeon Cr (Gibson Co.), Bruster Br and Flat Cr (Pike Co.), E Fk Crooked Cr (Spencer Co.), Busseron Cr (Sullivan Co.), and Lost Cr, Otter Cr, N Br Otter Cr in Vigo Co.
5. no

**Total Respondents 5**