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

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total
Invasive/non-native species	0% (0)	0% (0)	0% (0)	33% (2)	67% (4)	0% (0)	**6**
High sensitivity to pollution	17% (1)	17% (1)	0% (0)	17% (1)	0% (0)	50% (3)	**6**
Bioaccumulation of contaminants	0% (0)	50% (3)	0% (0)	17% (1)	0% (0)	33% (2)	**6**
Predators (native or domesticated)	0% (0)	0% (0)	33% (2)	67% (4)	0% (0)	0% (0)	**6**
Dependence on other species (mutualism, pollinators)	0% (0)	0% (0)	0% (0)	0% (0)	83% (5)	17% (1)	**6**
Diseases/parasites (of the species itself)	0% (0)	0% (0)	17% (1)	17% (1)	33% (2)	33% (2)	**6**
Regulated hunting/fishing pressure (too much)	0% (0)	0% (0)	0% (0)	0% (0)	100% (6)	0% (0)	**6**
Species over population	0% (0)	0% (0)	0% (0)	0% (0)	100% (6)	0% (0)	**6**
Unintentional take/ direct mortality (e.g., vehicle collisions, power line collisions, by-catch, harvesting equipment, land preparation machinery)	0% (0)	33% (2)	0% (0)	67% (4)	0% (0)	0% (0)	**6**
Unregulated collection pressure	0% (0)	0% (0)	17% (1)	33% (2)	50% (3)	0% (0)	**6**
Dependence on irregular resources (cyclical annual variations) (e.g., food, water, habitat limited due to annual variations in availability)	0% (0)	0% (0)	17% (1)	50% (3)	17% (1)	17% (1)	**6**
					Total Respondents		**66**

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

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total
Habitat loss (breeding range)	33% (2)	33% (2)	33% (2)	0% (0)	0% (0)	0% (0)	**6**
Habitat loss (feeding/foraging areas)	17% (1)	50% (3)	33% (2)	0% (0)	0% (0)	0% (0)	**6**
Small native range (high endemism)	17% (1)	17% (1)	0% (0)	33% (2)	33% (2)	0% (0)	**6**
Near limits of natural geographic range	17% (1)	0% (0)	17% (1)	0% (0)	67% (4)	0% (0)	**6**
Large home range requirements	0% (0)	0% (0)	17% (1)	17% (1)	67% (4)	0% (0)	**6**
Viable reproductive population size or availability	0% (0)	0% (0)	33% (2)	33% (2)	17% (1)	17% (1)	**6**
Specialized reproductive behavior or low reproductive rates	17% (1)	33% (2)	50% (3)	0% (0)	0% (0)	0% (0)	**6**
Degradation of movement/migration routes	17% (1)	50% (3)	0% (0)	17% (1)	17% (1)	0% (0)	**6**

(overwintering habitats, nesting and staging sites)							
Genetic pollution (hybridization)	0% (0)	0% (0)	0% (0)	0% (0)	33% (2)	67% (4)	**6**
Unknown	0% (0)	50% (1)	0% (0)	0% (0)	0% (0)	50% (1)	**2**
Other (please specify below)	50% (1)	0% (0)	50% (1)	0% (0)	0% (0)	0% (0)	**2**
					Total Respondents		**58**

8. Other threats to the Wildlife in Caves Habitat in Indiana.

1. Loss of forest habitat surrounding winter hibernacula/caves.

2. With reference to "unregulated collection pressure," I included disturbance related to research/monitoring.

3. Unregulated Human Activity in Hibernacula

4. needs caves or mines for hibernationwithin probably 60 miles of its summering ground

Total Respondents **4**

9. Please briefly describe the top two threats to the Wildlife in Caves Habitat in Indiana identified above.

1. Human disturbance of hibernating bats (e.g., Ray's Cave in Greene Co.)
Alterations to microclimate within hibernacula

2. -Some traditional hibernacula have been rendered unsuitable or degraded due to cave development/commercialization (including disturbance of hibernating bats by human visitation), modication of the cave environment, or alternation of surface features.
-Threats also occur on summer habitat (not addressed here because it is not captured within the "cave habitat" category).

3. Human disturbance of active hibernacula

Loss of typical maternal roosting structures (large snags with sloughing bark)

4. The major two threats are loss of summer and winter (caves) habitat. In addition, education of cavers and continued improvments to cave gates are important to the Indiana bat survival

5. 1. Non-point sources of pollution, especially sediments and pesticides
2. Point sources of pollution particularly sewage and spills of chemicals being transported along roads and railroads

Total Respondents **5**

10. Please rank the following threats to the HABITAT of the Wildlife in Caves Habitat in Indiana.

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

Commercial or residential development (sprawl)	17% (1)	50% (3)	33% (2)	0% (0)	0% (0)	0% (0)	**6**
Counterproductive financial incentives or regulations	0% (0)	0% (0)	0% (0)	17% (1)	50% (3)	33% (2)	**6**
Invasive/non-native species	0% (0)	0% (0)	17% (1)	17% (1)	67% (4)	0% (0)	**6**
Nonpoint source pollution (sedimentation and nutrients)	20% (1)	0% (0)	40% (2)	0% (0)	20% (1)	20% (1)	**5**
Habitat fragmentation	17% (1)	17% (1)	50% (3)	17% (1)	0% (0)	0% (0)	**6**
Successional change	0% (0)	0% (0)	17% (1)	17% (1)	67% (4)	0% (0)	**6**
Diseases (of plants that create habitat)	0% (0)	0% (0)	0% (0)	17% (1)	67% (4)	17% (1)	**6**
Habitat degradation	33% (2)	33% (2)	33% (2)	0% (0)	0% (0)	0% (0)	**6**
Climate change	17% (1)	17% (1)	33% (2)	17% (1)	0% (0)	17% (1)	**6**
Stream channelization	0% (0)	17% (1)	17% (1)	33% (2)	33% (2)	0% (0)	**6**
Impoundment of water/flow regulation	0% (0)	17% (1)	17% (1)	33% (2)	33% (2)	0% (0)	**6**
Agricultural/forestry practices	0% (0)	50% (3)	33% (2)	17% (1)	0% (0)	0% (0)	**6**
Residual contamination (persistent toxins)	0% (0)	17% (1)	50% (3)	0% (0)	0% (0)	33% (2)	**6**
Point source pollution (continuing)	0% (0)	33% (2)	17% (1)	17% (1)	0% (0)	33% (2)	**6**
Mining/acidification	0% (0)	0% (0)	50% (3)	0% (0)	33% (2)	17% (1)	**6**
Drainage practices (stormwater runoff)	0% (0)	0% (0)	0% (0)	67% (4)	17% (1)	17% (1)	**6**
Unknown	0% (0)	0% (0)	50% (1)	0% (0)	50% (1)	0% (0)	**2**
Other (please specify below)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	**1**
					Total Respondents		**97**

11. Other HABITAT threats to the Wildlife in Caves Habitat in Indiana.

1. Dumping of refuse in sinkholes, these often contain persistent toxins associated with transformers, tires, appliances, pesticide containers, and electronic devices.

2. needs cavaes or mines as indicated above; Pesticides could be a major threat, for this onther bats, but unknown for sure,

Total Respondents **2**

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

1. Adverse modifications to cave entrances (e.g., poorly designed bat gates), which cause a change in interior microclimates/temperatures.
Loss/degradation/fragmentation of forested areas surrounding caves used by bats during the fall swarming period.

2. Loss/degradation of traditional hibernacula.

loss, fragmentation and degradation of breeding habitat (note that breeding habitat also occurs in areas of the state not associated with caves)

3. The top two threats are habitat degradation of caves by potential migration of chemicals which alter the cave ecosystem, and the loss of roost trees via a number of man-related activities (commercial, agricultural, etc.)

4. Both non-point and point sources of pollution associated with the increasing human population of Southern Indiana and the development of the area.

5. habitat disappearing to development
needs caves and mines for hibernation,

Total Respondents **5**

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

	Yes, these efforts occur	Not aware of these efforts occuring	Response Total
Statewide year-round monitoring conducted by state agencies	0% (0)	100% (6)	**6**
Statewide once a year monitoring conducted by state agencies	0% (0)	100% (6)	**6**
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	83% (5)	17% (1)	**6**
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	17% (1)	83% (5)	**6**
Regional or local year-round monitoring conducted by state agencies	0% (0)	100% (6)	**6**
Regional or local once a year monitoring conducted by state agencies	0% (0)	100% (6)	**6**
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	33% (2)	67% (4)	**6**
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	17% (1)	83% (5)	**6**
		Total Respondents	**48**

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

	Yes, these efforts occur	Not aware of these efforts occuring	Response Total
Statewide year-round monitoring conducted by other organizations	0% (0)	100% (6)	**6**
Statewide once a year monitoring conducted by other	17% (1)	83% (5)	**6**

organizations			
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	33% (2)	67% (4)	**6**
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	17% (1)	83% (5)	**6**
Regional or local year-round monitoring conducted by other organizations	0% (0)	100% (6)	**6**
Regional or local once a year monitoring conducted by other organizations	0% (0)	100% (6)	**6**
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	17% (1)	83% (5)	**6**
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	33% (2)	67% (4)	**6**
		Total Respondents	**48**

15. How crucial are these monitoring efforts by state agencies for the conservation of the Wildlife in Caves Habitat in Indiana?

	Very crucial	**Somewhat crucial**	**Slightly crucial**	**Not crucial**	**Unknown**	**Response Total**
Statewide year-round monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	75% (3)	25% (1)	**4**
Statewide once a year monitoring conducted by state agencies	0% (0)	25% (1)	0% (0)	50% (2)	25% (1)	**4**
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	50% (3)	17% (1)	0% (0)	17% (1)	17% (1)	**6**
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	0% (0)	20% (1)	0% (0)	60% (3)	20% (1)	**5**
Regional or local year-round monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	100% (4)	0% (0)	**4**
Regional or local once a year monitoring conducted by state agencies	0% (0)	25% (1)	0% (0)	75% (3)	0% (0)	**4**
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	75% (3)	0% (0)	0% (0)	25% (1)	0% (0)	**4**
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	20% (1)	20% (1)	0% (0)	60% (3)	0% (0)	**5**
				Total Respondents		**36**

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

	Very crucial	Somewhat crucial	Slightly crucial	Not crucial	Unknown	Response Total
Statewide year-round monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	75% (3)	25% (1)	**4**
Statewide once a year monitoring conducted by other organizations	0% (0)	20% (1)	0% (0)	60% (3)	20% (1)	**5**
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	40% (2)	40% (2)	0% (0)	0% (0)	25% (1)	**5**
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	20% (1)	0% (0)	60% (3)	20% (1)	**5**
Regional or local year-round monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (4)	0% (0)	**4**
Regional or local once a year monitoring conducted by other organizations	0% (0)	25% (1)	0% (0)	75% (3)	0% (0)	**4**
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	75% (3)	0% (0)	0% (0)	25% (1)	0% (0)	**4**
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	25% (1)	25% (1)	0% (0)	60% (3)	0% (0)	**5**
				Total Respondents		**36**

17. Regional or local state agency monitoring for the Wildlife in Caves Habitat in Indiana.

1. All known I-bat hibernacula

2. -The IDNR conducts biennial hibernacula surveys in all known Indiana bat hibernacula in the state (except Batwing and Twin Domes Caves, which are surveyed under a separate Federal contract).
-Occassional monitoring/research is conducted in cave habitats on a localized basis by State agencies for specific purposes (such as the swarming habitat study at Wyandotte cave).
-Monitoring is also occasionally conducted in summer habitat (not included in this survey).

3. Caves in southern Indiana are monitored. Currently there are 33 hibernacula reported for the Indiana bat in southern Indiana. This confidential information is available upon request.

4. unkown

Total Respondents **4**

18. Regional or local monitoring by other organizations for the Wildlife in Caves Habitat in Indiana.

1. Rick Clawson, Missouri DOC, conducts the bienniel winter surveys at Twin Domes and Batwing caves. The Indiana Karst Conservancy (Keith Dunlap) also assists with monitoring efforts, especially at hibernacula that they own or

oversee. I have monitored the I-bat population in Reeves Cave in Monroe County.

2. There are surveys conducted at localized locations throughout the State of Indiana, primarily in summer habitat but also some cave habitat work, to address specific management or research needs. For example, surveys are conducted at all Department of Defense properties in the State.

3. See #17.

4. University of Louisville has been monitoring the Northern Cavefish at irregular intervals and locations in southern Indiana since 1994

5. Biyearly monitoring for cave bats in about 18 caves in which Indiana myotis is known to hibernate.

Total Respondents **5**

19. Please list organizations that are monitoring the Wildlife in Caves Habitat in Indiana.

1. Indiana DNR(Dr. Virgil Brack/ESI, Keith Dunlap, Scott Johnson), Indiana Karst Conservancy, local NSS Grotto members, and U.S. Fish and Wildlife Service

2. Federal agencies (e.g., Forest Service, DoD, COE)
Educational institutions (e.g., Purdue, ISU)
Local/County agencies
Private Conservation Organizations (e.g., Indiana Karst Conservancy)

3. IDNR, USFWS, Indiana Karst Conservancy, Indiana Cave Survey, various ecological consultants and universities (federal permit holders)

4. University of Louisville, Biology Department

5. Virgil Brack and company.

Total Respondents **5**

20. What are the current monitoring techniques for the Wildlife in Caves 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
Radio telemetry and tracking	33% (2)	33% (2)	0% (0)	17% (1)	0% (0)	17% (1)	**6**
Modeling	0% (0)	40% (2)	40% (2)	0% (0)	0% (0)	20% (1)	**5**
Coverboard routes	0% (0)	0% (0)	0% (0)	67% (2)	0% (0)	33% (1)	**3**
Spot mapping	0% (0)	0% (0)	33% (1)	33% (1)	0% (0)	33% (1)	**3**
Driving a survey route	0% (0)	0% (0)	0% (0)	67% (2)	0% (0)	33% (1)	**3**

Reporting from harvest, depredation, or unintentional take (road kill, bycatch)	33% (1)	33% (1)	0% (0)	0% (0)	0% (0)	33% (1)	**3**
Mark and recapture	17% (1)	33% (2)	17% (1)	33% (2)	0% (0)	0% (0)	**6**
Professional survey/census	60% (3)	20% (1)	0% (0)	0% (0)	0% (0)	20% (1)	**5**
Volunteer survey/census	25% (1)	75% (3)	0% (0)	0% (0)	0% (0)	0% (0)	**4**
Trapping (by any technique)	83% (5)	0% (0)	0% (0)	0% (0)	0% (0)	17% (1)	**6**
Representative sites	40% (2)	20% (1)	20% (1)	0% (0)	0% (0)	20% (1)	**5**
Probabilistic sites	67% (2)	0% (0)	0% (0)	0% (0)	0% (0)	33% (1)	**3**
Other (please specify below)	0% (0)	67% (2)	33% (1)	0% (0)	0% (0)	0% (0)	**3**
					Total Respondents		**55**

21. Other monitoring techniques for the Wildlife in Caves Habitat in Indiana.

1. AnaBat/acoustic and/or video monitoring of cave entrances to assess bat presence/use.

2. Stable isotope analysis, genetic genotyping of individuals (through guano analysis), thermal imagery surveys, contaminant analysis/monitoring through guano and/or whole body analysis

3. The use of Anabat as appropriate. Anabat is a bat detector that uses vocalizations to identify species.

4. Delury or Survey/Removal techniques have been used at Donaldson Cave in the 1990's

5. mist-netting stream
cave counts
rabies lab bats
trapping cave and mine entrances

Total Respondents **5**

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

1. Continue ongoing bienniel winter surveys at all known hibernacula.

2. -Biennial hibernacula surveys (which I would classify as "professional survey/census"), are the only means currently available to track Indiana bat population trends on a statewide or rangewide basis. These surveys are conducted rangewide.
-Survey and monitoring activities conducted in summer habitat are used to: 1) evaluate summer distribution in the state, and 2) evaluate roosting and foraging habitat use/needs. These surveys are conducted in Indiana as well as other states throughout the range of the species.

3. 1) Hibernacula counts to track population levels (Already being done)
2) Intensive radiotelemetry that tracks roost and foraging movements of specific colonies in representative areas across the state.

4. Trapping for Indiana bat includes mist netting and harp trapping. Internal cave surveys are important and more emphasis should be placed on the use of Anabat.

5. Development of an index of biotic integrity (IBI) for vertebrate cave communities in southern Indiana.
Selection of 5-10 locations for survey/counts every2-5 years. A similar survey schedule has been established for cavefish populations in Mammoth Cave National Park and could be used as a model (both IBI and survey).

6. the first 3 of the above.

Total Respondents **6**

23. What current HABITAT inventory and assessment efforts or activities by state agencies are you aware of for the Wildlife in Caves Habitat in Indiana?

	Yes, these efforts occur	No effort that I'm aware of	Response Total
Statewide annual inventory and assessment conducted by state agencies	0% (0)	100% (5)	**5**
Statewide once a year inventory and assessment conducted by state agencies	20% (1)	80% (4)	**5**
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	80% (4)	20% (1)	**5**
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	40% (2)	60% (3)	**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	0% (0)	100% (5)	**5**
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	20% (1)	80% (4)	**5**
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	20% (1)	80% (4)	**5**
		Total Respondents	**40**

24. What current HABITAT inventory and assessment efforts or activities by other organizations are you aware of for the Wildlife in Caves 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% (5)	**5**

Statewide once a year inventory and assessment conducted by other organizations	0% (0)	100% (5)	**5**
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	60% (3)	40% (2)	**5**
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	20% (1)	80% (4)	**5**
Regional or local year-round inventory and assessment conducted by other organizations	0% (0)	100% (5)	**5**
Regional or local once a year inventory and assessment conducted by other organizations	0% (0)	100% (5)	**5**
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	20% (1)	80% (4)	**5**
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	40% (2)	60% (3)	**5**
		Total Respondents	**40**

25. How crucial are these HABITAT efforts by state agencies for the conservation of the Wildlife in Caves 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)	50% (1)	50% (1)	**2**
Statewide once a year inventory and assessment conducted by state agencies	33% (1)	0% (0)	0% (0)	33% (1)	33% (1)	**3**
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	80% (4)	0% (0)	0% (0)	0% (0)	20% (1)	**5**
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	40% (2)	20% (1)	0% (0)	20% (1)	20% (1)	**5**
Regional or local year-round inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	**2**
Regional or local once a year inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	**2**

Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	33% (1)	33% (1)	0% (0)	0% (0)	33% (1)	**3**
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	33% (1)	33% (1)	0% (0)	33% (1)	0% (0)	**3**
				Total Respondents		**25**

26. How crucial are these HABITAT efforts by other organizations for the conservation of the Wildlife in Caves 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 year-round inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	**2**
Statewide once a year inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	**2**
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	75% (3)	0% (0)	0% (0)	0% (0)	25% (1)	**4**
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	50% (2)	0% (0)	0% (0)	25% (1)	25% (1)	**4**
Regional or local year-round inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	**2**
Regional or local once a year inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	**2**
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	33% (1)	0% (0)	0% (0)	33% (1)	33% (1)	**3**
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	50% (2)	25% (1)	0% (0)	25% (1)	0% (0)	**4**
				Total Respondents		**23**

27. Regional or local state agency HABITAT inventory and assessment for the Wildlife in Caves Habitat in Indiana.

1. cave habitat is assessed when the winter surveys of hibernacula are conducted state-wide.

2. -State conducted annual monitoring of the cave environment in most major hibernacula. Human disturbance in key hibernacula is also monitored.
-The contractor who conducts the biennial hibernacula surveys also documents information on cave "condition" (e.g., breakdown) and makes management recommendations.

3. Karst regions and summer habitat in Indiana

4. south central part of state

Total Respondents 4

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

1. completed by Rick Clawson, Missouri DOC, for Twin Domes and Batwing caves. USFWS- Reeves Cave and others

2. Several organizations coollect information on the location and condition of caves, as well as the presence of bats in caves, which provides useful information.

3. Karst regions and summer habitat in Indiana

4. Hoosier National Forest
Harrison/Crawford State Forest
Spring Mill State Park
Caves of south/central Indiana

5. south central part of state

Total Respondents 5

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

1. Indiana Karst Conservancy, NSS Grottos, USFWS, I-69 bat consultants

2. IKC, TNC, USGS, Indiana Cave Survey, USFS

3. IDNR, USFWS, Indiana Karst Conservancy, Indiana Cave Survey, ecological consultants and universities (federal permit holders)

4. U.S. Forest Service
Indiana DNR
University of Louisville

5. Virgil Brack and his company

Total Respondents 5

30. What are the current monitoring techniques for the Wildlife in Caves Habitat in Indiana?

If a technique is not applicable to the Wildlife in Caves 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	17% (1)	50% (3)	0% (0)	17% (1)	0% (0)	17% (1)	**6**
Aerial photography and analysis	0% (0)	60% (3)	0% (0)	20% (1)	0% (0)	20% (1)	**5**
Systematic sampling	40% (2)	20% (1)	20% (1)	20% (1)	0% (0)	0% (0)	**5**
Property tax estimates	0% (0)	0% (0)	0% (0)	33% (1)	0% (0)	67% (2)	**3**
State revenue data	0% (0)	0% (0)	0% (0)	33% (1)	0% (0)	67% (2)	**3**
Regulatory information	50% (2)	0% (0)	0% (0)	25% (1)	0% (0)	25% (1)	**4**
Participation in landuse programs	0% (0)	0% (0)	25% (1)	25% (1)	0% (0)	50% (2)	**4**
Modeling	0% (0)	40% (2)	40% (2)	20% (1)	0% (0)	0% (0)	**5**
Voluntary landowner reporting	25% (1)	25% (1)	0% (0)	25% (1)	0% (0)	25% (1)	**4**
Other (please specify below)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	**1**
					Total Respondents		**40**

31. Other HABITAT inventory and assessment techniques for the Wildlife in Caves Habitat in Indiana.

1. Temperature and Relative Humidity monitoring with remote dataloggers.

2. cave survey

Total Respondents **2**

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

1. Cave microclimate monitoring with dataloggers should continue. A range-wide protocol for monitoring cave temperature and humidity has been developed by Bat Conservation International and is being widely used (contact Jim Kennedy or Merlin Tuttle at BCI). I believe Scott Johnson has been following this protocol in Indiana.

2. -Cave microclimate data used in conjunction with results of hibernacula surveys.

-Techniques to link summer/winter populations (new genetic techniques such as stable isotope analysis; pit tagging).
-Information on habitat use/needs in the vicinity of caves during swarming is a critical need. At present, radio telemetry represents the best potential to collect this information.

3. Population surveys every five years and development of an IBI to be applied at 5-10 critical locations. These to include Blue Spring Caverns, Spring Mill State Park, and Harrison/Crawford State Forest

4. cave survey in winter, and net survey in summer

Total Respondents **4**

33. What is the current body of science for the Wildlife in Caves Habitat in Indiana?

		Response Total	Response Percent
Complete, up to date and extensive		**0**	**0%**
Adequate		**1**	**17%**
Inadequate		**3**	**50%**
Nonexistent		**0**	**0%**
Other (please explain below)	1. There is lots of research, but also great need due to endangered status. 2. Somewhere between Adequate & Inadequate	**2**	**33%**
	Total Respondents	**6**	

34. Please provide a citation (title, author, date, publisher) that would give the best overview of the Wildlife in Caves Habitat in Indiana, if available. This resource may be used if further detail is needed.

		Response Total	Response Percent
Title	1, Distribution and status of the northern cavefish 2. Wintering populations of bats in Indiana, with emphasis on the endangered Indiana Myotis, Myotis sodalist 3. Management of hibernacula in the state of Indiana 4. Home range near hibernacula in spring and autumn 5. Brack, Johnson and Dunlap, 2003.	**5**	**100%**

Author	1. Pearson, W. D. and C. Boston 2. Virgil Brack, Jr., Scott A. Johnson, and R. Keith Dunlap 3. Johnson, Brack, Dunlap 4. Russell C. Romme, Amy B. Henry, R. Andrew King, T. Glueck, and K. Tyrell	**4**	**80%**
Date	1. 1995 2. 2003 3. 2002 4. 2002	**4**	**80%**
Publisher	1. Final report to IN Department of Nat. Res.Div. of F&W 2. Proceedings of the IN Academy of Science 3. Bat Conservation International 4. The Indiana Bat: Biology and Management of an Endangered Species. Bat Conservation International 5. Proc. Ind. Acad, Sci. 112:-61-74.	**5**	**100%**
		Total Respondents	**5**

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

		Response Total	Response Percent
Title	1. Age, growth and fin erosion of the northern cavefish, Amblyopsis spelaea, in KY and IN 2. Biennial hibernacula survey reports 3. The nonhibernating ecology of bats in Indiana with emphasis on the endangered Indiana bat, Myotis sodalist 4. Mumford and Whitaker 1982	**4**	**100%**
Author	1. Louis, M. 2. Virgil Brack, Jr.	**2**	**50%**
Date	1. 1999 2. 1983	**2**	**50%**
Publisher	1. Unpubl. M.S. Thesis, University of Louisville 2. reports submitted to IDNR 3. Purdue University	**3**	**75%**

	Total Respondents	**4**

36. What is the current HABITAT body of science for the Wildlife in Caves Habitat in Indiana?

		Response Total	Response Percent
Complete, up to date and extensive		**0**	**0%**
Adequate		**1**	**17%**
Inadequate		**4**	**67%**
Nonexistent		**0**	**0%**
Other (please explain below)	Somewhere between Adequate and Inadequate	**1**	**17%**
	Total Respondents		**6**

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

		Response Total	Response Percent
Title	1. Cave adaptation in Amblyopsid fishes 2. see previous reference 3. same as Q34 4. Hibernacula of the endangered Indiana bat in Indiana 5. Mumford and Whitaker 1982	**5**	**100%**
Author	1. Poulson, T. 2. Brack, Virgil Jr., A.M. Wilkenson, R.E. Mumford	**2**	**40%**
Date	1. 1963 2. 1984	**2**	**40%**
Publisher	1. Amer. Midl. Nat. 70(2):257-290 2. Proceedings of the Indiana Academy of Science, vol. 93:463-468	**2**	**40%**
	Total Respondents		**5**

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

	Response Total	Response Percent
1. A faunal inventory of subterranean streams using a modified		

	index of biotic integrity 2. same as Q35 3. Distribution and ecology in Indiana. Pp 48-54 in Indiana Bat: Biology and Management of an Endangered Species (A. Kurta and J. Kennedy, Eds.) 4. Veilleux et al. 2003.		
Author	1. Jones, T.G. 2. John Whitaker Jr. & Virgil Brack Jr.	**2**	**50%**
Date	1. 1997 2. 2002	**2**	**50%**
Publisher	1. Unpubl. Ph.D. Disst. University of Louisville 2. Bat Conservation International 3. J. Mamm, 841068-1075	**3**	**75%**
		Total Respondents	**4**

39. What are the research needs for the Wildlife in Caves Habitat in Indiana?

	Urgently needed	Greatly needed	Needed	Slightly needed	Not needed	Unknown	Response Total
Life cycle	0% (0)	17% (1)	67% (4)	17% (1)	0% (0)	0% (0)	**6**
Distribution and abundance	17% (1)	33% (2)	33% (2)	17% (1)	0% (0)	0% (0)	**6**
Limiting factors (food, shelter, water, breeding sites)	50% (3)	0% (0)	50% (3)	0% (0)	0% (0)	0% (0)	**6**
Threats (predators/competition, contamination)	33% (2)	50% (3)	17% (1)	0% (0)	0% (0)	0% (0)	**6**
Relationship/dependence on specific habitats	33% (2)	33% (2)	33% (2)	0% (0)	0% (0)	0% (0)	**6**
Population health (genetic and physical)	17% (1)	33% (2)	17% (1)	33% (2)	0% (0)	0% (0)	**6**
Other (please specify below)	33% (1)	67% (2)	0% (0)	0% (0)	0% (0)	0% (0)	**3**
					Total Respondents		**39**

40. Other research needs for the Wildlife in Caves Habitat in Indiana.

1. We need urgently need to determine the effects of the loss/fragmentation/timber management of summer habitat/forest on maternity colonies/reproductive success not just caves/winter habitat.

2. More information is needed on autumn swarming and spring staging. Similarly new hibernacula need to be recorded.

3. 1. Metapopulation dynamics

2. Extent of populations in subterranean systems which annot be entered by humans

4. need to know more about rabies in some wildlife species

Total Respondents 4

41. What are the HABITAT research needs for the Wildlife in Caves Habitat in Indiana?

	Urgently needed	Greatly needed	Needed	Slightly needed	Not needed	Unknown	Response Total
Successional changes	0% (0)	0% (0)	17% (1)	33% (2)	50% (3)	0% (0)	**6**
Distribution and abundance (fragmentation)	0% (0)	50% (3)	33% (2)	17% (1)	0% (0)	0% (0)	**6**
Threats (land use change/competition, contamination/global warming)	50% (3)	33% (2)	17% (1)	0% (0)	0% (0)	0% (0)	**6**
Relationship/dependence on specific site conditions	17% (1)	83% (5)	0% (0)	0% (0)	0% (0)	0% (0)	**6**
Growth and development of individual components of the habitat	0% (0)	40% (2)	40% (2)	0% (0)	20% (1)	0% (0)	**5**
Other (please specify below)	33% (1)	67% (2)	0% (0)	0% (0)	0% (0)	0% (0)	**3**
					Total Respondents		**32**

42. Other HABITAT research needs for the Wildlife in Caves Habitat in Indiana.

1. How much forest habitat needs to remain arround a hibernaculum to sustain a population of size x during the fall swarming period?

2. -How does cave environment, especially temperature and temperature stability, affect suitability and use of cave by Indiana bats
-What components of the habitat immediately surrounding the cave are most important to Indiana bats during fall swarming and spring staging. How is this habitat used.

3. Recommend a detailed analysis of forest canopy to openness ratio and habitat intricacies that provide preferred home range requirements, e.g. primary roosts, secondary roosts, water, night roosts, food.

4. 1. Assessment of the physical dimensions of the phreatic environment available to cavefishes, and the connections between known windows into the system.
2. Toxin concentrations in cave sediments and their recruitment rates into undergroud waters.

5. need to know more of the relationship between winter and summer habitat, and also of migration.

Total Respondents 5

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

	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
Habitat protection (use below for details)	60% (3)	40% (2)	0% (0)	0% (0)	0% (0)	**5**
Population management (hunting, trapping)	0% (0)	0% (0)	0% (0)	100% (5)	0% (0)	**5**
Population enhancement (captive breeding and release)	0% (0)	0% (0)	0% (0)	100% (5)	0% (0)	**5**
Reintroduction (restoration)	0% (0)	0% (0)	0% (0)	100% (5)	0% (0)	**5**
Food plots	0% (0)	0% (0)	0% (0)	100% (5)	0% (0)	**5**
Threats reduction	40% (2)	40% (2)	0% (0)	20% (1)	0% (0)	**5**
Native predator control	0% (0)	0% (0)	0% (0)	80% (4)	20% (1)	**5**
Exotic/invasive species control	0% (0)	0% (0)	20% (1)	80% (4)	0% (0)	**5**
Regulation of collecting	60% (3)	40% (2)	0% (0)	0% (0)	0% (0)	**5**
Disease/parasite management	0% (0)	0% (0)	0% (0)	100% (5)	0% (0)	**5**
Translocation to new geographic range	0% (0)	0% (0)	0% (0)	100% (5)	0% (0)	**5**
Protection of migration routes	0% (0)	0% (0)	0% (0)	60% (3)	40% (2)	**5**
Limiting contact with pollutants/contaminants	0% (0)	40% (2)	0% (0)	20% (1)	40% (2)	**5**
Public education to reduce human disturbance	40% (2)	60% (3)	0% (0)	0% (0)	0% (0)	**5**
Culling/selective removal	0% (0)	0% (0)	0% (0)	100% (5)	0% (0)	**5**
Stocking	0% (0)	0% (0)	0% (0)	100% (5)	0% (0)	**5**
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	**0**
				Total Respondents		**80**

44. Other current conservation practices for the Wildlife in Caves Habitat in Indiana.

1. posting signs at caves, installing-bat friendly gates, land acquisition, installing fake video cameras to deter cave visits,using light-sensitve "speloggers" to monitor levels of human visitation

2. Note, I included regulation of research and research related disturbance under "regulation of collecting"

3. Protect ome caves and mines in which this species occurs.

Total Respondents **3**

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

1. Negotiate with the owner of Ray's Cave and other hibernacula to allow them to be gated or employ one or more of the other techniques above.

2. -Gating, securing conservation easements, or purchasing unprotected hibernacula (prioritizing based on current numbers or potential of hibernacula to harbor large numbers if disturbance is presently limiting numbers).
-Protecting surface features and forest cover surrounding hibernacula and manageing for high quality swarming habitat.

3. The purchasing and protection of recorded Indiana bat hibernacula and summer habitat. Similarly, public education is needed on the importance of caves, snags, and the importance of this species to man.

4. 1. Acqusition and protection of a reserve at Blue Spring Caverns
2. Limit public access to population concentrations already under agency control at Harrison/Crawford State Forest and Spring Mill State Park

5. protect caves a and mines
continued education of people about bats.

Total Respondents **5**

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

	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
Habitat protection through regulation	20% (1)	80% (4)	0% (0)	0% (0)	0% (0)	**5**
Habitat protection on public lands	40% (2)	60% (3)	0% (0)	0% (0)	0% (0)	**5**
Habitat protection incentives (financial)	0% (0)	40% (2)	0% (0)	40% (2)	20% (1)	**5**
Habitat restoration through regulation	0% (0)	40% (2)	0% (0)	40% (2)	20% (1)	**5**
Habitat restoration on public lands	0% (0)	100% (5)	0% (0)	0% (0)	0% (0)	**5**
Habitat restoration incentives (financial)	0% (0)	40% (2)	0% (0)	40% (2)	20% (1)	**5**
Artificial habitat creation (artificial reefs, nesting platforms)	0% (0)	20% (1)	0% (0)	80% (4)	0% (0)	**5**
Selective use of functionally equivalent exotic species in place of extirpated natives	0% (0)	0% (0)	0% (0)	100% (5)	0% (0)	**5**
Succession control (fire, mowing)	0% (0)	0% (0)	0% (0)	100% (5)	0% (0)	**5**
Corridor development/protection	0% (0)	40% (2)	0% (0)	40% (2)	20% (1)	**5**
Managing water regimes	0% (0)	20% (1)	0% (0)	60% (3)	20% (1)	**5**
Pollution reduction	0% (0)	60% (3)	0% (0)	20% (1)	20% (1)	**5**
Protection of adjacent buffer zone	20% (1)	20% (1)	0% (0)	40% (2)	20% (1)	**5**
Restrict public access and disturbance	60% (3)	40% (2)	0% (0)	0% (0)	0% (0)	**5**
Land use planning	40% (2)	60% (3)	0% (0)	0% (0)	0% (0)	**5**
Technical assistance	60% (3)	0% (0)	0% (0)	20% (1)	20% (1)	**5**
Cooperative land management agreements (conservation easements)	60% (3)	20% (1)	0% (0)	20% (1)	0% (0)	**5**
Other (please specify below)	50% (1)	50% (1)	0% (0)	0% (0)	0% (0)	**2**
				Total Respondents		**87**

47. Other current HABITAT conservation practices for the Wildlife in Caves Habitat in Indiana.

1. Generally educate the public on retaining old, dead or dying trees that provide habitat for wildlife, including the Indiana bat.

2. 1. Closing and/or year around gating of caves with large populations of hibernating or reproducing bats will ensure normal trophic cascades for those systems.
2. Restricting recreational caving in some caves might reduce periodic disturbances, increases in turbidity, and remobilization of toxins in sediments.

Total Respondents **2**

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

1. Conservation easements on private property containing important swarming habitat and connected karst features around key hibernacula.

2. same as Q45

3. See #45.

4. 1. Establishment of reserve at Blue pring Cavern
2. Restricted entry to selected caves in the Harrison/Crawford State Forest
3. Obtaining conservation easements/agreements with selected cave owners in Orange, Washington, Lawrence, and Harrison Counties.

Total Respondents **4**

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

1. I am consulting with FHWA and INDOT on their proposed I-69 extention which is traversing karst terrain in Monroe and Greene counties. INDOT consultants are surveying many previously unsurveyed caves (n = 60 in 2004-05) that are potential Indiana bat hibernacula. New data will be available by March 2005.

The FWS is also currently revising the Indiana Bat Recovery Plan, which once completed will be an excellent source of information for this effort. Lori Pruitt is the best contact to keep up with the plan's status.

2. Maintain bat friendly human barriers at hibernacula
Research needs:
1) determine adequate levels of snag retention in managed forests
2) Include snag retention and snag decay rate in models of forest composition
3) estimate reproductive success or survival

3. Work closely with all appropriate federal and state environmental agencies in coordinating efforts on the Indiana bat.

4. A map of all known sightings of cavefishes, and dye-traced and probable connections between these known locations should be produced. Such a compilation would be invaluable in assessing the potential impacts of proposed projects, spills, and other landscape events within the limited range of the northern cavefish in Indiana

Total Respondents **4**

6. Please rank the following threats to the wildlife in all Wetland Habitats in Indiana.

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total
Invasive/non-native species	0% (0)	4% (1)	30% (7)	17% (4)	26% (6)	22% (5)	**23**
High sensitivity to pollution	0% (0)	0% (0)	30% (7)	26% (6)	13% (3)	30% (7)	**23**
Bioaccumulation of contaminants	0% (0)	4% (1)	17% (4)	22% (5)	4% (1)	52% (12)	**23**
Predators (native or domesticated)	0% (0)	18% (4)	9% (2)	27% (6)	18% (4)	27% (6)	**22**
Dependence on other species (mutualism, pollinators)	0% (0)	4% (1)	4% (1)	4% (1)	57% (13)	30% (7)	**23**
Diseases/parasites (of the species itself)	0% (0)	0% (0)	13% (3)	26% (6)	9% (2)	52% (12)	**23**
Regulated hunting/fishing pressure (too much)	0% (0)	0% (0)	4% (1)	0% (0)	74% (17)	22% (5)	**23**
Species over population	0% (0)	9% (2)	4% (1)	9% (2)	61% (14)	17% (4)	**23**
Unintentional take/ direct mortality (e.g., vehicle collisions, power line collisions, by-catch, harvesting equipment, land preparation machinery)	4% (1)	13% (3)	9% (2)	22% (5)	39% (9)	13% (3)	**23**
Unregulated collection pressure	0% (0)	0% (0)	17% (4)	0% (0)	70% (16)	13% (3)	**23**
Dependence on irregular resources (cyclical annual variations) (e.g., food, water, habitat limited due to annual variations in availability)	13% (3)	17% (4)	22% (5)	17% (4)	13% (3)	17% (4)	**23**
					Total Respondents		**252**

7. Please also rank these threats to the wildlife in all Wetland Habitats in Indiana.

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total
Habitat loss (breeding range)	43% (10)	39% (9)	4% (1)	13% (3)	0% (0)	0% (0)	**23**
Habitat loss (feeding/foraging areas)	35% (8)	43% (10)	4% (1)	17% (4)	0% (0)	0% (0)	**23**
Small native range (high endemism)	9% (2)	4% (1)	0% (0)	4% (1)	36% (8)	48% (11)	**23**
Near limits of natural geographic range	9% (2)	9% (2)	13% (3)	4% (1)	13% (3)	52% (12)	**23**
Large home range requirements	4% (1)	4% (1)	0% (0)	13% (3)	43% (10)	35% (8)	**23**
Viable reproductive population size or availability	4% (1)	4% (1)	17% (4)	13% (3)	17% (4)	43% (10)	**23**
Specialized reproductive behavior or low reproductive rates	4% (1)	4% (1)	13% (3)	4% (1)	22% (5)	52% (12)	**23**
Degradation of movement/migration routes	9% (2)	22% (5)	30% (7)	4% (1)	22% (5)	13% (3)	**23**

(overwintering habitats, nesting and staging sites)							
Genetic pollution (hybridization)	0% (0)	4% (1)	22% (5)	9% (2)	43% (10)	22% (5)	**23**
Unknown	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (4)	**4**
Other (please specify below)	0% (0)	25% (1)	0% (0)	0% (0)	25% (1)	50% (2)	**4**
					Total Respondents		**215**

8. Other threats to the wildlife in all Wetland Habitats in Indiana.

1. X

2.. Continued loss and degradation of emergent wetland habitat in portions of the state due to development and poor agricultural practices.

3. Unknown

4. Human interaction wtih species,trapping ,relocation, scarring
Reproductive intervention by humans

5. Devalueing of species due to overpopulation
restricted management options.

6. Artificial manipulation of water levels in wetlands seems likely to increase mortality of over wintering snakes. Snakes hibernate underground at the groundwater interface. Raising water levels in the winter could drown snakes and lowering water table could expose them to extreme cold temperatures. Both activities are likely to kill over wintering snakes.

7. Loss of wetlands (muckland) would be the threat to this species

8. Although not habitat specific, the inability to responsibly and proactively manage muskrats according to the wildlife conservation model, as opposed to reactive measures through nuisance practices, is a concern regarding the conservation of muskrats. This concern applies across the landscape, not just in urban and suburban environments.

Total Respondents **8**

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

1. loss of early successional habitat.
hybridization with blue-winged warbler.

2. Loss of shallow marshes due to drainage for development & farming.
Loss of winter feed due to fall tillage.

3. Habitat loss through annual cycle
predators

4. Loss of habitat due to development and poor agricultural practices.
Degradation of habitat by invasive plant species.

5. Unknown

6. Water Quality
Human intervention during nesting process.

7. overpopulation
urbanization

8. continuing loss and/or degradation of emergent wetlands
possible disease outbreaks due to large concentrations of birds often in small areas

9. Habtiat loss and degradation

10. Loss of ephemeral wetland habitat and increase in migration distance to breeding sites as a result of this loss are the biggest threats to the species.

11. Loss & degradation of ephemeral wetland and upland forested habitat

12. Loss of ephemeral wetlands is the top threat; unfortunately, most existing ephemeral wetlands have been destroyed in Indiana. Even more unfortunately, many of them were destroyed with the misguided notion that deep water was better for wildlife - landowners were advised to dredge out the ephemeral wetlands to provide duck habitat. These fish-infested deep waters have no habitat for Plains leopard frog.
-invasive species like reed canary grass are proliferating in the habitats that remain, decreasing plant diversity, cover, and the overall health of the wetland.

13. Extreme rarity & habitat loss

14. Habitat destruction and habitat degradation

15. Artificial manipulation of water levels in wetlands seems likely to increase mortality of over wintering snakes. Snakes hibernate underground at the groundwater interface. Raising water levels in the winter could drown snakes and lowering water table could expose them to extreme cold temperatures. Both activities are likely to kill over wintering snakes.

Inappropriate management of sandy fire breaks in managed areas that are disked at inappropriate times, or are managed in inappropriate cover types. I have seen dead massasauga that have been disked on DNR lands

16. Only a few locations are known to have green salamanders in Indiana and this is a habitat specialist needing rocky outcrops in forested areas.

17. Wetland loss & degradation

18. probably draining of wetlands for farming or development

19. 1) loss of permanent wetland areas that include huge open/prairie buffer zones for nesting.
2) overland movement for nesting invites road kill of otherwise longlived adults
suboptimal size nesting areas focuses nest depredation

Inappropriate management of nesting areas – sandy fire breaks in managed areas are disked at inappropriate times, or are managed in inappropriate cover types

20. Fragmentation of populations due to habitat loss. Wetlands are managed as landscape scale systems relative to this species, resulting in metapopulation disruption and potential metapopulation decline. Because of low densities and small population sizes, populations that have become isolated are likely not viable.

21. habitat loss and fragmentation, loss of connectivity

Total Respondents **21**

10. Please rank the following threats to the HABITAT of all Wetland Habitats in Indiana.

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total
Commercial or residential development (sprawl)	13% (3)	39% (9)	26% (6)	17% (4)	0% (0)	4% (1)	**23**
Counterproductive financial incentives or regulations	0% (0)	26% (6)	17% (4)	4% (1)	22% (5)	30% (7)	**23**
Invasive/non-native species	0% (0)	22% (5)	13% (3)	17% (4)	17% (4)	30% (7)	**23**
Nonpoint source pollution (sedimentation and nutrients)	0% (0)	18% (4)	32% (7)	18% (4)	0% (0)	32% (7)	**22**
Habitat fragmentation	27% (6)	41% (9)	18% (4)	9% (2)	5% (1)	0% (0)	**22**
Successional change	0% (0)	23% (5)	18% (4)	18% (4)	14% (3)	27% (6)	**22**
Diseases (of plants that create habitat)	0% (0)	0% (0)	9% (2)	17% (4)	30% (7)	43% (10)	**23**
Habitat degradation	27% (6)	45% (10)	23% (5)	5% (1)	0% (0)	0% (0)	**22**
Climate change	0% (0)	0% (0)	5% (1)	32% (7)	9% (2)	55% (12)	**22**
Stream channelization	0% (0)	26% (6)	13% (3)	13% (3)	35% (8)	13% (3)	**23**
Impoundment of water/flow regulation	9% (2)	9% (2)	35% (8)	17% (4)	26% (6)	4% (1)	**23**
Agricultural/forestry practices	9% (2)	50% (11)	27% (6)	5% (1)	5% (1)	5% (1)	**22**
Residual contamination (persistent toxins)	0% (0)	0% (0)	17% (4)	30% (7)	4% (1)	48% (11)	**23**
Point source pollution (continuing)	0% (0)	9% (2)	23% (5)	27% (6)	0% (0)	41% (9)	**22**
Mining/acidification	4% (1)	4% (1)	9% (2)	22% (5)	13% (3)	48% (11)	**23**
Drainage practices (stormwater runoff)	4% (1)	17% (4)	17% (4)	9% (2)	22% (5)	30% (7)	**23**
Unknown	0% (0)	0% (0)	0% (0)	0% (0)	14% (1)	86% (6)	**7**
Other (please specify below)	0% (0)	0% (0)	17% (1)	0% (0)	0% (0)	83% (5)	**6**
					Total Respondents		**374**

11. Other HABITAT threats to the wildlife in all Wetland Habitats in Indiana.

1. X
2. None
3. Drainage of wetland areas.
4. Lega jurisdiction issues presently unclear, draft of state isolated wetland law out for comment.

Total Respondents 4

12. Please briefly describe the top two HABITAT threats to the wildlife in all Wetland Habitats in Indiana identified above.

1. loss of early successional woody habitat.
habitat loss to development

2. 1. Commercial or residential development by filling or draining wetlands.
Stream and lake "renovation" have degraded habitat back to where it was when the original habitat destruction occured.

3. agricultural practices
drainage practices

4. Loss of habitat due to development and poor agricultural practices.
Degradation of plant community by exotic plants invading wetland habitats.

5. Development encroachment on some colonies
Destruction of nesting trees

6. Canada Geese are their own worst enemy. Their concentrations by large numbers of geese on small wetlands have the capacity to pollute the water and cause increased erosiuon due to their feeding habits.
The destruction of natural wetland habitats by developement, agriculture and continued road construction.

7. Agriculture
urban sprawl

8. presently little or no protection of isolated wetlands
- habitat degradation due to increased sediment/nutrient loads

9. Habitat loss & degradation

10. Habitat degradation or loss and fragmentation of habitat are the largest threats.

11. Habitat loss & degradation

12. Loss of ephemeral wetland habitat, invasion of wetlands by species like reed canary grass, cattails, purple loosestrife or other invasives that create monocultures, agricultural practices that destroy ephemeral wetlands.

13. Habitat fragmentation & degradation

14. Habitat destruction and degradation of ephemeral wetlands

Fire suppression in graminoid wetland habitat creates late successional wetlands that are not appropriate habitat. Conversely, late spring fire in these habitats is likely to cause direct adult mortality.

15. Artificial manipulation of water levels in wetlands seems likely to increase mortality of over wintering snakes. Snakes hibernate underground at the groundwater interface. Raising water levels in the winter could drown snakes and lowering water table could expose them to extreme cold temperatures. Both activities are likely to kill over wintering snakes. IN addition, herbaceous wetland are lost under this management regime, replaced by open water wetlands.

16. Habitat degradation and fragmentation due to deforestation.

17. Habitat degradation & fragmentation

18. loss of habitat due to farming or development

19.	the participant has to speculate about the meaning of successional change. Is a "change" an increase or decrease in early successional habitats? Climate change also is speculative. Agriculture/Forestry practices have different effects. Grouping these practices into a single category does not appropriately represent each individual practice. Point and non point pollution may have a positive or negative effect.
20.	1) Habitat loss through wetland drainage/ tiny stream ditching. 2) conversion of sand prairie nesting habitat to cropland or something else (e.g. forestation via fire prevention) Manipulation of natural wetlands for management of other species has a disruptive impact on natural wetland dynamics. This may include reduced survival of Blanding's or reduced productivity of the habitat.
21.	Loss of adjacent uplands or inappropriate cover/management. Blanding's requires nesting habitats that are secure from disturbance and that are within a reasonable distance to wetland habitats. Loss of appropriate habitat (ether due to tradition conversion to agriculture or to conversion of inappropriate conservation cover types) is negatively impacting reproductive success in this species. Long-distance movements
22.	coal mining, agriculture

Total Respondents **22**

13. What current monitoring efforts by state agencies are you aware of for all Wetland Habitats in Indiana?

	Yes, these efforts occur	Not aware of these efforts occuring	Response Total
Statewide year-round monitoring conducted by state agencies	23% (5)	77% (17)	**22**
Statewide once a year monitoring conducted by state agencies	20% (4)	80% (16)	**20**
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	15% (3)	85% (17)	**20**
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	25% (5)	75% (15)	**20**
Regional or local year-round monitoring conducted by state agencies	10% (2)	90% (18)	**20**
Regional or local once a year monitoring conducted by state agencies	5% (1)	95% (19)	**20**
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	5% (1)	5% (19)	**20**
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	35% (7)	65% (13)	**20**
		Total Respondents	**162**

14. What current monitoring efforts by other organizations are you aware of for the Wildlife in all Wetland Habitats in Indiana?

	Yes, these efforts occur	Not aware of these efforts occuring	Response Total
Statewide year-round monitoring conducted by other organizations	0% (0)	100% (22)	**22**
Statewide once a year monitoring conducted by other organizations	14% (3)	86% (19)	**22**

Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	5% (1)	95% (21)	**22**
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	9% (2)	91% (20)	**22**
Regional or local year-round monitoring conducted by other organizations	0% (0)	100% (22)	**22**
Regional or local once a year monitoring conducted by other organizations	14% (3)	86% (19)	**22**
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	5% (1)	95% (21)	**22**
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	59% (13)	41% (9)	**22**
		Total Respondents	**176**

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

	Very crucial	Somewhat crucial	Slightly crucial	Not crucial	Unknown	Response Total
Statewide year-round monitoring conducted by state agencies	20% (4)	10% (2)	10% (2)	35% (7)	25% (5)	**20**
Statewide once a year monitoring conducted by state agencies	16% (3)	16% (3)	11% (2)	32% (6)	26% (5)	**19**
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	11% (2)	17% (3)	17% (3)	39% (7)	17% (3)	**18**
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	11% (2)	11% (2)	11% (2)	39% (7)	28% (5)	**18**
Regional or local year-round monitoring conducted by state agencies	6% (1)	17% (3)	11% (2)	39% (7)	28% (5)	**18**
Regional or local once a year monitoring conducted by state agencies	5% (1)	11% (2)	16% (3)	37% (7)	32% (6)	**19**
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	6% (1)	6% (1)	24% (4)	35% (6)	29% (5)	**17**
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	11% (2)	21% (4)	0% (0)	42% (8)	26% (5)	**19**
				Total Respondents		**148**

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

	Very crucial	Somewhat crucial	Slightly crucial	Not crucial	Unknown	Response Total

	crucial	crucial	crucial	crucial		Total
Statewide year-round monitoring conducted by other organizations	5% (1)	10% (2)	0% (0)	40% (8)	45% (9)	**20**
Statewide once a year monitoring conducted by other organizations	5% (1)	15% (3)	10% (2)	25% (5)	45% (9)	**20**
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	10% (2)	5% (1)	5% (1)	35% (7)	45% (9)	**20**
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	15% (3)	0% (0)	0% (0)	30% (6)	55% (11)	**20**
Regional or local year-round monitoring conducted by other organizations	5% (1)	5% (1)	5% (1)	32% (6)	53% (10)	**19**
Regional or local once a year monitoring conducted by other organizations	16% (3)	5% (1)	5% (1)	32% (6)	42% (8)	**19**
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	15% (3)	0% (0)	5% (1)	25% (5)	55% (11)	**20**
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	24% (5)	19% (4)	14% (3)	14% (3)	29% (6)	**21**
				Total Respondents		**159**

17. Regional or local state agency monitoring for the Wildlife in all Wetland Habitats in Indiana.

1. none
2. At present only when a permit for work in a wetland is applied for.
   Smaller more numerous wetlands have little oversite.
3. Selected State Fish and Wildlife Areas and Reservoir properties operated by the Department of Natural Resources conduct counts during the fall migration period.
4. State wide for existing and new colonies every 5 years
5. Fish and Wildlife areas and Reservoirs as part of the weekly Waterfowl survey from Aug to Jan.
6. weekly waterfowl counts at selected sites
   - neck collar observations statewide as encountered
   - mid winter waterfowl survey of selected sites
7. IDNR, Non-game herpetologist incorporates this as part of the annual field season.
8. INDR runs a NAAMP frog monitory program
9. None
10. INDR Nature Preserve Division
11. I'd guess that agencies that issue drainage permits are relevant here.
12. Fish Creek, Patoka River, Pigeon Creek

Total Respondents **12**

18. Regional or local monitoring by other organizations for the Wildlife in all Habitats in Indiana.

1. federal Breeding Bird Survey statewide; May Day Bird Count, Summer Bird Count
2. Species is not monitored. Habitat changes requiring permits are checked by, IDNR, IDEM, ACOE (in some cases).
3. Not aware of any efforts.
4. unknown
5. Lake associations busineeses and anyone living around a emergent wetland with a yard with Canada Goose complaints will monitor populations in order to prove they have a problem so they can destroy nests or eggs.
6. christmas bird count
7. Spencer Cortwright, IUN
   Robert Brodman, Saint Joseph's College
8. Robert Brodman, Saint Joseph's College in NW Indiana
9. Univerisity professors and members of the Herpetology TAC for the State of Indiana as part of their annual field season.
10. NW Indiana (Newton, Jasper, Pulaski, Lake, Porter counties).
11. Robert Brodman, Saint Joseph's College
12. "BioBlitz" in Lake Co.
    Herp Center at IUPFW - I presume they've done something in Steuben and La Grange Cos.
13. Fish Creek, Patoka River, Pigeon Creek, Muscatatuck River

Total Respondents **13**

19. Please list organizations that are monitoring the Wildlife in all Wetland Habitats in Indiana.

1. USGS, birding groups
2. To some extent: Waterfowl USA, Ducks Unlimited, The Nature Conservancy, The Audubon Society.
3. Not aware of any organizations.
4. Indiana Department of Natural Resources, Division of Fish & Wildlife
5. Div of Fish and Wildlife
   Div of Reservoirs.
6. Audubon
   US Fish and Wildlife Service

- US Fish and Wildlife Service

7. Spencer Cortwright, IUN
Robert Brodman, Saint Joseph's College

8. Robert Brodman, Saint Joseph's College

9. TNC- funded research at Cline Lake Fen

10. Ball State University; Tom Morrell.

11. Indiana Division of Fish and Wildlife. Population monitoring efforts at state, regional and local scales are to monitor annual trends. Monitoring programs used by IDF&W are not habitat specific for muskrat.

12. What I know is above.

13. TNC has funded some work at Cline Lake Fen to better understand population dynamics, habitat use, etc...

14. Bruce Kingsbury, IUPU Fort Wayne,

Total Respondents **14**

20. What are the current monitoring techniques for the Wildlife in all Wetland Habitats 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
Radio telemetry and tracking	5% (1)	20% (4)	60% (12)	5% (1)	0% (0)	10% (2)	**20**
Modeling	11% (2)	21% (4)	26% (5)	0% (0)	0% (0)	42% (8)	**19**
Coverboard routes	0% (0)	7% (1)	20% (3)	27% (4)	0% (0)	47% (7)	**15**
Spot mapping	11% (2)	22% (4)	17% (3)	6% (1)	0% (0)	44% (8)	**18**
Driving a survey route	42% (8)	5% (1)	21% (4)	11% (2)	0% (0)	21% (4)	**19**
Reporting from harvest, depredation, or unintentional take (road kill, bycatch)	32% (6)	16% (3)	0% (0)	37% (7)	0% (0)	16% (3)	**19**
Mark and recapture	15% (3)	25% (5)	35% (7)	5% (1)	5% (1)	15% (3)	**20**
Professional survey/census	28% (5)	5% (10)	6% (1)	0% (0)	0% (0)	11% (2)	**18**
Volunteer survey/census	18% (3)	18% (3)	35% (6)	0% (0)	0% (0)	29% (5)	**17**
Trapping (by any	21% (4)	32% (6)	21% (4)	0% (0)	0% (0)	26% (5)	**19**

technique)							
Representative sites	17% (3)	56% (10)	6% (1)	0% (0)	0% (0)	22% (4)	**18**
Probabilistic sites	7% (1)	47% (7)	7% (1)	0% (0)	0% (0)	40% (6)	**15**
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (4)	**4**
					Total Respondents		**221**

21. Other monitoring techniques for the Wildlife in all Wetland Habitats in Indiana.

1. X
2. aerial surveys
3. unknown
4. aerial surveys
5. Look for burrows in muck

Total Respondents **5**

22. What one or two monitoring techniques would you recommend for effective conservation of the Wildlife in all Wetland Habitats in Indiana?

1. spot-mapping in appropriate habitats
2. Nesting & brood counts state wide.
3. aerial survey
   banding
4. Continue current state surveys every 5 years
5. Mark and recapture. Means to track species movement and association with non target species and times of interaction with non target spp.
   Mark and harvest. Same as above but also eliiminates and reduces concentrations in non desiralbe areas.
6. aerial surveys
   banding and neck collaring
7. banding and/or neck collaring. Procedures in place, nationally accepted, good national data base maintained.
   - weekly waterfowl counts at selected sites. Samples most of the major concentration areas. Very good historical data for trend analysis.
8. Professional survey and either mark recapture or telemetry
9. Pit-fall traps and cover board objects near ephemeral wetland breeding sites.
10. Fall surveys at breeding sites
11. Call surveys and systematic sampling

12.	Minnow trapping and possible either mark recapture or telemetry
13.	Professional surveys
14.	look for burrows in muck connected with trapping
15.	IDF&W uses Harvest Reports and Professional Surveys. Here again, the assumption is that aquatic systems include all habitat types occupied by muskrat.
16.	1) radiotrack females to nesting sites. 2) monitor nests for depredation (Both somewhat labor-intensive for at least one person.)

Total Respondents **16**

23. What current HABITAT inventory and assessment efforts or activities by state agencies are you aware of for the Wildlife in all Wetland Habitats in Indiana?

	Yes, these efforts occur	No effort that I'm aware of	Response Total
Statewide annual inventory and assessment conducted by state agencies	0% (0)	100% (22)	**22**
Statewide once a year inventory and assessment conducted by state agencies	0% (0)	100% (22)	**22**
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	5% (1)	95% (21)	**22**
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	18% (4)	82% (18)	**22**
Regional or local year-round inventory and assessment conducted by state agencies	0% (0)	100% (22)	**22**
Regional or local once a year inventory and assessment conducted by state agencies	0% (0)	100% (22)	**22**
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	100% (22)	**22**
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	14% (3)	86% (19)	**22**
	Total Respondents		**176**

24. What current HABITAT inventory and assessment efforts or activities by other organizations are you aware of for the Wildlife in all Wetland Habitats 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% (22)	**22**
Statewide once a year inventory and assessment conducted by other organizations	0% (0)	100% (22)	**22**
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by other	5% (1)	95% (21)	**22**

organizations			
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	18% (4)	82% (18)	**22**
Regional or local year-round inventory and assessment conducted by other organizations	5% (1)	95% (21)	**22**
Regional or local once a year inventory and assessment conducted by other organizations	9% (2)	91% (20)	**22**
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	5% (1)	95% (21)	**22**
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	50% (11)	50% (11)	**22**
		Total Respondents	**176**

25. How crucial are these HABITAT efforts by state agencies for the conservation of the Wildlife in All Wetland Habitats 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	16% (3)	6% (1)	11% (2)	32% (6)	37% (7)	**19**
Statewide once a year inventory and assessment conducted by state agencies	12% (2)	6% (1)	6% (1)	35% (6)	41% (7)	**17**
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	6% (1)	12% (2)	6% (1)	35% (6)	41% (7)	**17**
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	12% (2)	29% (5)	0% (0)	29% (5)	29% (5)	**17**
Regional or local year-round inventory and assessment conducted by state agencies	6% (1)	6% (1)	11% (2)	35% (6)	41% (7)	**17**
Regional or local once a year inventory and assessment conducted by state agencies	6% (1)	6% (1)	6% (1)	41% (7)	41% (7)	**17**
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	6% (1)	12% (2)	6% (1)	35% (6)	41% (7)	**17**
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	12% (2)	12% (2)	12% (2)	29% (5)	35% (6)	**17**
				Total Respondents		**138**

26. How crucial are these HABITAT efforts by other organizations for the conservation of the Wildlife in All Wetland Habitats 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 year-round inventory and assessment conducted by other organizations	5% (1)	5% (1)	11% (2)	32% (6)	47% (9)	**19**
Statewide once a year inventory and assessment conducted by other organizations	11% (2)	0% (0)	5% (1)	37% (7)	47% (9)	**19**
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	11% (2)	11% (2)	5% (1)	26% (5)	47% (9)	**19**
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	5% (1)	16% (3)	5% (1)	32% (6)	42% (8)	**19**
Regional or local year-round inventory and assessment conducted by other organizations	10% (2)	5% (1)	10% (2)	30% (6)	45% (9)	**20**
Regional or local once a year inventory and assessment conducted by other organizations	20% (4)	0% (0)	10% (2)	30% (6)	40% (8)	**20**
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	5% (1)	5% (1)	5% (1)	32% (6)	53% (10)	**19**
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	10% (2)	20% (4)	25% (5)	15% (3)	30% (6)	**20**
				Total Respondents		**155**

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

1. none
2. On state land.
3. Do not occur to my knowledge.
4. unknown

5. isolated wetlands law
6. Northeast Indiana

Total Respondents **6**

28. Regional or local HABITAT inventory and assessment by other organizations for the Wildlife in All Wetland Habitats in Indiana.

1. statewide aerial imagery
2. None that I am aware of.
3. Do not occur to my knowledge.
4. unknown
5. Indiana wetland inventory maps
county aerial photos for NRCS
soils mapping county maps
6. Cortwright monitors populations in Brown County & Porter County
Brodman monitors them in Owens County
7. Kankakee Sands and other Conservancy preserves - staff evaluate the restored/created habitat to judge its ability to support Plains leopard frog and other species of concern.
8. Robert Brodman, Saint Joseph's College in NW Indiana
9. NW Indiana (Newton, Jasper, Pulaski, Lake & Porter Counties)
10. IUPU-FW faculty and students work in wetlands with this species in NE Indiana

Total Respondents **10**

29. Please list organizations that are monitoring this HABITAT for the Wildlife in All Wetland Habitats in Indiana.

1. USDA?
2. None that I am aware of.
3. Do not occur to my knowledge
4. unknown
5. - US Fish and Wildlife Service
- Natural Resource Conservation Service
- Indiana Department of Environmental Management
6. IDNR, Non-game Herpetologist; University Professors, members of the Herpetology TAC Committee for the State of Indiana
7. TNC.
8. Robert Brodman, Saint Joseph's College

9.	Ball State University NE Ind. Indiana State University NW
10.	Because something is known about wetland loss in Indiana, I presume the state is keeping track of something.

Total Respondents **10**

30. What are the current HABITAT inventory and/or assessment techniques for Wildlife in All Wetland Habitats 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
GIS mapping	9% (2)	27% (6)	36% (8)	0% (0)	0% (0)	27% (6)	**22**
Aerial photography and analysis	14% (3)	23% (5)	27% (6)	5% (1)	0% (0)	32% (7)	**22**
Systematic sampling	9% (2)	23% (5)	18% (4)	9% (2)	0% (0)	41% (9)	**22**
Property tax estimates	0% (0)	0% (0)	0% (0)	22% (4)	0% (0)	78% (14)	**18**
State revenue data	0% (0)	0% (0)	0% (0)	22% (4)	0% (0)	78% (14)	**18**
Regulatory information	6% (1)	22% (4)	0% (0)	22% (4)	0% (0)	50% (9)	**18**
Participation in landuse programs	0% (0)	20% (4)	10% (2)	20% (4)	0% (0)	50% (10)	**20**
Modeling	0% (0)	14% (3)	29% (6)	5% (1)	0% (0)	52% (11)	**21**
Voluntary landowner reporting	0% (0)	10% (2)	14% (3)	14% (3)	0% (0)	62% (13)	**21**
Other (please specify below)	0% (0)	18% (2)	0% (0)	9% (1)	0% (0)	73% (8)	**11**
					Total Respondents		**193**

31. Other HABITAT inventory and assessment techniques for the Wildlife in All Wetland Habitats in Indiana.

1.	X
2.	unknown
3.	I am not aware of any inventory or assessment techniques used specifically for Canada Goose Habitat in Indiana.; SurveyAnswerTextNull

4. Pit-fall trapping and cover board objects adjacent to ephemeral wetlands; mark and recapture
5. Visual estimate of amount of appropriate habitat being provided in restored areas.
6. look for runways in muck and trap for them

Total Respondents **6**

32. What one or two HABITAT inventory and assessment techniques would you recommend for effective conservation of the Wildlife in All Wetland Habitats in Indiana?

1. aerial/satellite imagery coupled with modeling
2. Wetlands should be monitored by overhead photo methods with ground truth checks.
This should occur on a regular basis with aggressive enforcement against illegal wetlands destruction
3. spring aerial surveys
4. none
5. GIS mapping would be the most cost affective means for creating an inventory of emergent plant spp. that would support Canada Geese in emergent wetlands
Systemnatic water sampling of high use areas would determine nutrient loading and water quality. US Fish and Wildlife Service Draft Environmentalo Impact Statement, Resident Canads Goose Management, Feb.2002.; SurveyAnswerTextNull
6. aerial surveys
reports from state fwas
7. analysis of county aerial photos as these are done on a somewhat regular basis
- updating and ground truthing Wetland Inventory maps
8. Surveys
9. Pit-fall traps and cover boards can be used to assess population size and use of ephemeral wetlands for breeding; Mark and recapture can be used to determine migration patterns and use of specific ephemeral wetlands for breeding
10. Systematic survey & GIS
11. Systematic sampling (intesive) and GIS (less intensive)
12. Sysematic sampling & GIS
13. 1) High resolution aerial photography at normal marsh water levels - digitize for GIS.
2) Monitor wetland vegetation - blandings prefer floating emergents (e.g. duck weed) and get crowded out by cattail expansion.

Total Respondents **13**

33. What is the current body of science for the Wildlife in All Wetland Habitats in Indiana?

	Response Total	Response Percent
Complete, up to date and extensive	1	6%

extensive			
Adequate		3	17%
Inadequate		11	61%
Nonexistent		2	11%
Other (please explain below)	Literature is not habitat specific for muskrats in Indiana	1	6%
		Total Respondents	18

34. Please provide a citation (title, author, date, publisher) that would give the best overview of the Wildlife in All Wetland Habitats in Indiana, if available. This resource may be used if further detail is needed.

		Response Total	Response Percent
Title	BNA Account - Golden-winged Warbler Spring Breeding Duck Survey Amphibians and reptiles from 23 counties of Indiana. Amphibians and reptiles from 23 counties of Indiana. Unknown Fur animals of Indiana Unknown Status and Distribution of candidate endangered herpetofauna in the Fish Creek watershed	1	100%
Author	JL Confer Kristen Chodacheck Robert Brodman Robert Brodman Mumford and Whitaker 1982 David Brooks review Minton's guide Bruce Kingsbury, Spencer Cortwright	1	100%
Date	1992 2003 2003 2003 unknown 1959 2001 1994	1	100%
Publisher	American Ornithologists' Union IDNR Proceedings of the Indiana Academy of Science, 112: 43-54. Proceedings of the Indiana Academy of Science, 112: 43-54. Unknown IDF&W Get BioBlitz & IUPFW reports from DNR IDNR Division of Fish and Wildlife	1	100%
		Total Respondents	1

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

		Response Total	Response Percent
Title	Birds of Indiana Waterfowl Ecology & Management Amphibians and reptiles from 23 counties of Indiana. ongoing background work in NE & MN	1	100%
Author	R Mumford and C. Keller Compiled by: Ratti, Flake, Wentz Robert Brodman unknown	1	100%
Date	1984 1982 2003 unknown	1	100%
Publisher	Indiana Univerisity Press The Wildlife Society Proceedings of the Indiana Academy of Science, 112: 43-54. unknown	1	100%
	Total Respondents		1

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

		Response Total	Response Percent
Complete, up to date and extensive		0	0%
Adequate		5	28%
Inadequate		11	61%
Nonexistent		1	6%
Other (please explain below)	unknown	1	6%
	Total Respondents		18

37. Please provide a citation (title, author, date, publisher) that would give the best HABITAT overview of the Wildlife in All Wetland Habitats in Indiana, if available. This resource may be used if further detail is needed.

		Response Total	Response Percent
Title	Waterfowl & Wetlands- Integrated Review Not my expertise	1	100%
Author	Edited : Bookhout contact JW Lang for NE & MN	0	0%
Date	1979 unknown	0	0%
Publisher	The Wildlife Society unknown	0	0%

Total Respondents	**1**

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

		Response Total	Response Percent
Title	Creating Freshwater Wetlands	**1**	**100%**
Author	Hammer	**1**	**100%**
Date	1997	**1**	**100%**
Publisher	CRC Press	**1**	**100%**
	Total Respondents		**1**

39. What are the research needs for the Wildlife in All Wetland Habitats in Indiana?

	Urgently needed	Greatly needed	Needed	Slightly needed	Not needed	Unknown	Response Total
Life cycle	5% (1)	14% (3)	36% (8)	18% (4)	27% (6)	0% (0)	**22**
Distribution and abundance	9% (2)	23% (5)	50% (11)	5% (1)	14% (3)	0% (0)	**22**
Limiting factors (food, shelter, water, breeding sites)	41% (9)	18% (4)	18% (4)	9% (2)	14% (3)	0% (0)	**22**
Threats (predators/competition, contamination)	27% (6)	14% (3)	36% (8)	14% (3)	9% (2)	0% (0)	**22**
Relationship/dependence on specific habitats	27% (6)	18% (4)	27% (6)	5% (1)	23% (5)	0% (0)	**22**
Population health (genetic and physical)	18% (4)	18% (4)	32% (7)	14% (3)	18% (4)	0% (0)	**22**
Other (please specify below)	0% (0)	33% (3)	0% (0)	0% (0)	11% (1)	56% (5)	**9**
					Total Respondents		**141**

40. Other research needs for the Wildlife in All Wetland Habitats in Indiana.

1. X
2. unknown
3. Research is needed to justify extending or modifying the hunting seasons to eliminate the problem of the so callled nuisance goose in urban areas, around lakes and golf courses.
4. food availability throughout annual cycle
ways to deter use
5. impact of high snow goose populations on Canada geese nesting sites

	- develop more effective dispersal, relocation or removal techniques gor maxima geese
6.	Information on metapopulation dynamics and migration distances to and from ephemeral wetlands are needed. Information on how many ephemeral wetland habitats within the landscape are needed to maintain healthy populations of the species is also needed. Information on buffer size and vegetation composition around ephemeral wetlands is needed.
7.	Quite little is known about much of the basic natural history or this species
8.	Research needs as related to muskrats are not habitat specific.
9.	1) Longterm fidelity to specific sites. 2) Limits to sand prairie needs for nesting. 3) Limits to recruitment when forced to nest in rowcrop areas.

Total Respondents 9

41. What are the HABITAT research needs for the Wildlife in All Wetland Habitats in Indiana?

	Urgently needed	Greatly needed	Needed	Slightly needed	Not needed	Unknown	Response Total
Successional changes	0% (0)	36% (8)	41% (9)	18% (4)	5% (1)	0% (0)	**22**
Distribution and abundance (fragmentation)	18% (4)	45% (10)	27% (6)	9% (2)	0% (0)	0% (0)	**22**
Threats (land use change/competition, contamination/global warming)	32% (7)	27% (6)	23% (5)	14% (3)	0% (0)	5% (1)	**22**
Relationship/dependence on specific site conditions	27% (6)	23% (5)	14% (3)	27% (6)	5% (1)	5% (1)	**22**
Growth and development of individual components of the habitat	0% (0)	33% (7)	29% (6)	24% (5)	0% (0)	14% (3)	**21**
Other (please specify below)	13% (1)	13% (1)	13% (1)	13% (1)	0% (0)	50% (4)	**8**
						Total Respondents	**117**

42. Other HABITAT research needs for the Wildlife in All Wetland Habitats in Indiana.

1.	X
2.	unknown
3.	Habitat needs should be researched in an attempt to find and propogate habitats that are esthetically pleasing to humans for urban settings yet displeasing to geese.
4.	availability throughout annual cycle
5.	Information on metapopulation dynamics and migration distances to and from ephemeral wetlands are needed. Information on how many ephemeral wetland habitats within the landscape are needed to maintain healthy populations of the species is also needed. Information on buffer size and vegetation composition around ephemeral wetlands is needed.

ephemeral wetlands is needed.

6. Spatial relationships between occupied wetlands relative to population dynamics

Physical characteristics of over wintering sites

Total Respondents 6

43. How well do the following conservation efforts address the threats to all wildlife in all Wetland Habitats in Indiana?

	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
Habitat protection (use below for details)	27% (6)	64% (14)	5% (1)	0% (0)	5% (1)	**22**
Population management (hunting, trapping)	18% (4)	18% (4)	9% (2)	45% (10)	9% (2)	**22**
Population enhancement (captive breeding and release)	0% (0)	0% (0)	0% (0)	86% (19)	14% (3)	**22**
Reintroduction (restoration)	5% (1)	0% (0)	0% (0)	86% (19)	9% (2)	**22**
Food plots	14% (3)	14% (3)	14% (3)	55% (12)	5% (1)	**22**
Threats reduction	5% (1)	36% (8)	0% (0)	27% (6)	32% (7)	**22**
Native predator control	0% (0)	18% (4)	9% (2)	50% (11)	23% (5)	**22**
Exotic/invasive species control	5% (1)	27% (6)	0% (0)	45% (10)	23% (5)	**22**
Regulation of collecting	14% (3)	43% (9)	5% (1)	29% (6)	10% (2)	**21**
Disease/parasite management	5% (1)	9% (2)	5% (1)	55% (12)	27% (6)	**22**
Translocation to new geographic range	0% (0)	10% (2)	0% (0)	81% (17)	10% (2)	**21**
Protection of migration routes	14% (3)	18% (4)	5% (1)	32% (7)	32% (7)	**22**
Limiting contact with pollutants/contaminants	0% (0)	27% (6)	5% (1)	32% (7)	36% (8)	**22**
Public education to reduce human disturbance	0% (0)	45% (10)	5% (1)	18% (4)	32% (7)	**22**
Culling/selective removal	0% (0)	18% (4)	0% (0)	73% (16)	9% (2)	**22**
Stocking	5% (1)	0% (0)	0% (0)	86% (19)	9% (2)	**22**
Other (please specify below)	25% (2)	0% (0)	13% (1)	0% (0)	63% (5)	**8**
				Total Respondents		**358**

44. Other current conservation practices for the Wildlife in All Wetland Habitats in Indiana.

1. 1. X
2. unknown
3. Wetland restoration
4. Too little is known

5.	Invasive species control (buckthorn, autumn olive, phargimtes) to keep open herbaceous habitat suitable for massasauga
6.	Preserve wetlands

Total Respondents 6

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

1.	Habitat protection and habitat manipulation.
2.	Restoring wetlands & providing quality upland nesting cover adjoining these wetlands. Reduce fall tillage near wetlands.
3.	Habitat protection throughout annual cycle
4.	continue 5 year surveys
5.	Modification of hunting seasons and opening of urban areas to hunting to reduce numbers of so called nuisance geese populations in leu of nest destruction and egg shaking.; SurveyAnswerTextNull
6.	Enhancement of migratory/staging habitat enhancement of breeding habitat where populations do not conflict with landuse
7.	develop practices and procedures to increase harvest of local birds
8.	Ephermeral Wetland and forested upland habitat protection
9.	1.Habitat protection needs to be improved greatly. Ephemeral wetlands are not protected or valued as much as other wetlands via regulation. 2.Restoration of ephemeral wetlands and retention of these habitats within the landscape.
10.	Protection & restoration of ephermeral wetlands within the historic range of this species.
11.	Design and management of conservation areas that specifically incorporate life history requirements of the species across relatively large habitats (>1,000 acres). This species is too often subjected to management decisions that favor other species, and these often have a negative impact on available wetland and nesting habitat. In some cases (water level manipulations , late spring prescribed fire), these management decisions seem likely to result in direct mortality of adults.
12.	Habitat protection
13.	See #43. In addition, although not habitat specific, outreach programs are needed to effectively and accurately educate citizens about wildlife (game and non-game), the wildlife conservation model (for game and non-game), and the need for effective muskrat management programs.
14.	1) Restoration in new, very large natural areas in NW Indiana. 2) Raccoon reduction near constrained (small) areas of occupied habitat in NE Indiana.
15.	Design and management of conservation areas that specifically incorporate life history requirements of the species across relatively large habitats (>1,000 acres). This species is too often subjected to management decisions that favor other species, and these often have a negative impact on available wetland and nesting habitat. In some cases, these management decisions seem likely to result in direct mortality of adults and eggs.

16	Restoration of habitat and connectivity

Total Respondents 16

46. How well do the following conservation efforts address the HABITAT threats to all wildlife in all Wetland Habitats in Indiana?

	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
Habitat protection through regulation	24% (5)	67% (14)	5% (1)	0% (0)	5% (1)	**21**
Habitat protection on public lands	57% (12)	38% (8)	5% (1)	0% (0)	0% (0)	**21**
Habitat protection incentives (financial)	20% (4)	40% (8)	5% (1)	0% (0)	35% (7)	**20**
Habitat restoration through regulation	14% (3)	33% (7)	10% (2)	5% (1)	38% (8)	**21**
Habitat restoration on public lands	29% (6)	38% (8)	10% (2)	5% (1)	19% (4)	**21**
Habitat restoration incentives (financial)	14% (3)	38% (8)	5% (1)	5% (1)	38% (8)	**21**
Artificial habitat creation (artificial reefs, nesting platforms)	14% (3)	29% (6)	0% (0)	29% (6)	29% (6)	**21**
Selective use of functionally equivalent exotic species in place of extirpated natives	0% (0)	14% (3)	14% (3)	43% (9)	29% (6)	**21**
Succession control (fire, mowing)	29% (6)	24% (5)	10% (2)	14% (3)	24% (5)	**21**
Corridor development/protection	14% (3)	24% (5)	5% (1)	29% (6)	29% (6)	**21**
Managing water regimes	14% (3)	38% (8)	14% (3)	10% (2)	24% (5)	**21**
Pollution reduction	0% (0)	48% (10)	0% (0)	5% (1)	48% (10)	**21**
Protection of adjacent buffer zone	24% (5)	43% (9)	5% (1)	10% (2)	19% (4)	**21**
Restrict public access and disturbance	5% (1)	38% (8)	5% (1)	14% (3)	38% (8)	**21**
Land use planning	20% (4)	35% (7)	5% (1)	10% (2)	30% (6)	**20**
Technical assistance	5% (1)	43% (9)	10% (2)	10% (2)	33% (7)	**21**
Cooperative land management agreements (conservation easements)	19% (4)	24% (5)	0% (0)	5% (1)	52% (11)	**21**
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	100% (5)	**5**

Total Respondents 360

47. Other current HABITAT conservation practices for the Wildlife in All Wetland Habitats in Indiana.

1.	X
2.	unknown
3.	Many of the current 'conservation practices' and incentive programs promoted by biologists seem to be aimed at ducks and actually manage against this species.

Total Respondents 3

48. What one or two specific HABITAT practices would you recommend for more effective conservation of the Wildlife in All Wetland Habitats in Indiana?

1. retard succession to desired habitat stage; incentives to conserve shrubby habitats.
2. Regulations are needed to protect small wetlands.
Habitat restoration programs for private land owners. (Financial help)
3. Habitat protection incentives
habitat protection regulations
4. continue efforts to protect and enhance wetland and ripairian habitats.
5. Control of plant species that spread by vegetative means that from thick colonies such as catttail.
6. food plots
refuge areas
7. providing additional financial incentives on private lands for easements to protect existing wetlands or to restore wetlands
8 Forested emphermeral wetland protection and forest protection
9. Restoration and protection of ephemeral wetlands; protection of buffers needed for amphibians migrating to the ephemeral wetland for breeding;
10. When creating wetlands under a landowner incentive program, create ephemeral wetlands whenever possible rather than duck ponds.
11. Protection and retoration of ephemeral wetlands.
12. Habitat protection on private & public lands
13. Wwtland protection
14. anything that helps to preserve wetlands could help this animal.
15. 1) Use fire to maintain large sand prairies near appropriate wetlands
2) Acquire/purchase easments on additional blocks of land that have permanent wetlands associated with large sandy uplands.
16. Protection, restoration and appropriate management of adjacent uplands as nesting habitat around known populations
17. restore habitat and connectivity, allow beaver activity

Total Respondents **17**

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

1. Indiana needs to take a more active role in protecting and restoring emergent wetlands. Probably the upward spiral of land value will insure the loss of our last quality habitat. To this date jobs and revenue are number one on our priorities. We will destroy any stream or wetland for a new residence, more agricultural production, or a factory. I fear we may be to late. As I see what has occured during my 35 year as a land manager in Indiana I sometimes feel we have already lost the battle.

2.	no
3.	no
4.	In Indiana we need to consider two distinct groups of Canada geese. I have tried to address both groups in the information provided above. The geese migrating down from the traditional nesting grounds in Canada face high snow goose populations, degradition and destruction of existing wetlands, short stopping and a warming winter weather pattern. These have had a severe influence on traditional migration patterns and routes. The Maxima geese being yearround residents are much more prone to goose - human conflicts. Also tend to gather in large numbers on small water bodies leading to possible disease outbreaks.
5.	The distribution of spotted salamanders in Indiana is more spotty than one might expect.
6.	It is not known if Rana blairi exists in Indiana. The only known specimen from Indiana were collected and deposited in museums prior to the species even being described. To the best of my knowledge, the most recently documented Rana blairi from Indiana was about 30 years ago.
7.	Step one is the need for more information about this species and its abundance in Indiana
8.	This species is too often taken for granted on managed lands. Management activities in wetlands and adjacent uplands (water level manipulations , late spring prescribed fire) contribute directly to increased mortality.
9.	Four-toed salamanders have a very spotty distribution that is poorly understood. They are often not found in habitats that seem ideally suited but then found in what one might call an inferior site.
10.	Contiguous blandings populations have 4000 >yearling turtles in Minnesota and 140000 >yearling turtles in Nebraska, among the largest for any turtle in the USA. Main habitat components include big shallow but permanent wetlands, and very large sand prairies for nesting - so large as to be non-economical for regular raccoon use (some foxes & others use). These places have excellent juvenile recruitment, evidently not seen in other habitat. Take it from here.
Total Respondents	**10**

Appendix E-65: Wetlands

Technical experts did not provide input on a representative species for this habitat.

There are no species of greatest conservation need in this guild.

6. Please rank the following threats to the Wildlife in Emergent Wetland Habitats in Indiana.

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total
Invasive/non-native species	0% (0)	0% (0)	50% (4)	25% (2)	25% (2)	0% (0)	**8**
High sensitivity to pollution	0% (0)	0% (0)	38% (3)	50% (4)	13% (1)	0% (0)	**8**
Bioaccumulation of contaminants	0% (0)	13% (1)	38% (3)	38% (3)	0% (0)	13% (1)	**8**
Predators (native or domesticated)	0% (0)	38% (3)	0% (0)	38% (3)	25% (2)	0% (0)	**8**
Dependence on other species (mutualism, pollinators)	0% (0)	0% (0)	0% (0)	13% (1)	88% (7)	0% (0)	**8**
Diseases/parasites (of the species itself)	0% (0)	0% (0)	25% (2)	63% (5)	13% (1)	0% (0)	**8**
Regulated hunting/fishing pressure (too much)	0% (0)	0% (0)	13% (1)	0% (0)	88% (7)	0% (0)	**8**
Species over population	0% (0)	25% (2)	13% (1)	0% (0)	63% (5)	0% (0)	**8**
Unintentional take/ direct mortality (e.g., vehicle collisions, power line collisions, by-catch, harvesting equipment, land preparation machinery)	0% (0)	0% (0)	13% (1)	38% (3)	50% (4)	0% (0)	**8**
Unregulated collection pressure	0% (0)	0% (0)	0% (0)	0% (0)	100% (8)	0% (0)	**8**
Dependence on irregular resources (cyclical annual variations) (e.g., food, water, habitat limited due to annual variations in availability)	0% (0)	25% (2)	38% (3)	13% (1)	25% (2)	0% (0)	**8**
					Total Respondents		**88**

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

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total
Habitat loss (breeding range)	25% (2)	38% (3)	13% (1)	25% (2)	0% (0)	0% (0)	**8**
Habitat loss (feeding/foraging areas)	25% (2)	25% (2)	13% (1)	38% (3)	0% (0)	0% (0)	**8**
Small native range (high endemism)	0% (0)	0% (0)	0% (0)	0% (0)	100% (8)	0% (0)	**8**
Near limits of natural geographic range	0% (0)	0% (0)	0% (0)	0% (0)	100% (8)	0% (0)	**8**
Large home range requirements	0% (0)	0% (0)	0% (0)	12% (1)	88% (7)	0% (0)	**8**
Viable reproductive population size or availability	0% (0)	0% (0)	0% (0)	25% (2)	75% (6)	0% (0)	**8**
Specialized reproductive behavior or low reproductive rates	0% (0)	0% (0)	0% (0)	13% (1)	88% (7)	0% (0)	**8**
Degradation of							

movement/migration routes (overwintering habitats, nesting and staging sites)							
Genetic pollution (hybridization)	0% (0)	0% (0)	38% (3)	13% (1)	50% (4)	0% (0)	**8**
Unknown	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
					Total Respondents		**74**

8. Other threats to the Wildlife in Emergent Wetland Habitats in Indiana.

1. X

2. Continued loss and degradation of emergent wetland habitat in portions of the state due to development and poor agricultural practices.

3. Unknown

4. Human interaction wtih species,trapping ,relocation, scarring
Reproductive intervention by humans

5. Devalueing of species due to overpopulation
restricted management options

Total Respondents **5**

9. Please briefly describe the top two threats to the Wildlife in Emergent Wetland Habitats in Indiana identified above.

1. Loss of shallow marshes due to drainage for development & farming.
Loss of winter feed due to fall tillage.

2. Habitat loss through annual cycle
predators

3. Loss of habitat due to development and poor agricultural practices.
Degradation of habitat by invasive plant species.

4. Unknown

5. Water Quality
Human intervention during nesting process.

6. overpopulation
urbanization

7. continuing loss and/or degradation of emergent wetlands

- possible disease outbreaks due to large concentrations of birds often in small areas

Total Respondents **7**

10. Please rank the following threats to the HABITAT of the Wildlife in Emergent Wetland Habitats in Indiana.

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total
Commercial or residential development (sprawl)	25% (2)	38% (3)	38% (3)	0% (0)	0% (0)	0% (0)	**8**
Counterproductive financial incentives or regulations	0% (0)	50% (4)	38% (3)	0% (0)	13% (1)	0% (0)	**8**
Invasive/non-native species	0% (0)	38% (3)	38% (3)	13% (1)	13% (1)	0% (0)	**8**
Nonpoint source pollution (sedimentation and nutrients)	0% (0)	50% (4)	25% (2)	25% (2)	0% (0)	0% (0)	**8**
Habitat fragmentation	14% (1)	29% (2)	43% (3)	14% (1)	0% (0)	0% (0)	**7**
Successional change	0% (0)	25% (2)	25% (2)	38% (3)	13% (1)	0% (0)	**8**
Diseases (of plants that create habitat)	0% (0)	0% (0)	25% (2)	50% (4)	25% (2)	0% (0)	**8**
Habitat degradation	13% (1)	38% (3)	50% (4)	0% (0)	0% (0)	0% (0)	**8**
Climate change	0% (0)	0% (0)	0% (0)	75% (6)	25% (2)	0% (0)	**8**
Stream channelization	0% (0)	50% (4)	25% (2)	25% (2)	0% (0)	0% (0)	**8**
Impoundment of water/flow regulation	0% (0)	25% (2)	25% (2)	38% (3)	13% (1)	0% (0)	**8**
Agricultural/forestry practices	13% (1)	50% (4)	25% (2)	13% (1)	0% (0)	0% (0)	**8**
Residual contamination (persistent toxins)	0% (0)	0% (0)	38% (3)	50% (4)	0% (0)	13% (1)	**8**
Point source pollution (continuing)	0% (0)	25% (2)	25% (2)	50% (4)	0% (0)	0% (0)	**8**
Mining/acidification	0% (0)	13% (1)	13% (1)	25% (2)	13% (1)	38% (3)	**8**
Drainage practices (stormwater runoff)	0% (0)	25% (2)	50% (4)	13% (1)	13% (1)	0% (0)	**8**
Unknown	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Other (please specify below)	0% (0)	0% (0)	33% (1)	0% (0)	0% (0)	67% (2)	**3**
					Total Respondents		**131**

11. Other HABITAT threats to the Wildlife in Emergent Wetland Habitats in Indiana.

1. X

2. None

3. Drainage of wetland areas.

4. legal jurisdiction issues presently unclear, draft of state isolated wetland law out for comment.

Total Respondents **4**

12. Please briefly describe the top two HABITAT threats to the Wildlife in Emergent Wetland Habitats in Indiana identified above.

1. Commercial or residential development by filling or draining wetlands.
Stream and lake "renovation" have degraded habitat back to where it was when
the original habitat destruction occured.

2. agricultural practices
drainage practices

3. Loss of habitat due to development and poor agricultural practices.
Degradation of plant community by exotic plants invading wetland habitats.

4. Development encroachment on some colonies
Destruction of nesting trees

5. Canada Geese are their own worst enemy. Their concentrations by large numbers of geese on small wetlands have the capacity to pollute the water and cause increased erosiuon due to their feeding habits.
The destruction of natural wetland habitats by developement, agriculture and continued road construction.

6. Agriculture
urban sprawl

7. presently little or no protection of isolated wetlands

- habitat degradation due to increased sediment/nutrient loads

Total Respondents **7**

13. What current monitoring efforts by state agencies are you aware of for the Wildlife in Emergent Wetland Habitats in Indiana?

	Yes, these efforts occur	Not aware of these efforts occuring	Response Total
Statewide year-round monitoring conducted by state agencies	63% (5)	38% (3)	**8**
Statewide once a year monitoring conducted by state agencies	50% (3)	50% (3)	**6**
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	50% (3)	50% (3)	**6**
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	50% (3)	50% (3)	**6**
Regional or local year-round monitoring conducted by state agencies	33% (2)	67% (4)	**6**
Regional or local once a year monitoring conducted by state agencies	17% (1)	83% (5)	**6**
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	17% (1)	83% (5)	**6**

Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	33% (2)	67% (4)	**6**
		Total Respondents	**50**

14. What current monitoring efforts by other organizations are you aware of for the Wildlife in Emergent Wetland Habitats in Indiana?

	Yes, these efforts occur	Not aware of these efforts occuring	Response Total
Statewide year-round monitoring conducted by other organizations	0% (0)	100% (8)	**8**
Statewide once a year monitoring conducted by other organizations	25% (2)	75% (6)	**8**
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	13% (1)	88% (7)	**8**
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	13% (1)	88% (7)	**8**
Regional or local year-round monitoring conducted by other organizations	0% (0)	100% (8)	**8**
Regional or local once a year monitoring conducted by other organizations	13% (1)	88% (7)	**8**
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	13% (1)	88% (7)	**8**
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	38% (3)	63% (5)	**8**
		Total Respondents	**64**

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

	Very crucial	Somewhat crucial	Slightly crucial	Not crucial	Unknown	Response Total
Statewide year-round monitoring conducted by state agencies	50% (4)	0% (0)	13% (1)	25% (2)	13% (1)	**8**
Statewide once a year monitoring conducted by state agencies	17% (1)	17% (1)	33% (2)	17% (1)	17% (1)	**6**
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	0% (0)	50% (3)	50% (3)	0% (0)	**6**
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	0% (0)	17% (1)	0% (0)	67% (4)	20% (1)	**6**
Regional or local year-round monitoring conducted by state agencies	17% (1)	33% (2)	0% (0)	33% (2)	17% (1)	**6**

Regional or local once a year monitoring conducted by state agencies	0% (0)	33% (2)	17% (1)	33% (2)	17% (1)	**6**
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	0% (0)	40% (2)	60% (3)	0% (0)	**5**
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	83% (5)	17% (1)	**6**
				Total Respondents		**49**

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

	Very crucial	Somewhat crucial	Slightly crucial	Not crucial	Unknown	Response Total
Statewide year-round monitoring conducted by other organizations	13% (1)	13% (1)	0% (0)	38% (3)	38% (3)	**8**
Statewide once a year monitoring conducted by other organizations	0% (0)	25% (2)	25% (2)	13% (1)	38% (3)	**8**
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	13% (1)	50% (4)	38% (3)	**8**
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	50% (4)	50% (4)	**8**
Regional or local year-round monitoring conducted by other organizations	13% (1)	0% (0)	13% (1)	38% (3)	38% (3)	**8**
Regional or local once a year monitoring conducted by other organizations	0% (0)	13% (1)	13% (1)	38% (3)	38% (3)	**8**
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	13% (1)	0% (0)	13% (1)	38% (3)	38% (3)	**8**
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	13% (1)	0% (0)	13% (1)	38% (3)	38% (3)	**8**
					Total Respondents	**64**

17. Regional or local state agency monitoring for the Wildlife in Emergent Wetland Habitats in Indiana.

1. At present only when a permit for work in a wetland is applied for.
Smaller more numerous wetlands have little oversite.

2. Selected State Fish and Wildlife Areas and Reservoir properties operated by the Department of Natural Resources conduct counts during the fall migration period.

3. State wide for existing and new colonies every 5 years

4. Fish and Wildlife areas and Reservoirs as part of the weekly Waterfowl survey from Aug to Jan.

5. weekly waterfowl counts at selected sites

- neck collar observations statewide as encountered

- mid winter waterfowl survey of selected sites

Total Respondents 5

18. Regional or local monitoring by other organizations for the Wildlife in Emergent Wetland Habitats in Indiana.

1. Some wildlife species are not monitored. Habitat changes requiring permits are checked by, IDNR, IDEM, ACOE (in some cases).

2. Not aware of any efforts.

3. unknown

4. Lake associations busineeses and anyone living around a emergent wetland with a yard with Canada Goose complaints will monitor populations in order to prove they have a problem so they can destroy nests or eggs.

5. christmas bird count

Total Respondents 5

19. Please list organizations that are monitoring the Wildlife in Emergent Wetland Habitats in Indiana.

1. To some extent: Waterfowl USA, Ducks Unlimited, The Nature Conservancy,
The Audubon Society.

2. Not aware of any organizations.

3. Indiana Department of Natural Resources, Division of Fish & Wildlife

4. Div of Fish and Wildlife
Div of Reservoirs.

5. Audubon

- US Fish and Wildlife Service

Total Respondents 5

20. What are the current monitoring techniques for the Wildlife in Emergent Wetland Habitats in Indiana?

	Not used but	Not used and not

			possible with existing technology and data	possible with existing technology and data	feasible		
Radio telemetry and tracking	0% (0)	14% (1)	71% (5)	0% (0)	0% (0)	14% (1)	**7**
Modeling	29% (2)	14% (1)	14% (1)	0% (0)	0% (0)	43% (3)	**7**
Coverboard routes	0% (0)	0% (0)	25% (1)	0% (0)	0% (0)	75% (3)	**4**
Spot mapping	20% (1)	0% (0)	0% (0)	0% (0)	0% (0)	80% (4)	**5**
Driving a survey route	86% (6)	14% (1)	0% (0)	0% (0)	0% (0)	0% (0)	**7**
Reporting from harvest, depredation, or unintentional take (road kill, bycatch)	86% (6)	14% (1)	0% (0)	0% (0)	0% (0)	0% (0)	**7**
Mark and recapture	43% (3)	29% (2)	14% (1)	0% (0)	14% (1)	0% (0)	**7**
Professional survey/census	50% (3)	50% (3)	0% (0)	0% (0)	0% (0)	0% (0)	**6**
Volunteer survey/census	50% (2)	25% (1)	0% (0)	0% (0)	0% (0)	25% (1)	**4**
Trapping (by any technique)	29% (2)	29% (2)	14% (1)	0% (0)	0% (0)	29% (2)	**7**
Representative sites	40% (2)	20% (1)	20% (1)	0% (0)	0% (0)	20% (1)	**5**
Probabilistic sites	0% (0)	25% (1)	25% (1)	0% (0)	0% (0)	50% (2)	**4**
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	**0**
					Total Respondents		**70**

21. Other monitoring techniques for the Wildlife in Emergent Wetland Habitats in Indiana.

1. X

2. aerial surveys

3. unknown

4. aerial surveys

Total Respondents **4**

22. What one or two monitoring techniques would you recommend for effective conservation of the Wildlife in Emergent Wetland Habitats in Indiana?

1. Nesting & brood counts state wide.

2. aerial survey
banding

3. Continue current state surveys every 5 years

4. Mark and recapture. Means to track species movement and association with non target species and times of interaction with non target spp.
Mark and harvest. Same as above but also eliiminates and reduces concentrations in non desiralbe areas.

5. aerial surveys
banding and neck collaring

6. banding and/or neck collaring. Procedures in place, nationally accepted, good national data base maintained.

- weekly waterfowl counts at selected sites. Samples most of the major concentration areas. Very good historical data for trend analysis.

Total Respondents **6**

23. What current HABITAT inventory and assessment efforts or activities by state agencies are you aware of for the Wildlife in Emergent Wetland Habitats in Indiana?

	Yes, these efforts occur	No effort that I'm aware of	Response Total
Statewide annual inventory and assessment conducted by state agencies	0% (0)	100% (8)	**8**
Statewide once a year inventory and assessment conducted by state agencies	0% (0)	100% (8)	**8**
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	13% (1)	87% (7)	**8**
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	25% (2)	75% (6)	**8**
Regional or local year-round inventory and assessment conducted by state agencies	0% (0)	100% (8)	**8**
Regional or local once a year inventory and assessment conducted by state agencies	0% (0)	100% (8)	**8**
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	100% (8)	**8**
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	13% (1)	87% (7)	**8**
		Total Respondents	**64**

24. What current HABITAT inventory and assessment efforts or activities by other organizations are you aware of for the Wildlife in Emergent Wetland Habitats 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% (8)	**8**
Statewide once a year inventory and assessment conducted by other organizations	0% (0)	100% (8)	**8**
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (8)	**8**
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	38% (3)	63% (5)	**8**
Regional or local year-round inventory and assessment conducted by other organizations	0% (0)	100% (8)	**8**
Regional or local once a year inventory and assessment conducted by other organizations	0% (0)	100% (8)	**8**
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (8)	**8**
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	25% (2)	75% (6)	**8**
		Total Respondents	**64**

25. How crucial are these HABITAT efforts by state agencies for the conservation of the Wildlife in Emergent Wetland Habitats 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	38% (3)	0% (0)	13% (1)	38% (3)	13% (1)	**8**
Statewide once a year inventory and assessment conducted by state agencies	17% (1)	0% (0)	17% (1)	50% (3)	17% (1)	**6**
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	33% (2)	0% (0)	50% (3)	17% (1)	**6**

Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	33% (2)	0% (0)	50% (3)	17% (1)	**6**
Regional or local year-round inventory and assessment conducted by state agencies	17% (1)	0% (0)	17% (1)	50% (3)	17% (1)	**6**
Regional or local once a year inventory and assessment conducted by state agencies	0% (0)	17% (1)	0% (0)	67% (4)	17% (1)	**6**
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	17% (1)	0% (0)	67% (4)	17% (1)	**6**
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	17% (1)	0% (0)	67% (4)	17% (1)	**6**
				Total Respondents		**50**

26. How crucial are these HABITAT efforts by other organizations for the conservation of the Wildlife in Emergent Wetland Habitats 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 year-round inventory and assessment conducted by other organizations	13% (1)	0% (0)	13% (1)	38% (3)	38% (3)	**8**
Statewide once a year inventory and assessment conducted by other organizations	13% (1)	0% (0)	0% (0)	50% (4)	38% (3)	**8**
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	13% (1)	13% (1)	0% (0)	38% (3)	38% (3)	**8**
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	25% (2)	0% (0)	38% (3)	38% (3)	**8**
Regional or local year-round inventory and assessment conducted by other organizations	13% (1)	0% (0)	13% (1)	38% (3)	38% (3)	**8**
Regional or local once a year inventory and assessment conducted by other organizations	13% (1)	0% (0)	13% (1)	38% (3)	38% (3)	**8**
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	0% (0)	25% (2)	13% (1)	25% (2)	38% (3)	**8**
					Total Respondents	**64**

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

1. On state land.

2. Do not occur to my knowledge.

3. unknown

4. isolated wetlands law

Total Respondents **4**

28. Regional or local HABITAT inventory and assessment by other organizations for the Wildlife in Emergent Wetland Habitats in Indiana.

1. None that I am aware of.

2. Do not occur to my knowledge.

3. unknown

4. - Indiana wetland inventory maps
- county aerial photos for NRCS
- soils mapping county maps

Total Respondents **4**

29. Please list organizations that are monitoring this HABITAT for the Wildlife in Emergent Wetland Habitats in Indiana.

1. None that I am aware of.

2. Do not occur to my knowledge

3. unknown

4. - US Fish and Wildlife Service
- Natural Resource Conservation Service
- Indiana Department of Environmental Management

Total Respondents **4**

30. What are the current monitoring techniques for the Wildlife in Emergent Wetland Habitats in Indiana.

If a technique is not applicable to the Wildlife in Emergent Wetland Habitats, 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	13% (1)	25% (2)	38% (3)	0% (0)	0% (0)	25% (2)	**8**
Aerial photography and analysis	25% (2)	13% (1)	38% (3)	0% (0)	0% (0)	25% (2)	**8**
Systematic sampling	0% (0)	13% (1)	38% (3)	0% (0)	0% (0)	50% (4)	**8**
Property tax estimates	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (6)	**6**
State revenue data	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (6)	**6**
Regulatory information	17% (1)	50% (3)	0% (0)	0% (0)	0% (0)	33% (2)	**6**
Participation in landuse programs	0% (0)	38% (3)	25% (2)	0% (0)	0% (0)	38% (3)	**8**
Modeling	0% (0)	13% (1)	38% (3)	0% (0)	0% (0)	50% (4)	**8**
Voluntary landowner reporting	0% (0)	25% (2)	25% (2)	0% (0)	0% (0)	50% (4)	**8**
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (3)	**3**
					Total Respondents		**69**

31. Other HABITAT inventory and assessment techniques for the Wildlife in Emergent Wetland Habitats in Indiana.

1. X

2. unknown

3. I am not aware of any inventory or assessment techniques used specifically for Canada Goose Habitat in Indiana.; SurveyAnswerTextNull

Total Respondents **3**

32. What one or two HABITAT inventory and assessment techniques would you recommend for effective conservation of the Wildlife in Emergent Wetland Habitats in Indiana?

1. Wetlands should be monitored by overhead photo methods with ground truth checks.
This should occur on a regular basis with aggressive enforcement against illegal wetlands destruction

2. spring aerial surveys

3. none

4. GIS mapping would be the most cost affective means for creating an inventory of emergent plant spp. that would support Canada Geese in emergent wetlands
Systemnatic water sampling of high use areas would determine nutrient loading and water quality. US Fish and Wildlife Service Draft Environmentalo Impact Statement, Resident Canads Goose Management, Feb.2002.;
SurveyAnswerTextNull

5. aerial surveys
reports from state fwas

6. analysis of county aerial photos as these are done on a somewhat regular basis

- updating and ground truthing Wetland Inventory maps

Total Respondents	**6**

33. What is the current body of science for the Wildlife in Emergent Wetland Habitats in Indiana?

	Response Total	Response Percent
Complete, up to date and extensive	**1**	**25%**
Adequate	**1**	**25%**
Inadequate	**1**	**25%**
Nonexistent	**1**	**25%**
Other (please explain below)	**0**	**0%**
Total Respondents		**4**

34. Please provide a citation (title, author, date, publisher) that would give the best overview of the Wildlife in Emergent Wetland Habitats in Indiana, if available. This resource may be used if further detail is needed.

		Response Total	Response Percent
Title	1. Spring Breeding Duck Survey 2. Unknown	**2**	**100%**
Author	Kristen Chodacheck	**1**	**50%**
Date	2003	**1**	**50%**
Publisher	IDNR	**1**	**50%**
Total Respondents			**2**

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

		Response Total	Response Percent
Title	1. Waterfowl Ecology & Management 2. Unknown	2	100%
Author	Compiled by: Ratti, Flake, Wentz	1	50%
Date	1982	1	50%
Publisher	The Wildlife Society	1	50%
		Total Respondents	2

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

	Response Total	Response Percent
Complete, up to date and extensive	0	0%
Adequate	3	75%
Inadequate	0	0%
Nonexistent	1	25%
Other (please explain below)	0	0%
	Total Respondents	4

37. Please provide a citation (title, author, date, publisher) that would give the best HABITAT overview of the Wildlife in Emergent Wetland Habitats in Indiana, if available. This resource may be used if further detail is needed.

		Response Total	Response Percent
Title	1. Waterfowl & Wetlands- Integrated Review 2. Unknown	2	100%
Author	Edited : Bookhout	1	50%
Date	1979	1	50%
Publisher	The Wildlife Society	1	50%
		Total Respondents	2

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

	Response Total	Response Percent

Title	Creating Freshwater Wetlands	1	100%
Author	Hammer	1	100%
Date	1997	1	100%
Publisher	CRC Press	1	100%
		Total Respondents	1

39. What are the research needs for the Wildlife in Emergent Wetland Habitats in Indiana?

	Urgently needed	Greatly needed	Needed	Slightly needed	Not needed	Unknown	Response Total
Life cycle	0% (0)	13% (1)	13% (1)	13% (1)	63% (5)	0% (0)	8
Distribution and abundance	0% (0)	13% (1)	63% (5)	0% (0)	25% (2)	0% (0)	8
Limiting factors (food, shelter, water, breeding sites)	13% (1)	25% (2)	25% (2)	13% (1)	25% (2)	0% (0)	8
Threats (predators/competition, contamination)	0% (0)	13% (1)	63% (5)	13% (1)	13% (1)	0% (0)	8
Relationship/dependence on specific habitats	13% (1)	0% (0)	38% (3)	0% (0)	50% (4)	0% (0)	8
Population health (genetic and physical)	0% (0)	0% (0)	50% (4)	13% (1)	38% (3)	0% (0)	8
Other (please specify below)	0% (0)	33% (1)	0% (0)	0% (0)	33% (1)	33% (1)	3
					Total Respondents		51

40. Other research needs for the Wildlife in Emergent Wetland Habitats in Indiana.

1. X

2. unknown

3. Research is needed to justify extending or modifying the hunting seasons to eliminate the problem of the so callled nuisance goose in urban areas, around lakes and golf courses.

4. food availability throughout annual cycle
ways to deter use

5. impact of high snow goose populations on Canada geese nesting sites

- develop more effective dispersal, relocation or removal techniques gor maxima geese

Total Respondents 5

41. What are the HABITAT research needs for the Wildlife in Emergent Wetland Habitats in Indiana?

	Urgently needed	Greatly needed	Needed	Slightly needed	Not needed	Unknown	Response Total

Successional changes	0% (0)	13% (1)	38% (3)	38% (3)	13% (1)	0% (0)	**8**
Distribution and abundance (fragmentation)	0% (0)	50% (4)	38% (3)	13% (1)	0% (0)	0% (0)	**8**
Threats (land use change/competition, contamination/global warming)	13% (1)	38% (3)	25% (2)	25% (2)	0% (0)	0% (0)	**8**
Relationship/dependence on specific site conditions	0% (0)	0% (0)	38% (3)	50% (4)	13% (1)	0% (0)	**8**
Growth and development of individual components of the habitat	0% (0)	13% (1)	25% (2)	50% (4)	0% (0)	13% (1)	**8**
Other (please specify below)	0% (0)	0% (0)	0% (0)	50% (1)	0% (0)	50% (1)	**2**
					Total Respondents		**42**

42. Other HABITAT research needs for the Wildlife in Emergent Wetland Habitats in Indiana.

1. X

2. unknown

3. Habitat needs should be researched in an attempt to find and propogate habitats that are esthetically pleasing to humans for urban settings yet displeasing to geese.

4. availability throughout annual cycle

Total Respondents **4**

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

	Very well	**Somewhat**	**Not at all**	**Not used**	**Unknown**	**Response Total**
Habitat protection (use below for details)	50% (4)	50% (4)	0% (0)	0% (0)	0% (0)	**8**
Population management (hunting, trapping)	38% (3)	50% (4)	0% (0)	13% (1)	0% (0)	**8**
Population enhancement (captive breeding and release)	0% (0)	0% (0)	0% (0)	100% (8)	0% (0)	**8**
Reintroduction (restoration)	13% (1)	0% (0)	0% (0)	88% (7)	0% (0)	**8**
Food plots	38% (3)	38% (3)	13% (1)	13% (1)	0% (0)	**8**
Threats reduction	0% (0)	75% (6)	0% (0)	0% (0)	25% (2)	**8**
Native predator control	0% (0)	50% (4)	25% (2)	25% (2)	0% (0)	**8**
Exotic/invasive species control	0% (0)	63% (5)	0% (0)	38% (3)	0% (0)	**8**
Regulation of collecting	43% (3)	29% (2)	14% (1)	14% (1)	0% (0)	**7**
Disease/parasite management	13% (1)	25% (2)	13% (1)	38% (3)	13% (1)	**8**
Translocation to new geographic	0% (0)	25% (2)	0% (0)	75% (6)	0% (0)	**8**

range						
Protection of migration routes	38% (3)	38% (3)	0% (0)	13% (1)	13% (1)	**8**
Limiting contact with pollutants/contaminants	0% (0)	63% (5)	13% (1)	13% (1)	13% (1)	**8**
Public education to reduce human disturbance	0% (0)	75% (6)	0% (0)	13% (1)	13% (1)	**8**
Culling/selective removal	0% (0)	50% (4)	0% (0)	50% (4)	0% (0)	**8**
Stocking	13% (1)	0% (0)	0% (0)	87% (7)	0% (0)	**8**
Other (please specify below)	0% (0)	0% (0)	50% (1)	0% (0)	50% (1)	**2**
				Total Respondents		**129**

44. Other current conservation practices for the Wildlife in Emergent Wetland Habitats in Indiana.

1. X

2. unknown

Total Respondents **2**

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

1. Restoring wetlands & providing quality upland nesting cover adjoining these wetlands.
Reduce fall tillage near wetlands.

2. Habitat protection throughout annual cycle

3. continue 5 year surveys

4. Modification of hunting seasons and opening of urban areas to hunting to reduce numbers of so called nuisance geese populations in leu of nest destruction and egg shaking.; SurveyAnswerTextNull

5. Enhancement of migratory/staging habitat
enhancement of breeding habitat where populations do not conflict with landuse

6. develop practices and procedures to increase harvest of local birds

Total Respondents **6**

46. How well do the following conservation efforts address the HABITAT threats to the Wildlife in Emergent Wetland Habitats in Indiana?

	Very well	**Somewhat**	**Not at all**	**Not used**	**Unknown**	**Response Total**
Habitat protection through regulation	25% (2)	75% (6)	0% (0)	0% (0)	0% (0)	**8**
Habitat protection on public lands	75% (6)	25% (2)	0% (0)	0% (0)	0% (0)	**8**
Habitat protection incentives (financial)	38% (3)	50% (4)	0% (0)	0% (0)	13% (1)	**8**

Habitat restoration through regulation	38% (3)	38% (3)	13% (1)	0% (0)	13% (1)	**8**
Habitat restoration on public lands	63% (5)	38% (3)	0% (0)	0% (0)	0% (0)	**8**
Habitat restoration incentives (financial)	38% (3)	50% (4)	0% (0)	0% (0)	13% (1)	**8**
Artificial habitat creation (artificial reefs, nesting platforms)	38% (3)	50% (4)	0% (0)	13% (1)	0% (0)	**8**
Selective use of functionally equivalent exotic species in place of extirpated natives	0% (0)	38% (3)	13% (1)	38% (3)	13% (1)	**8**
Succession control (fire, mowing)	50% (4)	38% (3)	0% (0)	13% (1)	0% (0)	**8**
Corridor development/protection	38% (3)	38% (3)	0% (0)	25% (2)	0% (0)	**8**
Managing water regimes	38% (3)	63% (5)	0% (0)	0% (0)	0% (0)	**8**
Pollution reduction	0% (0)	100% (8)	0% (0)	0% (0)	0% (0)	**8**
Protection of adjacent buffer zone	50% (4)	50% (4)	0% (0)	0% (0)	0% (0)	**8**
Restrict public access and disturbance	13% (1)	88% (7)	0% (0)	0% (0)	0% (0)	**8**
Land use planning	57% (4)	43% (3)	0% (0)	0% (0)	0% (0)	**7**
Technical assistance	13% (1)	88% (7)	0% (0)	0% (0)	0% (0)	**8**
Cooperative land management agreements (conservation easements)	50% (4)	25% (2)	0% (0)	0% (0)	25% (2)	**8**
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
				Total Respondents		**136**

47. Other current HABITAT conservation practices for the Wildlife in Emergent Wetland Habitats in Indiana.

1. X

2. unknown

Total Respondents **2**

48. What one or two specific HABITAT practices would you recommend for more effective conservation of the Wildlife in Emergent Wetland Habitats in Indiana?

1. Regulations are needed to protect small wetlands.
Habitat restoration programs for private land owners. (Financial help)

2. Habitat protection incentives
habitat protection regulations

3. continue efforts to protect and enhance wetland and ripairian habitats.

4. Control of plant species that spread by vegetative means that from thick colonies such as catttail.

5. food plots
refuge areas

6. providing additional financial incentives on private lands for easements to protect existing wetlands or to restore

wetlands

Total Respondents **6**

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

1. Indiana needs to take a more active role in protecting and restoring emergent wetlands. Probably the upward spiral of land value will insure the loss of our last quality habitat. To this date jobs and revenue are number one on our priorities. We will destroy any stream or wetland for a new residence, more agricultural production, or a factory. I fear we may be to late. As I see what has occured during my 35 year as a land manager in Indiana I sometimes feel we have already lost the battle.

2. no

3. no

4. In Indiana we need to consider two distinct groups of Canada geese. I have tried to address both groups in the information provided above.

The geese migrating down from the traditional nesting grounds in Canada face high snow goose populations, degradition and destruction of existing wetlands, short stopping and a warming winter weather pattern. These have had a severe influence on traditional migration patterns and routes.

The Maxima geese being yearround residents are much more prone to goose - human conflicts. Also tend to gather in large numbers on small water bodies leading to possible disease outbreaks.

Total Respondents **4**

6. Please rank the following threats to the Wildlife in Ephemeral Wetland Habitats in Indiana.

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total
Invasive/non-native species	0% (0)	17% (1)	0% (0)	33% (2)	17% (1)	33% (2)	**6**
High sensitivity to pollution	0% (0)	0% (0)	67% (4)	17% (1)	0% (0)	17% (1)	**6**
Bioaccumulation of contaminants	0% (0)	0% (0)	17% (1)	17% (1)	0% (0)	67% (4)	**6**
Predators (native or domesticated)	0% (0)	0% (0)	20% (1)	20% (1)	0% (0)	60% (3)	**5**
Dependence on other species (mutualism, pollinators)	0% (0)	0% (0)	0% (0)	0% (0)	17% (1)	83% (5)	**6**
Diseases/parasites (of the species itself)	0% (0)	0% (0)	17% (1)	0% (0)	0% (0)	83% (5)	**6**
Regulated hunting/fishing pressure (too much)	0% (0)	0% (0)	0% (0)	0% (0)	50% (3)	50% (3)	**6**
Species over population	0% (0)	0% (0)	0% (0)	17% (1)	50% (3)	33% (2)	**6**
Unintentional take/ direct mortality (e.g., vehicle collisions, power line collisions, by-catch, harvesting equipment, land preparation machinery)	0% (0)	0% (0)	17% (1)	17% (1)	17% (1)	50% (3)	**6**
Unregulated collection pressure	0% (0)	0% (0)	17% (1)	0% (0)	33% (2)	50% (3)	**6**
Dependence on irregular resources (cyclical annual variations) (e.g., food, water, habitat limited due to annual variations in availability)	50% (3)	0% (0)	17% (1)	17% (1)	0% (0)	17% (1)	**6**
					Total Respondents		**65**

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

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total
Habitat loss (breeding range)	67% (4)	33% (2)	0% (0)	0% (0)	0% (0)	0% (0)	**6**
Habitat loss (feeding/foraging areas)	50% (3)	50% (3)	0% (0)	0% (0)	0% (0)	0% (0)	**6**
Small native range (high endemism)	17% (1)	0% (0)	0% (0)	0% (0)	67% (4)	17% (1)	**6**
Near limits of natural geographic range	17% (1)	17% (1)	17% (1)	0% (0)	50% (3)	0% (0)	**6**
Large home range requirements	0% (0)	0% (0)	0% (0)	17% (1)	67% (4)	17% (1)	**6**
Viable reproductive population size or availability	0% (0)	0% (0)	17% (1)	33% (2)	17% (1)	33% (2)	**6**
Specialized reproductive behavior or low reproductive rates	0% (0)	0% (0)	17% (1)	0% (0)	33% (2)	50% (3)	**6**
Degradation of movement/migration routes	17% (1)	33% (2)	33% (2)	0% (0)	0% (0)	17% (1)	**6**

(overwintering habitats, nesting and staging sites)							
Genetic pollution (hybridization)	0% (0)	0% (0)	17% (1)	17% (1)	0% (0)	67% (4)	**6**
Unknown	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	**0**
					Total Respondents		**55**

8. Other threats to the Wildlife in Ephemeral Wetland Habitats in Indiana.

No responses were entered for this question.

Total Respondents **0**

9. Please briefly describe the top two threats to the Wildlife in Ephemeral Wetland Habitats in Indiana identified above.

1. Habtiat loss and degradation
2. Loss of ephemeral wetland habitat and increase in migration distance to breeding sites as a result of this loss are the biggest threats to some wildlife species.
3. Loss & degradation of ephemeral wetland and upland forested habitat
4. -Loss of ephemeral wetlands is the top threat; unfortunately, most existing ephemeral wetlands have been destroyed in Indiana. Even more unfortunately, many of them were destroyed with the misguided notion that deep water was better for wildlife - landowners were advised to dredge out the ephemeral wetlands to provide duck habitat. These fish-infested deep waters have no habitat for Plains leopard frog.
   -invasive species like reed canary grass are proliferating in the habitats that remain, decreasing plant diversity, cover, and the overall health of the wetland.
5. Extreme rarity & habitat loss
6. Habitat destruction and habitat degradation

Total Respondents **6**

10. Please rank the following threats to the HABITAT of the Wildlife in Ephemeral Wetland Habitats in Indiana.

	Critical threat	**Serious threat**	**Somewhat of a threat**	**Slight threat**	**No threat**	**Unknown**	**Response Total**
Commercial or residential development (sprawl)	17% (1)	50% (3)	17% (1)	0% (0)	0% (0)	17% (1)	**6**
Counterproductive financial incentives or regulations	0% (0)	17% (1)	0% (0)	0% (0)	33% (2)	50% (3)	**6**

Invasive/non-native species	0% (0)	17% (1)	0% (0)	17% (1)	17% (1)	50% (3)	**6**
Nonpoint source pollution (sedimentation and nutrients)	0% (0)	0% (0)	50% (3)	17% (1)	0% (0)	33% (2)	**6**
Habitat fragmentation	33% (2)	50% (3)	17% (1)	0% (0)	0% (0)	0% (0)	**6**
Successional change	0% (0)	0% (0)	17% (1)	0% (0)	17% (1)	67% (4)	**6**
Diseases (of plants that create habitat)	0% (0)	0% (0)	0% (0)	0% (0)	17% (1)	83% (5)	**6**
Habitat degradation	50% (3)	50% (3)	0% (0)	0% (0)	0% (0)	0% (0)	**6**
Climate change	0% (0)	0% (0)	0% (0)	17% (1)	0% (0)	83% (5)	**6**
Stream channelization	0% (0)	17% (1)	17% (1)	0% (0)	67% (4)	0% (0)	**6**
Impoundment of water/flow regulation	0% (0)	0% (0)	50% (3)	0% (0)	50% (3)	0% (0)	**6**
Agricultural/forestry practices	17% (1)	50% (3)	17% (1)	0% (0)	0% (0)	17% (1)	**6**
Residual contamination (persistent toxins)	0% (0)	0% (0)	17% (1)	33% (2)	0% (0)	50% (3)	**6**
Point source pollution (continuing)	0% (0)	0% (0)	33% (2)	17% (1)	0% (0)	50% (3)	**6**
Mining/acidification	0% (0)	0% (0)	17% (1)	33% (2)	0% (0)	50% (3)	**6**
Drainage practices (stormwater runoff)	17% (1)	17% (1)	0% (0)	0% (0)	17% (1)	50% (3)	**6**
Unknown	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	**0**
					Total Respondents		**97**

11. Other HABITAT threats to the Wildlife in Ephemeral Wetland Habitats in Indiana.

No responses were entered for this question.

Total Respondents **0**

12. Please briefly describe the top two HABITAT threats to the Wildlife in Ephemeral Wetland Habitats in Indiana identified above.

1. Habitat loss & degradation
2. Habitat degradation or loss and fragmentation of habitat are the largest threats.
3. Habitat loss & degradation
4. Loss of ephemeral wetland habitat, invasion of wetlands by species like reed canary grass, cattails, purple loosestrife or other invasives that create monocultures, agricultural practices that destroy ephemeral wetlands.
5. Habitat fragmentation & degradation

6. Habitat destruction and degradation of ephemeral wetlands

Total Respondents **6**

13. What current monitoring efforts by state agencies are you aware of for the Wildlife in Ephemeral Wetland Habitats in Indiana?

	Yes, these efforts occur	Not aware of these efforts occuring	Response Total
Statewide year-round monitoring conducted by state agencies	0% (0)	100% (6)	**6**
Statewide once a year monitoring conducted by state agencies	17% (1)	83% (5)	**6**
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	100% (6)	**6**
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	17% (1)	83% (5)	**6**
Regional or local year-round monitoring conducted by state agencies	0% (0)	100% (6)	**6**
Regional or local once a year monitoring conducted by state agencies	0% (0)	100% (6)	**6**
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	100% (6)	**6**
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	17% (1)	83% (5)	**6**
		Total Respondents	**48**

14. What current monitoring efforts by other organizations are you aware of for the Wildlife in Ephemeral Wetland Habitats in Indiana?

	Yes, these efforts occur	Not aware of these efforts occuring	Response Total
Statewide year-round monitoring conducted by other organizations	0% (0)	100% (6)	**6**
Statewide once a year monitoring conducted by other organizations	0% (0)	100% (6)	**6**
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (6)	**6**
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (6)	**6**

Regional or local year-round monitoring conducted by other organizations	0% (0)	100% (6)	**6**
Regional or local once a year monitoring conducted by other organizations	33% (2)	67% (4)	**6**
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (6)	**6**
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	67% (4)	33% (2)	**6**
		Total Respondents	**48**

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

	Very crucial	Somewhat crucial	Slightly crucial	Not crucial	Unknown	Response Total
Statewide year-round monitoring conducted by state agencies	0% (0)	20% (1)	0% (0)	0% (0)	80% (4)	**5**
Statewide once a year monitoring conducted by state agencies	33% (2)	0% (0)	0% (0)	0% (0)	67% (4)	**6**
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	20% (1)	20% (1)	0% (0)	0% (0)	60% (3)	**5**
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	20% (1)	0% (0)	0% (0)	0% (0)	80% (4)	**5**
Regional or local year-round monitoring conducted by state agencies	0% (0)	20% (1)	0% (0)	0% (0)	80% (4)	**5**
Regional or local once a year monitoring conducted by state agencies	17% (1)	0% (0)	0% (0)	0% (0)	83% (5)	**6**
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	20% (1)	0% (0)	0% (0)	0% (0)	80% (4)	**5**
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	20% (1)	0% (0)	0% (0)	0% (0)	80% (4)	**5**
				Total Respondents		**42**

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

	Very crucial	Somewhat crucial	Slightly crucial	Not crucial	Unknown	Response Total
Statewide year-round monitoring conducted by other organizations	0% (0)	20% (1)	0% (0)	0% (0)	80% (4)	**5**
Statewide once a year monitoring conducted by other organizations	20% (1)	0% (0)	0% (0)	0% (0)	80% (4)	**5**

Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	20% (1)	20% (1)	0% (0)	0% (0)	60% (3)	**5**
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	20% (1)	0% (0)	0% (0)	0% (0)	80% (4)	**5**
Regional or local year-round monitoring conducted by other organizations	0% (0)	20% (1)	0% (0)	0% (0)	80% (4)	**5**
Regional or local once a year monitoring conducted by other organizations	50% (3)	0% (0)	0% (0)	0% (0)	50% (3)	**6**
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	20% (1)	0% (0)	0% (0)	0% (0)	80% (4)	**5**
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	40% (2)	20% (1)	20% (1)	0% (0)	20% (1)	**5**
				Total Respondents		**41**

17. Regional or local state agency monitoring for the Wildlife in Ephemeral Wetland Habitats in Indiana.

1. IDNR, Non-game herpetologist incorporates this as part of the annual field season.
2. INDR runs a NAAMP frog monitory program
3. None

Total Respondents **3**

18. Regional or local monitoring by other organizations for the Wildlife in Ephemeral Wetland Habitats in Indiana.

1. Spencer Cortwright, IUN
   Robert Brodman, Saint Joseph's College
2. Univerisity professors and members of the Herpetology TAC for the State of Indiana as part of their annual field season.
3. Robert Brodman, Saint Joseph's College in NW Indiana
4. NW Indiana (Newton, Jasper, Pulaski, Lake, Porter counties).

Total Respondents **4**

19. Please list organizations that are monitoring the Wildlife in Ephemeral Wetland Habitats in Indiana.

1. Spencer Cortwright, IUN
   Robert Brodman, Saint Joseph's College
2. Robert Brodman, Saint Joseph's College

Total Respondents **2**

20. What are the current monitoring techniques for the Wildlife in Ephemeral Wetland Habitats 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
Radio telemetry and tracking	0% (0)	0% (0)	83% (5)	0% (0)	0% (0)	17% (1)	**6**
Modeling	0% (0)	17% (1)	50% (3)	0% (0)	0% (0)	33% (2)	**6**
Coverboard routes	0% (0)	17% (1)	17% (1)	50% (3)	0% (0)	17% (1)	**6**
Spot mapping	0% (0)	0% (0)	50% (3)	0% (0)	0% (0)	50% (3)	**6**
Driving a survey route	17% (1)	0% (0)	0% (0)	67% (4)	0% (0)	17% (1)	**6**
Reporting from harvest, depredation, or unintentional take (road kill, bycatch)	0% (0)	0% (0)	0% (0)	83% (5)	0% (0)	17% (1)	**6**
Mark and recapture	0% (0)	0% (0)	83% (5)	0% (0)	0% (0)	17% (1)	**6**
Professional survey/census	33% (2)	50% (3)	0% (0)	0% (0)	0% (0)	17% (1)	**6**
Volunteer survey/census	0% (0)	17% (1)	67% (4)	0% (0)	0% (0)	17% (1)	**6**
Trapping (by any technique)	33% (2)	17% (1)	33% (2)	0% (0)	0% (0)	17% (1)	**6**
Representative sites	17% (1)	67% (4)	0% (0)	0% (0)	0% (0)	17% (1)	**6**
Probabilistic sites	20% (1)	60% (3)	0% (0)	0% (0)	0% (0)	20% (1)	**5**
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
					Total Respondents		**72**

21. Other monitoring techniques for the Wildlife in Ephemeral Wetland Habitats in Indiana.

No responses were entered for this question.

Total Respondents **0**

(skipped this question) 2

22. What one or two monitoring techniques would you recommend for effective conservation of the Wildlife in Ephemeral Wetland Habitats in Indiana?

1. Professional survey and either mark recapture or telemetry
2. Pit-fall traps and cover board objects near ephemeral wetland breeding sites.
3. Fall surveys at breeding sites
4. Call surveys and systematic sampling
5. Minnow trapping and possible either mark recapture or telemetry

Total Respondents **5**

23. What current HABITAT inventory and assessment efforts or activities by state agencies are you aware of for the Wildlife in Ephemeral Wetland Habitats in Indiana?

	Yes, these efforts occur	No effort that I'm aware of	Response Total
Statewide annual inventory and assessment conducted by state agencies	0% (0)	100% (6)	**6**
Statewide once a year inventory and assessment conducted by state agencies	0% (0)	100% (6)	**6**
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	100% (6	**6**
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	17% (1)	83% (5)	**6**
Regional or local year-round inventory and assessment conducted by state agencies	0% (0)	100% (6)	**6**
Regional or local once a year inventory and assessment conducted by state agencies	0% (0)	100% (6)	**6**
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	100% (6)	**6**

Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	17% (1)	83% (5)	**6**
		Total Respondents	**48**

24. What current HABITAT inventory and assessment efforts or activities by other organizations are you aware of for the Wildlife in Ephemeral Wetland Habitats 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% (6)	**6**
Statewide once a year inventory and assessment conducted by other organizations	0% (0)	100% (6)	**6**
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (6)	**6**
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	17% (1)	83% (5)	**6**
Regional or local year-round inventory and assessment conducted by other organizations	17% (1)	83% (5)	**6**
Regional or local once a year inventory and assessment conducted by other organizations	33% (2)	67% (4)	**6**
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	17% (1)	83% (5)	**6**
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	83% (5)	17% (1)	**6**
	Total Respondents		**48**

25. How crucial are these HABITAT efforts by state agencies for the conservation of the Wildlife in Ephemeral Wetland Habitats 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)	25% (1)	0% (0)	0% (0)	75% (3)	**4**
Statewide once a year inventory and assessment conducted by state agencies	25% (1)	0% (0)	0% (0)	0% (0)	75% (3)	**4**
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	25% (1)	0% (0)	0% (0)	0% (0)	75% (3)	**4**
Regional or local year-round inventory and assessment conducted by state agencies	0% (0)	25% (1)	0% (0)	0% (0)	75% (3)	**4**
Regional or local once a year inventory and assessment conducted by state agencies	25% (1)	0% (0)	0% (0)	0% (0)	75% (3)	**4**
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	25% (1)	0% (0)	0% (0)	0% (0)	75% (3)	**4**
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	25% (1)	0% (0)	0% (0)	0% (0)	75% (3)	**4**
				Total Respondents		**32**

26. How crucial are these HABITAT efforts by other organizations for the conservation of the Wildlife in Ephemeral Wetland Habitats 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 year-round inventory and assessment conducted by other organizations	0% (0)	25% (1)	0% (0)	0% (0)	75% (3)	**4**
Statewide once a year inventory and assessment conducted by other organizations	25% (1)	0% (0)	0% (0)	0% (0)	75% (3)	**4**
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	25% (1)	0% (0)	0% (0)	0% (0)	75% (3)	**4**
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	25% (1)	0% (0)	0% (0)	0% (0)	75% (3)	**4**
Regional or local year-round inventory and assessment conducted by other organizations	20% (1)	20% (1)	0% (0)	0% (0)	60% (3)	**5**
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	25% (1)	0% (0)	0% (0)	0% (0)	75% (3)	**4**
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	40% (2)	20% (1)	40% (2)	0% (0)	0% (0)	**5**
					Total Respondents	**35**

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

No responses were entered for this question.

Total Respondents **0**

28. Regional or local HABITAT inventory and assessment by other organizations for the Wildlife in Ephemeral Wetland Habitats in Indiana.

1. Cortwright monitors populations in Brown County & Porter County
   Brodman monitors them in Owens County
2. Kankakee Sands and other Conservancy preserves - staff evaluate the restored/created habitat to judge its ability to support Plains leopard frog and other species of concern.
3. Robert Brodman, Saint Joseph's College in NW Indiana
4. NW Indiana (Newton, Jasper, Pulaski, Lake & Porter Counties)

Total Respondents **4**

29. Please list organizations that are monitoring this HABITAT for the Wildlife in Ephemeral Wetland Habitats in Indiana.

1. IDNR, Non-game Herpetologist; University Professors, members of the Herpetology TAC Committee for the State of Indiana
2. TNC.
3. Robert Brodman, Saint Joseph's College

Total Respondents **3**

30. What are the current HABITAT inventory and/or assessment techniques for the Wildlife in Ephemeral Wetland Habitats 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
GIS mapping	17% (1)	0% (0)	50% (3)	0% (0)	0% (0)	33% (2)	**6**
Aerial photography and analysis	0% (0)	33% (2)	33% (2)	0% (0)	0% (0)	33% (2)	**6**
Systematic sampling	33% (2)	33% (2)	17% (1)	0% (0)	0% (0)	17% (1)	**6**
Property tax estimates	0% (0)	0% (0)	0% (0)	40% (2)	0% (0)	60% (3)	**5**
State revenue data	0% (0)	0% (0)	0% (0)	40% (2)	0% (0)	60% (3)	**5**
Regulatory information	0% (0)	0% (0)	0% (0)	40% (2)	0% (0)	60% (3)	**5**
Participation in landuse programs	0% (0)	0% (0)	0% (0)	40% (2)	0% (0)	60% (3)	**5**
Modeling	0% (0)	17% (1)	33% (2)	0% (0)	0% (0)	50% (3)	**6**
Voluntary landowner reporting	0% (0)	0% (0)	17% (1)	17% (1)	0% (0)	67% (4)	**6**
Other (please specify below)	0% (0)	67% (2)	0% (0)	0% (0)	0% (0)	33% (1)	**3**
					Total Respondents		**53**

31. Other HABITAT inventory and assessment techniques for the Wildlife in Ephemeral Wetland Habitats in Indiana.

1. Pit-fall trapping and cover board objects adjacent to ephemeral wetlands; mark and recapture
2. Visual estimate of amount of appropriate habitat being provided in restored areas.

Total Respondents **2**

32. What one or two HABITAT inventory and assessment techniques would you recommend for effective conservation of the Wildlife in Ephemeral Wetland Habitats in Indiana?

1. Surveys
2. Pit-fall traps and cover boards can be used to assess population size and use of ephemeral wetlands for breeding; Mark and recapture can be used to determine migration patterns and use of specific ephemeral wetlands for breeding

use of specific ephemeral wetlands for breeding

3. Systematic survey & GIS

4. Systematic sampling (intesive) and GIS (less intensive)

Total Respondents **4**

33. What is the current body of science for the Wildlife in Ephemeral Wetland Habitats in Indiana?

	Response Total	Response Percent
Complete, up to date and extensive	0	0%
Adequate	0	0%
Inadequate	5	83%
Nonexistent	1	17%
Other (please explain below)	0	0%
Total Respondents		6

34. Please provide a citation (title, author, date, publisher) that would give the best overview of the Wildlife in Ephemeral Wetland Habitats in Indiana, if available. This resource may be used if further detail is needed.

		Response Total	Response Percent
Title	1. Amphibians and reptiles from 23 counties of Indiana. 2. Amphibians and reptiles from 23 counties of Indiana.	2	100%
Author	1. Robert Brodman 2. Robert Brodman	2	100%
Date	1. 2003 2. 2003	2	100%
Publisher	1. Proceedings of the Indiana Academy of Science, 112: 43-54. 2. Proceedings of the Indiana Academy of Science, 112: 43-54.	2	100%
Total Respondents			2

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

		Response Total	Response Percent
Title	Amphibians and reptiles from 23 counties of Indiana.	1	100%
Author	Robert Brodman	1	100%
Date	2003	1	100%
Publisher	Proceedings of the Indiana Academy of Science, 112: 43-54.	1	100%
	Total Respondents		1

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

		Response Total	Response Percent
Complete, up to date and extensive		0	0%
Adequate		0	0%
Inadequate		6	100%
Nonexistent		0	0%
Other (please explain below)		0	0%
	Total Respondents		6

37. Please provide a citation (title, author, date, publisher) that would give the best HABITAT overview of the Wildlife in Ephemeral Wetland Habitats in Indiana, if available. This resource may be used if further detail is needed.

		Response Total	Response Percent
Title		0	0%
Author		0	0%
Date		0	0%
Publisher		0	0%
	Total Respondents		0

38. If possible, please provide a second citation (title, author, date, publisher) that would give another good HABITAT overview of the Wildlife in Ephemeral Wetland Habitats 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%**
Total Respondents		**0**

39. What are the research needs for the Wildlife in Ephemeral Wetland Habitats in Indiana?

	Urgently needed	Greatly needed	Needed	Slightly needed	Not needed	Unknown	Response Total
Life cycle	0% (0)	17% (1)	50% (3)	33% (2)	0% (0)	0% (0)	**6**
Distribution and abundance	17% (1)	33% (2)	50% (3)	0% (0)	0% (0)	0% (0)	**6**
Limiting factors (food, shelter, water, breeding sites)	67% (4)	0% (0)	33% (2)	0% (0)	0% (0)	0% (0)	**6**
Threats (predators/competition, contamination)	67% (4)	0% (0)	33% (2)	0% (0)	0% (0)	0% (0)	**6**
Relationship/dependence on specific habitats	50% (3)	33% (2)	0% (0)	17% (1)	0% (0)	0% (0)	**6**
Population health (genetic and physical)	33% (2)	33% (2)	17% (1)	17% (1)	0% (0)	0% (0)	**6**
Other (please specify below)	0% (0)	50% (1)	0% (0)	0% (0)	0% (0)	50% (1)	**2**
					Total Respondents		**38**

40. Other research needs for the Wildlife in Ephemeral Wetland Habitats in Indiana.

1. Information on metapopulation dynamics and migration distances to and from ephemeral wetlands are needed. Information on how many ephemeral wetland habitats within the landscape are needed to maintain healthy populations of Spotted salamander are also needed. Information on buffer size and vegetation composition around ephemeral wetlands is needed.

2. Quite little is known about much of the basic natural history of some wildlife species

Total Respondents **2**

41. What are the HABITAT research needs for the Wildlife in Ephemeral Wetland Habitats in Indiana?

	Urgently needed	Greatly needed	Needed	Slightly needed	Not needed	Unknown	Response Total
Successional changes	0% (0)	17% (1)	83% (5)	0% (0)	0% (0)	0% (0)	**6**
Distribution and abundance (fragmentation)	50% (3)	33% (2)	17% (1)	0% (0)	0% (0)	0% (0)	**6**
Threats (land use change/competition,	67% (4)	33% (2)	0% (0)	0% (0)	0% (0)	0% (0)	**6**

contamination/global warming)							
Relationship/dependence on specific site conditions	67% (4)	17% (1)	0% (0)	17% (1)	0% (0)	0% (0)	**6**
Growth and development of individual components of the habitat	0% (0)	33% (2)	50% (3)	17% (1)	0% (0)	0% (0)	**6**
Other (please specify below)	0% (0)	50% (1)	0% (0)	0% (0)	0% (0)	50% (1)	**2**
						Total Respondents	**32**

42. Other HABITAT research needs for the Wildlife in Ephemeral Wetland Habitats in Indiana.

1.	Information on metapopulation dynamics and migration distances to and from ephemeral wetlands are needed. Information on how many ephemeral wetland habitats within the landscape are needed to maintain healthy populations of some wildlife species is also needed. Information on buffer size and vegetation composition around ephemeral wetlands is needed.

Total Respondents **1**

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

	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
Habitat protection (use below for details)	33% (2)	50% (3)	0% (0)	0% (0)	17% (1)	**6**
Population management (hunting, trapping)	0% (0)	0% (0)	17% (1)	50% (3)	33% (2)	**6**
Population enhancement (captive breeding and release)	0% (0)	0% (0)	0% (0)	67% (4)	33% (2)	**6**
Reintroduction (restoration)	0% (0)	0% (0)	0% (0)	83% (5)	17% (1)	**6**
Food plots	0% (0)	0% (0)	0% (0)	83% (5)	17% (1)	**6**
Threats reduction	17% (1)	0% (0)	0% (0)	33% (2)	50% (3)	**6**
Native predator control	0% (0)	0% (0)	0% (0)	33% (2)	67% (4)	**6**
Exotic/invasive species control	0% (0)	17% (1)	0% (0)	17% (1)	67% (4)	**6**
Regulation of collecting	0% (0)	17% (1)	0% (0)	50% (3)	33% (2)	**6**
Disease/parasite management	0% (0)	0% (0)	0% (0)	67% (4)	33% (2)	**6**
Translocation to new geographic range	0% (0)	0% (0)	0% (0)	67% (4)	33% (2)	**6**
Protection of migration routes	0% (0)	0% (0)	0% (0)	33% (2)	67% (4)	**6**
Limiting contact with pollutants/contaminants	0% (0)	0% (0)	0% (0)	67% (4)	33% (2)	**6**
Public education to reduce human disturbance	0% (0)	17% (1)	0% (0)	33% (2)	50% (3)	**6**
Culling/selective removal	0% (0)	0% (0)	0% (0)	83% (5)	17% (1)	**6**

Stocking	0% (0)	0% (0)	0% (0)	83% (5)	17% (1)	**6**
Other (please specify below)	50% (1)	0% (0)	0% (0)	0% (0)	50% (1)	**2**
					Total Respondents	**98**

44. Other current conservation practices for the Wildlife in Ephemeral Wetland Habitats in Indiana.

1. Wetland restoration
2. Too little is known

Total Respondents **2**

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

1. Ephermeral Wetland and forested upland habitat protection
2. 1.Habitat protection needs to be improved greatly. Ephemeral wetlands are not protected or valued as much as other wetlands via regulation.
   2.Restoration of ephemeral wetlands and retention of these habitats within the landscape.
3. Protection & restoration of ephermeral wetlands within the historic range of some wildlife species.

Total Respondents **3**

46. How well do the following conservation efforts address the HABITAT threats to the Wildlife in Ephemeral Wetland Habitats in Indiana?

	Very well	**Somewhat**	**Not at all**	**Not used**	**Unknown**	**Response Total**
Habitat protection through regulation	50% (3)	50% (3)	0% (0)	0% (0)	0% (0)	**6**
Habitat protection on public lands	67% (4)	33% (2)	0% (0)	0% (0)	0% (0)	**6**
Habitat protection incentives (financial)	17% (1)	17% (1)	17% (1)	0% (0)	50% (3)	**6**
Habitat restoration through regulation	0% (0)	33% (2)	0% (0)	0% (0)	67% (4)	**6**
Habitat restoration on public lands	0% (0)	50% (3)	0% (0)	0% (0)	50% (3)	**6**
Habitat restoration incentives (financial)	0% (0)	17% (1)	17% (1)	0% (0)	67% (4)	**6**
Artificial habitat creation (artificial reefs, nesting platforms)	0% (0)	17% (1)	0% (0)	17% (1)	67% (4)	**6**
Selective use of functionally equivalent exotic species in place of extirpated natives	0% (0)	0% (0)	17% (1)	17% (1)	67% (4)	**6**
Succession control (fire, mowing)	0% (0)	0% (0)	17% (1)	17% (1)	67% (4)	**6**
Corridor development/protection	0% (0)	17% (1)	0% (0)	17% (1)	67% (4)	**6**
Managing water regimes	0% (0)	17% (1)	17% (1)	0% (0)	67% (4)	**6**

Pollution reduction	0% (0)	17% (1)	0% (0)	0% (0)	83% (5)	**6**
Protection of adjacent buffer zone	0% (0)	50% (3)	0% (0)	0% (0)	50% (3)	**6**
Restrict public access and disturbance	0% (0)	0% (0)	0% (0)	17% (1)	83% (5)	**6**
Land use planning	0% (0)	33% (2)	0% (0)	0% (0)	67% (4)	**6**
Technical assistance	0% (0)	17% (1)	17% (1)	0% (0)	67% (4)	**6**
Cooperative land management agreements (conservation easements)	0% (0)	0% (0)	0% (0)	17% (1)	83% (5)	**6**
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
				Total Respondents		**103**

47. Other current HABITAT conservation practices for the Wildlife in Ephemeral Wetland Habitats in Indiana.

Many of the current 'conservation practices' and incentive programs promoted by biologists seem to be aimed at ducks and actually manage against some other wildlife species.

Total Respondents **1**

48. What one or two specific HABITAT practices would you recommend for more effective conservation of the Wildlife in Ephemeral Wetland Habitats in Indiana?

1. Forested emphermeral wetland protection and forest protection
2. Restoration and protection of ephemeral wetlands; protection of buffers needed for amphibians migrating to the ephemeral wetland for breeding;
3. When creating wetlands under a landowner incentive program, create ephemeral wetlands whenever possible rather than duck ponds.
4. Protection and retoration of ephemeral wetlands.
5. Habitat protection on private & public lands

Total Respondents **5**

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

1. The distribution of spotted salamanders in Indiana is more spotty than one might expect.
2. It is not known if Rana blairi exists in Indiana. The only known specimen from Indiana were collected and deposited in museums prior to the species even being described. To the best of my knowledge, the most recently documented Rana blairi from Indiana was about 30 years ago.
3. Step one is the need for more information about some wildlife species and their abundance in Indiana

Appendix E-67: Ephemeral

Total Respondents	**3**

Appendix E-68: Forested

Technical experts did not provide input on a representative species for this habitat.

There are no species of greatest conservation need in this guild.

6. Please rank the following threats to the Wildlife in Herbaceous Marsh Wetland Habitats in Indiana.

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total
Invasive/non-native species	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	**1**
High sensitivity to pollution	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Bioaccumulation of contaminants	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Predators (native or domesticated)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	**1**
Dependence on other species (mutualism, pollinators)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	**1**
Diseases/parasites (of the species itself)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Regulated hunting/fishing pressure (too much)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Species over population	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Unintentional take/ direct mortality (e.g., vehicle collisions, power line collisions, by-catch, harvesting equipment, land preparation machinery)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	**1**
Unregulated collection pressure	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	**1**
Dependence on irregular resources (cyclical annual variations) (e.g., food, water, habitat limited due to annual variations in availability)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
					Total Respondents		**11**

7. Please also rank these threats to the Wildlife in Herbaceous Marsh Wetland Habitats in Indiana.

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total
Habitat loss (breeding range)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	**1**
Habitat loss (feeding/foraging areas)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	**1**
Small native range (high endemism)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Near limits of natural geographic range	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Large home range requirements	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	**1**
Viable reproductive population size or availability	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Specialized reproductive behavior or low reproductive rates	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Degradation of movement/migration routes	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**

(overwintering habitats, nesting and staging sites)							
Genetic pollution (hybridization)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Unknown	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	**0**
Other (please specify below)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	**1**
					Total Respondents		**10**

8. Other threats to the Wildlife in Herbaceous Marsh Wetland Habitatsin Indiana.

1. Artificial manipulation of water levels in wetlands seems likely to increase mortality of over wintering snakes. Snakes hibernate underground at the groundwater interface. Raising water levels in the winter could drown snakes and lowering water table could expose them to extreme cold temperatures. Both activities are likely to kill over wintering snakes.

Total Respondents **1**

9. Please briefly describe the top two threats to the Wildlife in Herbaceous Marsh Wetland Habitats in Indiana identified above.

1. Artificial manipulation of water levels in wetlands seems likely to increase mortality of over wintering snakes. Snakes hibernate underground at the groundwater interface. Raising water levels in the winter could drown snakes and lowering water table could expose them to extreme cold temperatures. Both activities are likely to kill over wintering snakes.

   Inappropriate management of sandy fire breaks in managed areas that are disked at inappropriate times, or are managed in inappropriate cover types. I have seen dead massasauga that have been disked on DNR lands

Total Respondents **1**

10. Please rank the following threats to the HABITAT of the Wildlife in Herbaceous Marsh Wetland Habitats in Indiana.

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

Habitat degradation	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	**1**
Climate change	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Stream channelization	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Impoundment of water/flow regulation	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	**1**
Agricultural/forestry practices	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	**1**
Residual contamination (persistent toxins)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Point source pollution (continuing)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Mining/acidification	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Drainage practices (stormwater runoff)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Unknown	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	**0**
					Total Respondents		**17**

11. Other HABITAT threats to the Wildlife in Herbaceous Marsh Wetland Habitats in Indiana.

No responses were entered for this question.

Total Respondents **0**

(skipped this question) 1

12. Please briefly describe the top two HABITAT threats to the in Indiana identified above.

Fire suppression in graminoid wetland habitat creates late successional wetlands that are not appropriate habitat. Conversely, late spring fire in these habitats is likely to cause direct adult mortality.

1. Artificial manipulation of water levels in wetlands seems likely to increase mortality of over wintering snakes. Snakes hibernate underground at the groundwater interface. Raising water levels in the winter could drown snakes and lowering water table could expose them to extreme cold temperatures. Both activities are likely to kill over wintering snakes. IN addition, herbaceous wetland are lost under this management regime, replaced by open water wetlands.

Total Respondents **1**

13. What current monitoring efforts by state agencies are you aware of for the Wildlife in Herbaceous Marsh Wetland Habitats in Indiana?

	Yes, these efforts occur	**Not aware of these efforts occuring**	**Response Total**
Statewide year-round monitoring conducted by state agencies	0% (0)	100% (1)	**1**

Statewide once a year monitoring conducted by state agencies	0% (0)	100% (1)	**1**
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	100% (1)	**1**
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	0% (0)	100% (1)	**1**
Regional or local year-round monitoring conducted by state agencies	0% (0)	100% (1)	**1**
Regional or local once a year monitoring conducted by state agencies	0% (0)	100% (1)	**1**
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	100% (1)	**1**
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	100% (1)	0% (0)	**1**
		Total Respondents	**8**

14. What current monitoring efforts by other organizations are you aware of for the Wildlife in Herbaceous Marsh Wetland Habitats in Indiana?

	Yes, these efforts occur	**Not aware of these efforts occuring**	**Response Total**
Statewide year-round monitoring conducted by other organizations	0% (0)	100% (1)	**1**
Statewide once a year monitoring conducted by other organizations	0% (0)	100% (1)	**1**
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (1)	**1**
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (1)	**1**
Regional or local year-round monitoring conducted by other organizations	0% (0)	100% (1)	**1**
Regional or local once a year monitoring conducted by other organizations	0% (0)	100% (1)	**1**
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (1)	**1**
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	100% (1)	0% (0)	**1**
		Total Respondents	**8**

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

	Very crucial	Somewhat crucial	Slightly crucial	Not crucial	Unknown	Response Total
Statewide year-round monitoring conducted by state agencies	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	**1**
Statewide once a year monitoring conducted by state agencies	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	**1**
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	**1**
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	**1**
Regional or local year-round monitoring conducted by state agencies	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	**1**
Regional or local once a year monitoring conducted by state agencies	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	**1**
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	**1**
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	**1**
				Total Respondents		**8**

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

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

Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	**1**
					Total Respondents	**7**

17. Regional or local state agency monitoring for the Wildlife in Herbaceous Marsh Wetland Habitats in Indiana.

No responses were entered for this question.

Total Respondents **0**

(skipped this question) 1

18. Regional or local monitoring by other organizations for the Wildlife in Herbaceous Marsh Wetland Habitats in Indiana.

No responses were entered for this question.

Total Respondents **0**

(skipped this question) 1

19. Please list organizations that are monitoring the Wildlife in Herbaceous Marsh Wetland Habitats in Indiana.

1. TNC- funded research at Cline Lake Fen

Total Respondents **1**

20. What are the current monitoring techniques for the Wildlife in Herbaceous Marsh Wetland Habitats 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
Radio telemetry and tracking	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	**1**
Modeling	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Coverboard routes	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Spot mapping	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	**1**
Driving a survey route	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**

Reporting from harvest, depredation, or unintentional take (road kill, bycatch)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Mark and recapture	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	**1**
Professional survey/census	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	**1**
Volunteer survey/census	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Trapping (by any technique)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Representative sites	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Probabilistic sites	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
					Total Respondents		**13**

21. Other monitoring techniques for the Wildlife in Herbaceous Marsh Wetland Habitats in Indiana.

No responses were entered for this question.

Total Respondents	**0**
(skipped this question)	1

22. What one or two monitoring techniques would you recommend for effective conservation of the Wildlife in Herbaceous Marsh Wetland Habitats in Indiana?

No responses were entered for this question.

Total Respondents	**0**
(skipped this question)	1

23. What current HABITAT inventory and assessment efforts or activities by state agencies are you aware of for the Wildlife in Herbaceous Marsh Wetland Habitats in Indiana?

	Yes, these efforts occur	No effort that I'm aware of	Response Total
Statewide annual inventory and assessment conducted by state agencies	0% (0)	100% (1)	**1**
Statewide once a year inventory and assessment conducted by state agencies	0% (0)	100% (1)	**1**
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	0% (0)	100% (1)	**1**
Regional or local year-round inventory and assessment conducted by state agencies	0% (0)	100% (1)	**1**
Regional or local once a year inventory and assessment conducted by state agencies	0% (0)	100% (1)	**1**
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	100% (1)	**1**
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	100% (1)	0% (0)	**1**
		Total Respondents	**8**

24. What current HABITAT inventory and assessment efforts or activities by other organizations are you aware of for the Wildlife in Herbaceous Marsh Wetland Habitats 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	100% (1)	0% (0)	**1**
		Total Respondents	**8**

25. How crucial are these HABITAT efforts by state agencies for the conservation of the Wildlife in Herbaceous Marsh Wetland Habitats in Indiana?

	These	**These**	**These efforts**	**These**

	efforts are very crucial for this HABITAT	efforts are somewhat crucial for this HABITAT	efforts are slightly crucial for this HABITAT	efforts are not crucial for this HABITAT		Total
Statewide annual inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Statewide once a year inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**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)	0% (0)	100% (1)	**1**
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	**1**
Regional or local year-round inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Regional or local once a year inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
				Total Respondents		**8**

26. How crucial are these HABITAT efforts by other organizations for the conservation of the Wildlife in Herbaceous Marsh Wetland Habitats 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 year-round inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**

Statewide once a year inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	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)	0% (0)	0% (0)	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)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Regional or local year-round inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Regional or local once a year inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	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)	0% (0)	0% (0)	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)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
					Total Respondents	**8**

27. Regional or local state agency HABITAT inventory and assessment for the Wildlife in Herbaceous Marsh Wetland Habitats in Indiana.

No responses were entered for this question.

Total Respondents **0**

(skipped this question) 1

28. Regional or local HABITAT inventory and assessment by other organizations for the Wildlife in Herbaceous Marsh Wetland Habitats in Indiana.

No responses were entered for this question.

Total Respondents **0**

(skipped this question) 1

29. Please list organizations that are monitoring this HABITAT for the Wildlife in Herbaceous Marsh Wetland Habitats in Indiana.

No responses were entered for this question.

Total Respondents **0**

(skipped this question) 1

30. What are the current monitoring techniques for the Wildlife in Herbaceous Marsh Wetland Habitats in Indiana. If a technique is not applicable to the 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)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	**1**
Aerial photography and analysis	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	**1**
Systematic sampling	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	**1**
Property tax estimates	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
State revenue data	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Regulatory information	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Participation in landuse programs	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Modeling	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Voluntary landowner reporting	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
						Total Respondents	**10**

31. Other HABITAT inventory and assessment techniques for the Wildlife in Herbaceous Marsh Wetland Habitats in Indiana.

No responses were entered for this question.

Total Respondents **0**

(skipped this question) 1

32. What one or two HABITAT inventory and assessment techniques would you recommend for effective conservation of the Wildlife in Herbaceous Marsh Wetland Habitats 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 Herbaceous Marsh Wetland Habitats in Indiana?

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

34. Please provide a citation (title, author, date, publisher) that would give the best overview of the Wildlife in Herbaceous Marsh Wetland Habitats in Indiana, if available. This resource may be used if further detail is needed.

	Response Total	Response Percent
Title	1	100%
Author	1	100%
Date	0	0%
Publisher	0	0%
Total Respondents		1

35. If possible, please provide a second citation (title, author, date, publisher) that would give another good overview of the Wildlife in Herbaceous Marsh Wetland Habitats 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%
Total Respondents		0
(skipped this question)		1

36. What is the current HABITAT body of science for the Wildlife in Herbaceous Marsh Wetland Habitats in Indiana?

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

37. Please provide a citation (title, author, date, publisher) that would give the best HABITAT overview of the Wildlife in Herbaceous Marsh Wetland Habitats in Indiana, if available. This resource may be used if further detail is needed.

	Response Total	Response Percent
Title	0	0%
Author	0	0%
Date	0	0%
Publisher	0	0%
Total Respondents	0	
(skipped this question)	1	

38. If possible, please provide a second citation (title, author, date, publisher) that would give another good HABITAT overview of the Wildlife in Herbaceous Marsh Wetland Habitats 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%
Total Respondents	0	
(skipped this question)	1	

39. What are the research needs for the Wildlife in Herbaceous Marsh Wetland Habitats in Indiana?

	Urgently needed	Greatly needed	Needed	Slightly needed	Not needed	Unknown	Response Total
Life cycle	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	1

Distribution and abundance	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	**1**
Limiting factors (food, shelter, water, breeding sites)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	**1**
Threats (predators/competition, contamination)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	**1**
Relationship/dependence on specific habitats	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	**1**
Population health (genetic and physical)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	**1**
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	**0**
						Total Respondents	**6**

40. Other research needs for the Wildlife in Herbaceous Marsh Wetland Habitats in Indiana.

No responses were entered for this question.

Total Respondents **0**

(skipped this question) 1

41. What are the HABITAT research needs for the Wildlife in Herbaceous Marsh Wetland Habitats in Indiana?

	Urgently needed	Greatly needed	Needed	Slightly needed	Not needed	Unknown	Response Total
Successional changes	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	**1**
Distribution and abundance (fragmentation)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	**1**
Threats (land use change/competition, contamination/global warming)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	**1**
Relationship/dependence on specific site conditions	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	**1**
Growth and development of individual components of the habitat	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	**0**
						Total Respondents	**5**

42. Other HABITAT research needs for the Wildlife in Herbaceous Marsh Wetland Habitats in Indiana.

1. Spatial relationships between occupied wetlands relative to population dynamics

   Physical characteristics of over wintering sites

Total Respondents 1

43. How well do the following conservation efforts address the threats to the Wildlife in Herbaceous Marsh Wetland Habitats in Indiana?

	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
Habitat protection (use below for details)	0% (0)	100% (1)	0% (0)	0% (0)	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**
Reintroduction (restoration)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	**1**
Food plots	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	**1**
Threats reduction	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	**1**
Native predator control	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	**1**
Exotic/invasive species control	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	**1**
Regulation of collecting	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	**1**
Disease/parasite management	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Translocation to new geographic range	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	**1**
Protection of migration routes	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	**1**
Limiting contact with pollutants/contaminants	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Public education to reduce human disturbance	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Culling/selective removal	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	**1**
Stocking	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	**1**
Other (please specify below)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	**1**
				Total Respondents		**17**

44. Other current conservation practices for the Wildlife in Herbaceous Marsh Wetland Habitats in Indiana.

1. Invasive species control (buckthorn, autumn olive, phargimtes) to keep open herbaceous habitat suitable for massasauga

Total Respondents 1

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

1. Design and management of conservation areas that specifically incorporate life history requirements of some wildlife species across relatively large habitats (>1,000 acres). Some species are too often subjected to management decisions that favor other species, and these often have a negative impact on available wetland and nesting habitat. In some cases (water level manipulations, late spring prescribed fire), these management decisions seem likely to result in direct mortality of adults.

Total Respondents 1

46. How well do the following conservation efforts address the HABITAT threats to the Wildlife in Herbaceous Marsh Wetland Habitats in Indiana?

	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
Habitat protection through regulation	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	**1**
Habitat protection on public lands	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	**1**
Habitat protection incentives (financial)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Habitat restoration through regulation	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Habitat restoration on public lands	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	**1**
Habitat restoration incentives (financial)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Artificial habitat creation (artificial reefs, nesting platforms)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	**1**
Selective use of functionally equivalent exotic species in place of extirpated natives	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	**1**
Succession control (fire, mowing)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	**1**
Corridor development/protection	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Managing water regimes	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	**1**
Pollution reduction	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Protection of adjacent buffer zone	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	**1**
Restrict public access and disturbance	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Land use planning	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Technical assistance	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	**1**
Cooperative land management agreements (conservation easements)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
				Total Respondents		**18**

47. Other current HABITAT conservation practices for the Wildlife in Herbaceous Marsh Wetland Habitats in Indiana.

No responses were entered for this question.

Total Respondents	**0**
(skipped this question)	1

48. What one or two specific HABITAT practices would you recommend for more effective conservation of the Wildlife in Herbaceous Marsh Wetland Habitats in Indiana?

No responses were entered for this question.

Total Respondents	**0**
(skipped this question)	1

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

1. Some species are too often taken for granted on managed lands. Management activities in wetlands and adjacent uplands (water level manipulations, late spring prescribed fire) contribute directly to increased mortality.

Total Respondents	**1**

Appendix E-70: Mudflats

Technical experts did not provide input on a representative species for this habitat.

There are no species of greatest conservation need in this guild.

6. Please rank the following threats to the Wildlife in Permanent Wetland Habitats in Indiana.

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total
Invasive/non-native species	0% (0)	14% (1)	0% (0)	0% (0)	43% (3)	43% (3)	**7**
High sensitivity to pollution	0% (0)	0% (0)	0% (0)	14% (1)	14% (1)	71% (5)	**7**
Bioaccumulation of contaminants	0% (0)	0% (0)	0% (0)	14% (1)	14% (1)	71% (5)	**7**
Predators (native or domesticated)	0% (0)	14% (1)	0% (0)	14% (1)	29% (2)	43% (3)	**7**
Dependence on other species (mutualism, pollinators)	0% (0)	0% (0)	14% (1)	0% (0)	57% (4)	29% (2)	**7**
Diseases/parasites (of the species itself)	0% (0)	0% (0)	0% (0)	14% (1)	14% (1)	71% (5)	**7**
Regulated hunting/fishing pressure (too much)	0% (0)	0% (0)	0% (0)	0% (0)	86% (6)	14% (1)	**7**
Species over population	0% (0)	0% (0)	0% (0)	14% (1)	71% (5)	14% (1)	**7**
Unintentional take/ direct mortality (e.g., vehicle collisions, power line collisions, by-catch, harvesting equipment, land preparation machinery)	14% (1)	29% (2)	0% (0)	0% (0)	57% (4)	0% (0)	**7**
Unregulated collection pressure	0% (0)	0% (0)	29% (2)	0% (0)	71% (5)	0% (0)	**7**
Dependence on irregular resources (cyclical annual variations) (e.g., food, water, habitat limited due to annual variations in availability)	0% (0)	29% (2)	14% (1)	29% (2)	14% (1)	14% (1)	**7**
					Total Respondents		**77**

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

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total
Habitat loss (breeding range)	57% (4)	29% (2)	0% (0)	14% (1)	0% (0)	0% (0)	**7**
Habitat loss (feeding/foraging areas)	43% (3)	43% (3)	0% (0)	14% (1)	0% (0)	0% (0)	**7**
Small native range (high endemism)	14% (1)	14% (1)	0% (0)	0% (0)	57% (4)	14% (1)	**7**
Near limits of natural geographic range	14% (1)	14% (1)	14% (1)	14% (1)	43% (3)	0% (0)	**7**
Large home range requirements	14% (1)	14% (1)	0% (0)	14% (1)	57% (4)	0% (0)	**7**
Viable reproductive population size or availability	14% (1)	14% (1)	29% (2)	14% (1)	14% (1)	14% (1)	**7**
Specialized reproductive behavior or low reproductive rates	14% (1)	14% (1)	29% (2)	0% (0)	29% (2)	14% (1)	**7**
Degradation of movement/migration routes	14% (1)	43% (3)	0% (0)	0% (0)	29% (2)	14% (1)	**7**

(overwintering habitats, nesting and staging sites)							
Genetic pollution (hybridization)	0% (0)	0% (0)	14% (1)	0% (0)	86% (6)	0% (0)	**7**
Unknown	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	**2**
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	**2**
					Total Respondents		**67**

8. Other threats to the Wildlife in Permanent Wetland Habitats in Indiana.

1. Loss of wetlands (muckland) would be the threat to some wildlife species

2. Although not habitat specific, the inability to responsibly and proactively manage muskrats according to the wildlife conservation model, as opposed to reactive measures through nuisance practices, is a concern regarding the conservation of muskrats. This concern applies across the landscape, not just in urban and suburban environments.

Total Respondents **2**

9. Please briefly describe the top two threats to the Wildlife in Permanent Wetland Habitats in Indiana identified above.

1. Only a few locations are known to have green salamanders in Indiana and this is a habitat specialist needing rocky outcrops in forested areas.
2. Wetland loss & degradation
3. probably draining of wetlands for farming or development
4. 1) loss of permanent wetland areas that include huge open/prairie buffer zones for nesting.
   2) overland movement for nesting invites road kill of otherwise longlived adults suboptimal size nesting areas focuses nest depredation

   Inappropriate management of nesting areas – sandy fire breaks in managed areas are disked at inappropriate times, or are managed in inappropriate cover types
5. Fragmentation of populations due to habitat loss. Wetlands are managed as landscape scale systems relative to the Blanding's turtle, resulting in metapopulation disruption and potential metapopulation decline. Because of low densities and small population sizes, populations that have become isolated are likely not viable.
6. habitat loss and fragmentation, loss of connectivity

Total Respondents **6**

10. Please rank the following threats to the HABITAT of the Wildlife in Permanent Wetland Habitats in Indiana.

	Critical threat	**Serious threat**	**Somewhat of a threat**	**Slight threat**	**No threat**	**Unknown**	**Response Total**
Commercial or residential development (sprawl)	0% (0)	43% (3)	14% (1)	43% (3)	0% (0)	0% (0)	**7**

Counterproductive financial incentives or regulations	0% (0)	14% (1)	0% (0)	14% (1)	29% (2)	43% (3)	**7**
Invasive/non-native species	0% (0)	14% (1)	0% (0)	14% (1)	29% (2)	43% (3)	**7**
Nonpoint source pollution (sedimentation and nutrients)	0% (0)	0% (0)	33% (2)	17% (1)	0% (0)	50% (3)	**6**
Habitat fragmentation	43% (3)	43% (3)	0% (0)	0% (0)	14% (1)	0% (0)	**7**
Successional change	0% (0)	17% (1)	17% (1)	17% (1)	17% (1)	33% (2)	**6**
Diseases (of plants that create habitat)	0% (0)	0% (0)	0% (0)	0% (0)	43% (3)	57% (4)	**7**
Habitat degradation	33% (2)	50% (3)	0% (0)	17% (1)	0% (0)	0% (0)	**6**
Climate change	0% (0)	0% (0)	17% (1)	0% (0)	0% (0)	83% (5)	**6**
Stream channelization	0% (0)	14% (1)	0% (0)	14% (1)	43% (3)	29% (2)	**7**
Impoundment of water/flow regulation	14% (1)	0% (0)	43% (3)	0% (0)	29% (2)	14% (1)	**7**
Agricultural/forestry practices	0% (0)	67% (4)	17% (1)	0% (0)	17% (1)	0% (0)	**6**
Residual contamination (persistent toxins)	0% (0)	0% (0)	0% (0)	14% (1)	14% (1)	71% (5)	**7**
Point source pollution (continuing)	0% (0)	0% (0)	17% (1)	17% (1)	0% (0)	67% (4)	**6**
Mining/acidification	14% (1)	0% (0)	0% (0)	14% (1)	29% (2)	43% (3)	**7**
Drainage practices (stormwater runoff)	0% (0)	14% (1)	0% (0)	14% (1)	43% (3)	29% (2)	**7**
Unknown	0% (0)	0% (0)	0% (0)	0% (0)	25% (1)	75% (3)	**4**
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (3)	**3**
					Total Respondents		**113**

11. Other HABITAT threats to the Wildlife in Permanent Wetland Habitats in Indiana.

No responses were entered for this question.

Total Respondents **0**

12. Please briefly describe the top two HABITAT threats to the Wildlife in Permanent Wetland Habitats in Indiana identified above.

1. Habitat degradation and fragmentation due to deforestation.
2. Habitat degradation & fragmentation
3. loss of habitat due to farming or development

	the participant has to speculate about the meaning of successional change. Is a "change" an increase or decrease in early successional habitats? Climate change also is speculative.
4.	Agriculture/Forestry practices have different effects. Grouping these practices into a single category does not appropriately represent each individual practice. Point and non point pollution may have a positive or negative effect.
5.	1) Habitat loss through wetland drainage/ tiny stream ditching. 2) conversion of sand prairie nesting habitat to cropland or something else (e.g. forestation via fire prevention) Manipulation of natural wetlands for management of other species has a disruptive impact on natural wetland dynamics. This may include reduced survival of Blanding's or reduced productivity of the habitat.
6.	Loss of adjacent uplands or inappropriate cover/management. Blanding's requires nesting habitats that are secure from disturbance and that are within a reasonable distance to wetland habitats. Loss of appropriate habitat (ether due to tradition conversion to agriculture or to conversion of inappropriate conservation cover types) is negatively impacting reproductive success in this species. Long-distance movements
7.	coal mining, agriculture
	Total Respondents **7**

13. What current monitoring efforts by state agencies are you aware of for the Wildlife in Permanent Wetland Habitats in Indiana?

	Yes, these efforts occur	Not aware of these efforts occuring	Response Total
Statewide year-round monitoring conducted by state agencies	0% (0)	100% (6)	**6**
Statewide once a year monitoring conducted by state agencies	0% (0)	100% (6)	**6**
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	100% (6)	**6**
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	17% (1)	83% (5)	**6**
Regional or local year-round monitoring conducted by state agencies	0% (0)	100% (6)	**6**
Regional or local once a year monitoring conducted by state agencies	0% (0)	100% (6)	**6**
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	100% (6)	**6**
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	50% (3)	50% (3)	**6**
		Total Respondents	**48**

14. What current monitoring efforts by other organizations are you aware of for the Wildlife in Permanent Wetland Habitats in Indiana?

	Yes, these efforts occur	Not aware of these efforts occuring	Response Total
Statewide year-round monitoring conducted by other organizations	0% (0)	100% (6)	**6**
Statewide once a year monitoring conducted by other organizations	0% (0)	100% (6)	**6**
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (6)	**6**
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	17% (1)	83% (5)	**6**
Regional or local year-round monitoring conducted by other organizations	0% (0)	100% (6)	**6**
Regional or local once a year monitoring conducted by other organizations	0% (0)	100% (6)	**6**
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (6)	**6**
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	83% (5)	17% (1)	**6**
		Total Respondents	**48**

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

	Very crucial	Somewhat crucial	Slightly crucial	Not crucial	Unknown	Response Total
Statewide year-round monitoring conducted by state agencies	0% (0)	0% (0)	20% (1)	80% (4)	0% (0)	**5**
Statewide once a year monitoring conducted by state agencies	0% (0)	20% (1)	0% (0)	80% (4)	0% (0)	**5**
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	40% (2)	0% (0)	60% (3)	0% (0)	**5**
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	20% (1)	20% (1)	20% (1)	40% (2)	0% (0)	**5**
Regional or local year-round monitoring conducted by state agencies	0% (0)	0% (0)	20% (1)	80% (4)	0% (0)	**5**
Regional or local once a year monitoring conducted by state agencies	0% (0)	0% (0)	20% (1)	80% (4)	0% (0)	**5**
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	20% (1)	20% (1)	40% (2)	20% (1)	**5**

Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	17% (1)	50% (3)	0% (0)	33% (2)	0% (0)	**6**
					Total Respondents	**41**

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

	Very crucial	Somewhat crucial	Slightly crucial	Not crucial	Unknown	Response Total
Statewide year-round monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	80% (4)	20% (1)	**5**
Statewide once a year monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	80% (4)	20% (1)	**5**
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	20% (1)	0% (0)	0% (0)	60% (3)	20% (1)	**5**
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	40% (2)	0% (0)	0% (0)	40% (2)	20% (1)	**5**
Regional or local year-round monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	75% (3)	25% (1)	**4**
Regional or local once a year monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	75% (3)	25% (1)	**4**
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	20% (1)	0% (0)	0% (0)	40% (2)	40% (2)	**5**
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	33% (2)	33% (2)	17% (1)	0% (0)	17% (1)	**6**
				Total Respondents		**39**

17. Regional or local state agency monitoring for the Wildlife in Permanent Wetland Habitats in Indiana.

1. INDR Nature Preserve Division
2. I'd guess that agencies that issue drainage permits are relevant here.
3. Fish Creek, Patoka River, Pigeon Creek

Total Respondents **3**

18. Regional or local monitoring by other organizations for the Wildlife in Permanent Wetland Habitats in Indiana.

1. Robert Brodman, Saint Joseph's College
2. "BioBlitz" in Lake Co.
   Herp Center at IUPFW - I presume they've done something in Steuben and La Grange Cos.
3. Fish Creek, Patoka River, Pigeon Creek, Muscatatuck River

Total Respondents 3

19. Please list organizations that are monitoring the Wildlife in Permanent Wetland Habitats in Indiana.

1. Ball State University; Tom Morrell.

2. Indiana Division of Fish and Wildlife. Population monitoring efforts at state, regional and local scales are to monitor annual trends. Monitoring programs used by IDF&W are not habitat specific for muskrat.

3. What I know is above.

4. TNC has funded some work at Cline Lake Fen to better understand population dynamics, habitat use, etc...

5. Bruce Kingsbury, IUPU Fort Wayne,

Total Respondents 5

20. What are the current monitoring techniques for the Wildlife in Permanent Wetland Habitats 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
Radio telemetry and tracking	0% (0)	60% (3)	20% (1)	20% (1)	0% (0)	0% (0)	**5**
Modeling	0% (0)	25% (1)	25% (1)	0% (0)	0% (0)	50% (2)	**4**
Coverboard routes	0% (0)	0% (0)	25% (1)	25% (1)	0% (0)	50% (2)	**4**
Spot mapping	20% (1)	40% (2)	0% (0)	20% (1)	0% (0)	20% (1)	**5**
Driving a survey route	0% (0)	0% (0)	0% (0)	50% (2)	0% (0)	50% (2)	**4**
Reporting from harvest, depredation, or unintentional take (road kill, bycatch)	0% (0)	40% (2)	0% (0)	40% (2)	0% (0)	20% (1)	**5**

Mark and recapture	0% (0)	20% (1)	20% (1)	20% (1)	0% (0)	40% (2)	**5**
Professional survey/census	0% (0)	50% (2)	25% (1)	0% (0)	0% (0)	25% (1)	**4**
Volunteer survey/census	0% (0)	20% (1)	40% (2)	0% (0)	0% (0)	40% (2)	**5**
Trapping (by any technique)	0% (0)	50% (2)	25% (1)	0% (0)	0% (0)	25% (1)	**4**
Representative sites	0% (0)	80% (4)	0% (0)	0% (0)	0% (0)	20% (1)	**5**
Probabilistic sites	0% (0)	50% (2)	0% (0)	0% (0)	0% (0)	50% (2)	**4**
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	**2**
					Total Respondents		**56**

21. Other monitoring techniques for the Wildlife in Permanent Wetland Habitats in Indiana.

1. Look for burrows in muck

Total Respondents **1**

22. What one or two monitoring techniques would you recommend for effective conservation of the Wildlife in Permanent Wetland Habitats in Indiana?

1. Professional surveys
2. look for burrows in muck connected with trapping
3. IDF&W uses Harvest Reports and Professional Surveys. Here again, the assumption is that aquatic systems include all habitat types occupied by muskrat.
4. 1) radiotrack females to nesting sites.
2) monitor nests for depredation

(Both somewhat labor-intensive for at least one person.)

Total Respondents **4**

23. What current HABITAT inventory and assessment efforts or activities by state agencies are you aware of for the Wildlife in Permanent Wetland Habitats in Indiana?

	Yes, these efforts occur	**No effort that I'm aware of**	**Response Total**
Statewide annual inventory and assessment conducted by state agencies	0% (0)	100% (6)	**6**
Statewide once a year inventory and assessment conducted by state agencies	0% (0)	100% (6)	**6**
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	17% (1)	83% (5)	**6**
Regional or local year-round inventory and assessment conducted by state agencies	0% (0)	100% (6)	**6**
Regional or local once a year inventory and assessment conducted by state agencies	0% (0)	100% (6)	**6**
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	100% (6)	**6**
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	100% (6)	**6**
		Total Respondents	**48**

24. What current HABITAT inventory and assessment efforts or activities by other organizations are you aware of for the Wildlife in Permanent Wetland Habitats 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% (6)	**6**
Statewide once a year inventory and assessment conducted by other organizations	0% (0)	100% (6)	**6**
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (6)	**6**
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (6)	**6**
Regional or local year-round inventory and assessment conducted by other organizations	0% (0)	100% (6)	**6**
Regional or local once a year inventory and assessment conducted by other organizations	0% (0)	100% (6)	**6**
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (6)	**6**
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	50% (3)	50% (3)	**6**
		Total Respondents	**48**

25. How crucial are these HABITAT efforts by state agencies for the conservation of the Wildlife in Permanent Wetland Habitats in Indiana?

	These	**These**	**These**	**These**

	efforts are very crucial for this HABITAT	efforts are somewhat crucial for this HABITAT	efforts are slightly crucial for this HABITAT	efforts are not crucial for this HABITAT		Total
Statewide annual inventory and assessment conducted by state agencies	0% (0)	0% (0)	20% (1)	40% (2)	40% (2)	**5**
Statewide once a year inventory and assessment conducted by state agencies	0% (0)	20% (1)	0% (0)	40% (2)	40% (2)	**5**
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	0% (0)	20% (1)	40% (2)	40% (2)	**5**
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	60% (3)	0% (0)	20% (1)	20% (1)	**5**
Regional or local year-round inventory and assessment conducted by state agencies	0% (0)	0% (0)	20% (1)	40% (2)	40% (2)	**5**
Regional or local once a year inventory and assessment conducted by state agencies	0% (0)	0% (0)	20% (1)	40% (2)	40% (2)	**5**
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	20% (1)	20% (1)	20% (1)	40% (2)	**5**
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	20% (1)	20% (1)	40% (2)	0% (0)	20% (1)	**5**
				Total Respondents		**40**

26. How crucial are these HABITAT efforts by other organizations for the conservation of the Wildlife in Permanent Wetland Habitats 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 year-round inventory and assessment conducted by other organizations	0% (0)	0% (0)	20% (1)	40% (2)	40% (2)	**5**
Statewide once a year inventory and assessment conducted by other organizations	0% (0)	0% (0)	20% (1)	40% (2)	40% (2)	**5**
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	0% (0)	20% (1)	40% (2)	40% (2)	**5**

Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	20% (1)	20% (1)	40% (2)	20% (1)	**5**
Regional or local year-round inventory and assessment conducted by other organizations	0% (0)	0% (0)	20% (1)	40% (2)	40% (2)	**5**
Regional or local once a year inventory and assessment conducted by other organizations	0% (0)	0% (0)	20% (1)	40% (2)	40% (2)	**5**
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	0% (0)	20% (1)	20% (1)	60% (3)	**5**
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	20% (1)	40% (2)	0% (0)	40% (2)	**5**
				Total Respondents		**40**

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

Northeast Indiana

Total Respondents **1**

28. Regional or local HABITAT inventory and assessment by other organizations for the Wildlife in Permanent Wetland Habitats in Indiana.

IUPU-FW faculty and students work in wetlands with some wildlife species in NE Indiana

Total Respondents **1**

29. Please list organizations that are monitoring this HABITAT for the Wildlife in Permanent Wetland Habitats in Indiana.

1. Ball State University NE Ind.
Indiana State University NW

2. Because something is known about wetland loss in Indiana, I presume the state is keeping track of something.

Total Respondents **2**

30. What are the current HABITAT inventory and/or assessment techniques for the Wildlife in Permanent Wetland Habitats in Indiana?

	Frequently	Occasionally	Not used but possible	Not used and not possible	Not	Response

			with existing technology and data	with existing technology and data			
GIS mapping	0% (0)	33% (2)	33% (2)	0% (0)	0% (0)	33% (2)	**6**
Aerial photography and analysis	0% (0)	17% (1)	17% (1)	17% (1)	0% (0)	50% (3)	**6**
Systematic sampling	0% (0)	17% (1)	0% (0)	17% (1)	0% (0)	67% (4)	**6**
Property tax estimates	0% (0)	0% (0)	0% (0)	40% (2)	0% (0)	60% (3)	**5**
State revenue data	0% (0)	0% (0)	0% (0)	40% (2)	0% (0)	60% (3)	**5**
Regulatory information	0% (0)	20% (1)	0% (0)	40% (2)	0% (0)	40% (2)	**5**
Participation in landuse programs	0% (0)	20% (1)	0% (0)	40% (2)	0% (0)	40% (2)	**5**
Modeling	0% (0)	0% (0)	20% (1)	20% (1)	0% (0)	60% (3)	**5**
Voluntary landowner reporting	0% (0)	0% (0)	0% (0)	40% (2)	0% (0)	60% (3)	**5**
Other (please specify below)	0% (0)	0% (0)	0% (0)	25% (1)	0% (0)	75% (3)	**4**
					Total Respondents		**52**

31. Other HABITAT inventory and assessment techniques for the Wildlife in Permanent Wetland Habitats in Indiana.

look for runways in muck and trap for them

Total Respondents **1**

32. What one or two HABITAT inventory and assessment techniques would you recommend for effective conservation of the Wildlife in Permanent Wetland Habitats in Indiana?

1. Sysematic sampling & GIS
2. 1) High resolution aerial photography at normal marsh water levels - digitize for GIS.
   2) Monitor wetland vegetation - blandings prefer floating emergents (e.g. duck weed) and get crowded out by cattail expansion.

Total Respondents **2**

33. What is the current body of science for the Wildlife in Permanent Wetland Habitats in Indiana?

		Response Total	Response Percent
Complete, up to date and extensive		0	0%
Adequate		1	17%
Inadequate		4	67%
Nonexistent		0	0%
Other (please explain below)	Literature is not habitat specific for muskrats in Indiana	1	17%
		Total Respondents	6

34. Please provide a citation (title, author, date, publisher) that would give the best overview of the Wildlife in Permanent Wetland Habitats in Indiana, if available. This resource may be used if further detail is needed.

		Response Total	Response Percent
Title	2. Fur animals of Indiana 4. Status and Distribution of candidate endangered herpetofauna in the Fish Creek watershed	2	50%
Author	1. Mumford and Whitaker 1982 2. David Brooks 3. review Minton's guide 4. Bruce Kingsbury, Spencer Cortwright	4	100%
Date	2. 1959 3. 2001 4. 1994	3	75%
Publisher	2. IDF&W 3. Get BioBlitz & IUPFW reports from DNR 4. IDNR Division of Fish and Wildlife	3	75%
		Total Respondents	4

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

		Response Total	Response Percent
Title	ongoing background work in NE & MN	1	100%
Author		0	0%
Date		0	0%
Publisher		0	0%
		Total Respondents	1

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

		Response Total	Response Percent
Complete, up to date and extensive		0	0%
Adequate		1	17%
Inadequate		4	67%
Nonexistent		0	0%
Other (please explain below)	unknown	1	17%
	Total Respondents		6

37. Please provide a citation (title, author, date, publisher) that would give the best HABITAT overview of the Wildlife in Permanent Wetland Habitats in Indiana, if available. This resource may be used if further detail is needed.

		Response Total	Response Percent
Title	Not my expertise	1	100%
Author	contact JW Lang for NE & MN	1	100%
Date		0	0%
Publisher		0	0%
	Total Respondents		1

38. If possible, please provide a second citation (title, author, date, publisher) that would give another good HABITAT overview of the Wildlife in Permanent Wetland Habitats 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%
Total Respondents		0

39. What are the research needs for the Wildlife in Permanent Wetland Habitats in Indiana?

	Urgently needed	Greatly needed	Needed	Slightly needed	Not needed	Unknown	Response Total
Life cycle	17% (1)	0% (0)	50% (3)	17% (1)	17% (1)	0% (0)	6
Distribution and abundance	17% (1)	33% (2)	17% (1)	17% (1)	17% (1)	0% (0)	6

Limiting factors (food, shelter, water, breeding sites)	67% (4)	0% (0)	0% (0)	17% (1)	17% (1)	0% (0)	**6**
Threats (predators/competition, contamination)	33% (2)	0% (0)	17% (1)	33% (2)	17% (1)	0% (0)	**6**
Relationship/dependence on specific habitats	33% (2)	17% (1)	33% (2)	0% (0)	17% (1)	0% (0)	**6**
Population health (genetic and physical)	33% (2)	0% (0)	33% (2)	17% (1)	17% (1)	0% (0)	**6**
Other (please specify below)	0% (0)	25% (1)	0% (0)	0% (0)	0% (0)	75% (3)	**4**
					Total Respondents		**40**

40. Other research needs for the Wildlife in Permanent Wetland Habitats in Indiana.

1. Research needs as related to muskrats are not habitat specific.

2. 1) Longterm fidelity to specific sites.
   2) Limits to sand prairie needs for nesting.
   3) Limits to recruitment when forced to nest in rowcrop areas.

Total Respondents **2**

41. What are the HABITAT research needs for the Wildlife in Permanent Wetland Habitats in Indiana?

	Urgently needed	**Greatly needed**	**Needed**	**Slightly needed**	**Not needed**	**Unknown**	**Response Total**
Successional changes	0% (0)	67% (4)	17% (1)	17% (1)	0% (0)	0% (0)	**6**
Distribution and abundance (fragmentation)	17% (1)	67% (4)	0% (0)	17% (1)	0% (0)	0% (0)	**6**
Threats (land use change/competition, contamination/global warming)	33% (2)	17% (1)	17% (1)	17% (1)	0% (0)	17% (1)	**6**
Relationship/dependence on specific site conditions	33% (2)	33% (2)	0% (0)	17% (1)	0% (0)	17% (1)	**6**
Growth and development of individual components of the habitat	0% (0)	60% (3)	20% (1)	0% (0)	0% (0)	20% (1)	**5**
Other (please specify below)	25% (1)	0% (0)	25% (1)	0% (0)	0% (0)	50% (2)	**4**
					Total Respondents		**33**

42. Other HABITAT research needs for the Wildlife in Permanent Wetland Habitats in Indiana.

1. Prairie restoration & fire management to perpetuate small sand blowouts

2. The relationship between upland nesting habitat, dispersal distance, barriers to dispersal etc may be critical information for the conservation of this turtle.

Total Respondents	**2**

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

	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
Habitat protection (use below for details)	0% (0)	83% (5)	17% (1)	0% (0)	0% (0)	**6**
Population management (hunting, trapping)	17% (1)	0% (0)	17% (1)	67% (4)	0% (0)	**6**
Population enhancement (captive breeding and release)	0% (0)	0% (0)	0% (0)	83% (5)	17% (1)	**6**
Reintroduction (restoration)	0% (0)	0% (0)	0% (0)	83% (5)	17% (1)	**6**
Food plots	0% (0)	0% (0)	17% (1)	83% (5)	0% (0)	**6**
Threats reduction	0% (0)	17% (1)	0% (0)	50% (3)	33% (2)	**6**
Native predator control	0% (0)	0% (0)	0% (0)	83% (5)	17% (1)	**6**
Exotic/invasive species control	0% (0)	0% (0)	0% (0)	83% (5)	17% (1)	**6**
Regulation of collecting	0% (0)	67% (4)	0% (0)	33% (2)	0% (0)	**6**
Disease/parasite management	0% (0)	0% (0)	0% (0)	83% (5)	17% (1)	**6**
Translocation to new geographic range	0% (0)	0% (0)	0% (0)	100% (5)	0% (0)	**5**
Protection of migration routes	0% (0)	0% (0)	17% (1)	50% (3)	33% (2)	**6**
Limiting contact with pollutants/contaminants	0% (0)	17% (1)	0% (0)	33% (2)	50% (3)	**6**
Public education to reduce human disturbance	0% (0)	33% (2)	17% (1)	17% (1)	33% (2)	**6**
Culling/selective removal	0% (0)	0% (0)	0% (0)	83% (5)	17% (1)	**6**
Stocking	0% (0)	0% (0)	0% (0)	83% (5)	17% (1)	**6**
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	100% (3)	**3**
				Total Respondents		**98**

44. Other current conservation practices for the Wildlife in Permanent Wetland Habitats in Indiana.

Preserve wetlands

Total Respondents	**0**

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

1. Habitat protection

2.	See #43. In addition, although not habitat specific, outreach programs are needed to effectively and accurately educate citizens about wildlife (game and non-game), the wildlife conservation model (for game and non-game), and the need for effective muskrat management programs.
3.	1) Restoration in new, very large natural areas in NW Indiana. 2) Raccoon reduction near constrained (small) areas of occupied habitat in NE Indiana.
4.	Design and management of conservation areas that specifically incorporate life history requirements of the Blanding's turtle across relatively large habitats (>1,000 acres). Some species are too often subjected to management decisions that favor other species, and these often have a negative impact on available wetland and nesting habitat. In some cases, these management decisions seem likely to result in direct mortality of adults and eggs.
5.	Restoration of habitat and connectivity

Total Respondents 5

46. How well do the following conservation efforts address the HABITAT threats to the Wildlife in Permanent Wetland Habitats in Indiana?

	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
Habitat protection through regulation	0% (0)	60% (3)	20% (1)	0% (0)	20% (1)	**5**
Habitat protection on public lands	40% (2)	40% (2)	20% (1)	0% (0)	0% (0)	**5**
Habitat protection incentives (financial)	0% (0)	50% (2)	0% (0)	0% (0)	50% (2)	**4**
Habitat restoration through regulation	0% (0)	40% (2)	20% (1)	0% (0)	40% (2)	**5**
Habitat restoration on public lands	20% (1)	20% (1)	20% (1)	20% (1)	20% (1)	**5**
Habitat restoration incentives (financial)	0% (0)	40% (2)	0% (0)	20% (1)	40% (2)	**5**
Artificial habitat creation (artificial reefs, nesting platforms)	0% (0)	20% (1)	0% (0)	40% (2)	40% (2)	**5**
Selective use of functionally equivalent exotic species in place of extirpated natives	0% (0)	0% (0)	0% (0)	80% (4)	20% (1)	**5**
Succession control (fire, mowing)	20% (1)	20% (1)	20% (1)	20% (1)	20% (1)	**5**
Corridor development/protection	0% (0)	0% (0)	20% (1)	60% (3)	20% (1)	**5**
Managing water regimes	0% (0)	40% (2)	20% (1)	20% (1)	20% (1)	**5**
Pollution reduction	0% (0)	20% (1)	0% (0)	20% (1)	60% (3)	**5**
Protection of adjacent buffer zone	20% (1)	0% (0)	20% (1)	40% (2)	20% (1)	**5**
Restrict public access and disturbance	0% (0)	0% (0)	20% (1)	40% (2)	40% (2)	**5**
Land use planning	0% (0)	20% (1)	20% (1)	40% (2)	20% (1)	**5**
Technical assistance	0% (0)	0% (0)	0% (0)	40% (2)	60% (3)	**5**
Cooperative land management agreements (conservation easements)	0% (0)	40% (2)	0% (0)	0% (0)	60% (3)	**5**
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	**2**
				Total Respondents		**86**

47. Other current HABITAT conservation practices for the Wildlife in Permanent Wetland Habitats in Indiana.

No responses were entered for this question.

Total Respondents **0**

48. What one or two specific HABITAT practices would you recommend for more effective conservation of the Wildlife in Permanent Wetland Habitats in Indiana?

1. Wwtland protection
2. anything that helps to preserve wetlands could help this animal.
3. 1) Use fire to maintain large sand prairies near appropriate wetlands
2) Acquire/purchase easments on additional blocks of land that have permanent wetlands associated with large sandy uplands.
4. Protection, restoration and appropriate management of adjacent uplands as nesting habitat around known populations
5. restore habitat and connectivity, allow beaver activity

Total Respondents **5**

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

1. Four-toed salamanders have a very spotty distribution that is poorly understood. They are often not found in habitats that seem ideally suited but then found in what one might call an inferior site.
2. Contiguous blandings populations have 4000 >yearling turtles in Minnesota and 140000 >yearling turtles in Nebraska, among the largest for any turtle in the USA. Main habitat components include big shallow but permanent wetlands, and very large sand prairies for nesting - so large as to be non-economical for regular raccoon use (some foxes & others use). These places have excellent juvenile recruitment, evidently not seen in other habitat. Take it from here.

Total Respondents **2**

6. Please rank the following threats to the Wildlife in Shrub/ Scrub Wetland Habitats in Indiana.

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total
Invasive/non-native species	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	**1**
High sensitivity to pollution	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	**1**
Bioaccumulation of contaminants	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Predators (native or domesticated)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	**1**
Dependence on other species (mutualism, pollinators)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	**1**
Diseases/parasites (of the species itself)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Regulated hunting/fishing pressure (too much)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	**1**
Species over population	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	**1**
Unintentional take/ direct mortality (e.g., vehicle collisions, power line collisions, by-catch, harvesting equipment, land preparation machinery)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	**1**
Unregulated collection pressure	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	**1**
Dependence on irregular resources (cyclical annual variations) (e.g., food, water, habitat limited due to annual variations in availability)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
					Total Respondents		**11**

7. Please also rank these threats to the Wildlife in Shrub/ Scrub Wetland Habitats in Indiana.

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

Specialized reproductive behavior or low reproductive rates	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	**1**
Degradation of movement/migration routes (overwintering habitats, nesting and staging sites)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	**1**
Genetic pollution (hybridization)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	**1**
Unknown	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	**0**
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	**0**
					Total Respondents		**9**

8. Other threats to the Wildlife in Shrub/ Scrub Wetland Habitats in Indiana.

No responses were entered for this question.

Total Respondents **0**

(skipped this question) 1

9. Please briefly describe the top two threats to the Wildlife in Shrub/ Scrub Wetland Habitats in Indiana identified above.

1. loss of early successional habitat.
hybridization with blue-winged warbler.

Total Respondents **1**

10. Please rank the following threats to the HABITAT of the Wildlife in Shrub/ Scrub Wetland Habitats in Indiana.

	Critical threat	**Serious threat**	**Somewhat of a threat**	**Slight threat**	**No threat**	**Unknown**	**Response Total**
Commercial or residential development (sprawl)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	**1**
Counterproductive financial incentives or regulations	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	**1**
Invasive/non-native species	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Nonpoint source pollution (sedimentation and nutrients)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Habitat fragmentation	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	**1**
Successional change	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	**1**
Diseases (of plants that create habitat)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	**1**
Habitat degradation	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	**1**
Climate change	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**

Stream channelization	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	**1**
Impoundment of water/flow regulation	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	**1**
Agricultural/forestry practices	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	**1**
Residual contamination (persistent toxins)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Point source pollution (continuing)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Mining/acidification	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Drainage practices (stormwater runoff)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Unknown	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	**0**
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	**0**
					Total Respondents		**16**

11. Other HABITAT threats to the Wildlife in Shrub/ Scrub Wetland Habitats in Indiana.

No responses were entered for this question.

Total Respondents **0**

(skipped this question) 1

12. Please briefly describe the top two HABITAT threats to the Wildlife in Shrub/ Scrub Wetland Habitats in Indiana identified above.

1. loss of early successional woody habitat.
habitat loss to development

Total Respondents **1**

13. What current monitoring efforts by state agencies are you aware of for the Wildlife in Shrub/ Scrub Wetland Habitats in Indiana?

	Yes, these efforts occur	**Not aware of these efforts occuring**	**Response Total**
Statewide year-round monitoring conducted by state agencies	0% (0)	100% (1)	**1**
Statewide once a year monitoring conducted by state agencies	0% (0)	100% (1)	**1**
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	100% (1)	**1**
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	0% (0)	100% (1)	**1**
Regional or local year-round monitoring conducted by state	0% (0)	100% (1)	**1**

agencies			
Regional or local once a year monitoring conducted by state agencies	0% (0)	100% (1)	**1**
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	100% (1)	**1**
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	0% (0)	100% (1)	**1**
		Total Respondents	**8**

14. What current monitoring efforts by other organizations are you aware of for the Wildlife in Shrub/ Scrub Wetland Habitats in Indiana?

	Yes, these efforts occur	**Not aware of these efforts occuring**	**Response Total**
Statewide year-round monitoring conducted by other organizations	0% (0)	100% (1)	**1**
Statewide once a year monitoring conducted by other organizations	100% (1)	0% (0)	**1**
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (1)	**1**
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (1)	**1**
Regional or local year-round monitoring conducted by other organizations	0% (0)	100% (1)	**1**
Regional or local once a year monitoring conducted by other organizations	0% (0)	100% (1)	**1**
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (1)	**1**
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (1)	**1**
		Total Respondents	**8**

15. How crucial are these monitoring efforts by state agencies for the conservation of the Wildlife in Shrub/ Scrub Wetland Habitats in Indiana?

	Very crucial	**Somewhat crucial**	**Slightly crucial**	**Not crucial**	**Unknown**	**Response Total**
Statewide year-round monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	**1**
Statewide once a year monitoring 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) monitoring conducted by state agencies						
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	**1**
Regional or local year-round monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	**1**
Regional or local once a year monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	**1**
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	**1**
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	**1**
				Total Respondents		**8**

16. How crucial are these monitoring efforts by other organizations for the conservation of the Wildlife in Shrub/ Scrub Wetland Habitats in Indiana?

	Very crucial	**Somewhat crucial**	**Slightly crucial**	**Not crucial**	**Unknown**	**Response Total**
Statewide year-round monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	**1**
Statewide once a year monitoring conducted by other organizations	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	**1**
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)	**1**
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)	**1**
Regional or local year-round monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	**1**
Regional or local once a year monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	**1**
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	**1**
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	**1**
				Total Respondents		**8**

17. Regional or local state agency monitoring for the Wildlife in Shrub/ Scrub Wetland Habitats in Indiana.

1. none

Total Respondents **1**

18. Regional or local monitoring by other organizations for the Wildlife in Shrub/ Scrub Wetland Habitats in Indiana.

1. federal Breeding Bird Survey statewide; May Day Bird Count, Summer Bird Count

Total Respondents **1**

19. Please list organizations that are monitoring the Wildlife in Shrub/ Scrub Wetland Habitats in Indiana.

1. USGS, birding groups

Total Respondents **1**

20. What are the current monitoring techniques for the Wildlife in Shrub/ Scrub Wetland Habitats 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
Radio telemetry and tracking	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	**1**
Modeling	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	**1**
Coverboard routes	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	**0**
Spot mapping	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	**1**
Driving a survey route	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	**1**
Reporting from harvest, depredation, or unintentional take (road kill, bycatch)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	**0**
Mark and recapture	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	**1**
Professional survey/census	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	**1**

Volunteer survey/census	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	**1**
Trapping (by any technique)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	**1**
Representative sites	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	**1**
Probabilistic sites	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	**1**
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	**0**
						Total Respondents	**10**

21. Other monitoring techniques for the Wildlife in Shrub/ Scrub Wetland Habitats in Indiana.

No responses were entered for this question.

Total Respondents	**0**
(skipped this question)	1

22. What one or two monitoring techniques would you recommend for effective conservation of the Wildlife in Shrub/ Scrub Wetland Habitats in Indiana?

1. spot-mapping in appropriate habitats

Total Respondents	**1**

23. What current HABITAT inventory and assessment efforts or activities by state agencies are you aware of for the Wildlife in Shrub/ Scrub Wetland Habitats in Indiana?

	Yes, these efforts occur	**No effort that I'm aware of**	**Response Total**
Statewide annual inventory and assessment conducted by state agencies	0% (0)	100% (1)	**1**
Statewide once a year inventory and assessment conducted by state agencies	0% (0)	100% (1)	**1**
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	100% (1)	**1**
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	100% (1)	**1**
Regional or local year-round inventory and assessment conducted by state agencies	0% (0)	100% (1)	**1**
Regional or local once a year inventory and assessment conducted by state agencies	0% (0)	100% (1)	**1**

Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	100% (1)	**1**
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	100% (1)	**1**
		Total Respondents	**8**

24. What current HABITAT inventory and assessment efforts or activities by other organizations are you aware of for the Wildlife in Shrub/ Scrub Wetland Habitats 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	100% (1)	0% (0)	**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**
		Total Respondents	**8**

25. How crucial are these HABITAT efforts by state agencies for the conservation of the Wildlife in Shrub/ Scrub Wetland Habitats 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						
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)	0% (0)	100% (1)	0% (0)	**1**
Regional or local once a year inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	**1**
Periodic regional or local (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 regional or local (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**
				Total Respondents		**8**

26. How crucial are these HABITAT efforts by other organizations for the conservation of the Wildlife in Shrub/ Scrub Wetland Habitats 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 year-round inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	**1**
Statewide once a year inventory and assessment conducted by other organizations	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 other organizations	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	**1**
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	**1**
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	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	**1**
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	**1**
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	**1**
				Total Respondents		**8**

27. Regional or local state agency HABITAT inventory and assessment for the Wildlife in Shrub/ Scrub Wetland Habitats in Indiana.

1. none

Total Respondents **1**

28. Regional or local HABITAT inventory and assessment by other organizations for the Wildlife in Shrub/ Scrub Wetland Habitats in Indiana.

1. statewide aerial imagery

Total Respondents **1**

29. Please list organizations that are monitoring this HABITAT for the Wildlife in Shrub/ Scrub Wetland Habitats in Indiana.

1. USDA?

Total Respondents **1**

30. What are the current HABITAT inventory and/or assessment techniques for Wildlife in Shrub/ Scrub Wetland Habitats 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**
GIS mapping	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	**1**
Aerial							

photography and analysis							
Systematic sampling	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	**1**
Property tax estimates	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
State revenue data	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Regulatory information	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Participation in landuse programs	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Modeling	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	**1**
Voluntary landowner reporting	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	**0**
					Total Respondents		**9**

31. Other HABITAT inventory and assessment techniques for the Wildlife in Shrub/ Scrub Wetland Habitats in Indiana.

No responses were entered for this question.

Total Respondents **0**

(skipped this question) 1

32. What one or two HABITAT inventory and assessment techniques would you recommend for effective conservation of the Wildlife in Shrub/ Scrub Wetland Habitats in Indiana?

1. aerial/satellite imagery coupled with modeling

Total Respondents **1**

33. What is the current body of science for the Wildlife in Shrub/ Scrub Wetland Habitats 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%
Total Respondents		1

34. Please provide a citation (title, author, date, publisher) that would give the best overview of the Wildlife in Shrub/ Scrub Wetland Habitats in Indiana, if available. This resource may be used if further detail is needed.

		Response Total	Response Percent
Title	BNA Account - Golden-winged Warbler	1	100%
Author	JL Confer	1	100%
Date	1992	1	100%
Publisher	American Ornithologists' Union	1	100%
	Total Respondents		1

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

		Response Total	Response Percent
Title	Birds of Indiana	1	100%
Author	R Mumford and C. Keller	1	100%
Date	1984	1	100%
Publisher	Indiana Univerisity Press	1	100%
	Total Respondents		1

36. What is the current HABITAT body of science for the Wildlife in Shrub/ Scrub Wetland Habitats 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%
	Total Respondents		1

37. Please provide a citation (title, author, date, publisher) that would give the best HABITAT overview of the Wildlife in Shrub/ Scrub Wetland Habitats in Indiana, if available. This resource may be used if further detail is needed.

		Response Total	Response Percent
Title	see previous sources	1	100%
Author		0	0%
Date		0	0%
Publisher		0	0%
	Total Respondents		1

38. If possible, please provide a second citation (title, author, date, publisher) that would give another good HABITAT overview of the Wildlife in Shrub/ Scrub Wetland Habitats 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%
	Total Respondents		0
	(skipped this question)		1

39. What are the research needs for the Wildlife in Shrub/ Scrub Wetland Habitats in Indiana?

	Urgently needed	Greatly needed	Needed	Slightly needed	Not needed	Unknown	Response Total
Life cycle	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Distribution and abundance	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Limiting factors (food, shelter, water, breeding sites)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	1
Threats (predators/competition, contamination)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	1
Relationship/dependence on specific habitats	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	1
Population health (genetic and physical)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	1
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
					Total Respondents		6

40. Other research needs for the Wildlife in Shrub/ Scrub Wetland Habitats in Indiana.

No responses were entered for this question.

Total Respondents	**0**
(skipped this question)	1

41. What are the HABITAT research needs for the Wildlife in Shrub/ Scrub Wetland Habitats in Indiana?

	Urgently needed	Greatly needed	Needed	Slightly needed	Not needed	Unknown	Response Total
Successional changes	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	**1**
Distribution and abundance (fragmentation)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	**1**
Threats (land use change/competition, contamination/global warming)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	**1**
Relationship/dependence on specific site conditions	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	**1**
Growth and development of individual components of the habitat	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	**1**
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	**0**
						Total Respondents	**5**

42. Other HABITAT research needs for the Wildlife in Shrub/ Scrub Wetland Habitats 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 Shrub/ Scrub Wetland Habitats in Indiana?

	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
Habitat protection (use below for details)	0% (0)	100% (1)	0% (0)	0% (0)	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**
Reintroduction (restoration)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	**1**
Food plots	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	**1**
Threats reduction	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	**1**

Native predator control	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	**1**
Exotic/invasive species control	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	**1**
Regulation of collecting	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	**1**
Disease/parasite management	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Translocation to new geographic range	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	**1**
Protection of migration routes	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	**1**
Limiting contact with pollutants/contaminants	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Public education to reduce human disturbance	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	**1**
Culling/selective removal	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	**1**
Stocking	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	**1**
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	**0**
				Total Respondents		**16**

44. Other current conservation practices for the Wildlife in Shrub/ Scrub Wetland Habitats in Indiana.

No responses were entered for this question.

Total Respondents **0**

(skipped this question) 1

45. What one or two specific practices would you recommend for more effective conservation of the Wildlife in Shrub/ Scrub Wetland Habitats in Indiana?

1. Habitat protection and habitat manipulation.

Total Respondents **1**

46. How well do the following conservation efforts address the HABITAT threats to the Wildlife in Shrub/ Scrub Wetland Habitats in Indiana?

	Very well	**Somewhat**	**Not at all**	**Not used**	**Unknown**	**Response Total**
Habitat protection through regulation	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	**1**
Habitat protection on public lands	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	**1**
Habitat protection incentives (financial)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	**1**
Habitat restoration through regulation	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	**1**
Habitat restoration on public lands	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	**1**
Habitat restoration incentives (financial)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	**1**
Artificial habitat creation (artificial reefs, nesting platforms)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	**1**

Selective use of functionally equivalent exotic species in place of extirpated natives	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	**1**
Succession control (fire, mowing)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	**1**
Corridor development/protection	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	**1**
Managing water regimes	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	**1**
Pollution reduction	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	**1**
Protection of adjacent buffer zone	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	**1**
Restrict public access and disturbance	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	**1**
Land use planning	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	**1**
Technical assistance	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	**1**
Cooperative land management agreements (conservation easements)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	**1**
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	**0**
				Total Respondents		**17**

47. Other current HABITAT conservation practices for the Wildlife in Shrub/ Scrub Wetland Habitats in Indiana.

No responses were entered for this question.

Total Respondents **0**

(skipped this question) 1

48. What one or two specific HABITAT practices would you recommend for more effective conservation of the Wildlife in Shrub/ Scrub Wetland Habitats in Indiana?

1. retard succession to desired habitat stage; incentives to conserve shrubby habitats.

Total Respondents **1**

49. Do you have any additional comments or information on the Wildlife in Shrub/ Scrub Wetland Habitats that you feel would be useful in the development of the Indiana Comprehensive Wildlife Strategy?

No responses were entered for this question.

Total Respondents **-1**

(skipped this question) 2

6. Please rank the following threats to ALL Amphibians in ALL Habitats in Indiana.

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total
Invasive/non-native species	6% (1)	11% (2)	11% (2)	11% (2)	11% (2)	50% (9)	**18**
High sensitivity to pollution	0% (0)	11% (2)	28% (5)	11% (2)	6% (1)	44% (8)	**18**
Bioaccumulation of contaminants	6% (1)	0% (0)	6% (1)	11% (2)	6% (1)	72% (13)	**18**
Predators (native or domesticated)	6% (1)	0% (0)	6% (1)	12% (2)	6% (1)	71% (12)	**17**
Dependence on other species (mutualism, pollinators)	6% (1)	6% (1)	0% (0)	0% (0)	17% (3)	72% (13)	**18**
Diseases/parasites (of the species itself)	0% (0)	0% (0)	6% (1)	6% (1)	0% (0)	88% (15)	**17**
Regulated hunting/fishing pressure (too much)	0% (0)	0% (0)	0% (0)	6% (1)	65% (11)	29% (5)	**17**
Species over population	0% (0)	0% (0)	0% (0)	6% (1)	71% (12)	24% (4)	**17**
Unintentional take/ direct mortality (e.g., vehicle collisions, power line collisions, by-catch, harvesting equipment, land preparation machinery)	0% (0)	0% (0)	6% (1)	12% (2)	41% (7)	41% (7)	**17**
Unregulated collection pressure	0% (0)	0% (0)	6% (1)	0% (0)	59% (10)	35% (6)	**17**
Dependence on irregular resources (cyclical annual variations) (e.g., food, water, habitat limited due to annual variations in availability)	24% (4)	12% (2)	24% (4)	6% (1)	6% (1)	29% (5)	**17**
					Total Respondents		**191**

7. Please also rank these threats to ALL Amphibians in ALL Habitats in Indiana.

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total
Habitat loss (breeding range)	47% (8)	35% (6)	6% (1)	6% (1)	0% (0)	6% (1)	**17**
Habitat loss (feeding/foraging areas)	35% (6)	35% (6)	12% (2)	6% (1)	6% (1)	6% (1)	**17**
Small native range (high endemism)	19% (3)	6% (1)	6% (1)	6% (1)	56% (9)	6% (1)	**16**
Near limits of natural geographic range	18% (3)	18% (3)	12% (2)	6% (1)	47% (8)	0% (0)	**17**

Large home range requirements	0% (0)	0% (0)	6% (1)	6% (1)	71% (12)	18% (3)	**17**
Viable reproductive population size or availability	0% (0)	0% (0)	12% (2)	12% (2)	24% (4)	53% (9)	**17**
Specialized reproductive behavior or low reproductive rates	0% (0)	0% (0)	18% (3)	0% (0)	41% (7)	41% (7)	**17**
Degradation of movement/migration routes (overwintering habitats, nesting and staging sites)	12% (2)	24% (4)	18% (3)	6% (1)	6% (1)	35% (6)	**17**
Genetic pollution (hybridization)	0% (0)	0% (0)	6% (1)	12% (2)	47% (8)	35% (6)	**17**
Unknown	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (3)	**3**
Other (please specify below)	50% (1)	50% (1)	0% (0)	0% (0)	0% (0)	0% (0)	**2**
					Total Respondents		**157**

8. Other threats to ALL Amphibians in ALL Habitats in Indiana.

1. Changes in burowing crayfish or rodent populations that would impact the availability of burrows.
2. Introduction of fish into formally fishless breeding waters.
3. Development of barriers between the Crayfish frog's burrow and breeding waters.

Total Respondents **1**

(skipped this question) 21

9. Please briefly describe the top two threats to ALL Amphibians in ALL Habitats in Indiana identified above.

1. Oxidus gracilis is a non-native carnivorous millipede invading caves in the east; it is now in several Indiana caves and is preying on the food base for cave salamanders. Further east, reports of greatly decreased insect diversity in caves invaded by this millipide have been reported. Potential impact is unknown, but could be significant.

2. -Loss of ephemeral wetlands is the top threat; unfortunately, most existing ephemeral wetlands have been destroyed in Indiana. Even more unfortunately, many of them were destroyed with the misguided notion that deep water was better for wildlife - landowners were advised to dredge out the ephemeral wetlands to provide duck habitat. These fish-infested deep waters have no habitat for Plains leopard frog.
-invasive species like reed canary grass are proliferating in the habitats that remain, decreasing plant diversity, cover, and the overall health of the wetland.

3. Habitat destruction and habitat degradation

4. Habitat loss & habitat degradation

5. Loss of ephemeral wetland breeding habitat and invasive Purple Loosrife.

6. Habtiat loss and degradation

7. Loss & degradation of ephemeral wetland and upland forested habitat

8. Loss of ephemeral & semipermanent wetlands

9. Wetland loss and degradation

10. Only a few locations are known to have green salamanders in Indiana and this is a habitat specialist needing rocky outcrops in forested areas.

11. The green salamander is only found at two sites in Indiana, are at the edge of the geographic range and they are habitat specialists.

12. Wetland loss & degradation

13. Hellbenders has a small geographic range and population sizes in Indiana. In many locations there is concern about low reproductive rates, but this is unknown in Indiana populations.

14. Extreme rarity & habitat loss

15. 1. Land use changes or other factors that impact the availability and persistence of suitable burrows.
2. Introduction of fish into formally fishless breeding waters and the development of barriers between the Crayfish frog's burrow and breeding waters.

16. Loss of ephemeral wetland habitat and increase in migration distance to breeding sites as a result of this loss are the biggest threats to the species.

Total Respondents	**16**
(skipped this question)	6

10. Please rank the following threats to the HABITAT of ALL Amphibians in ALL Habitats in Indiana.

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total
Commercial or residential development (sprawl)	6% (1)	35% (6)	47% (8)	6% (1)	0% (0)	6% (1)	**17**
Counterproductive financial incentives or regulations	0% (0)	6% (1)	0% (0)	12% (2)	18% (3)	65% (11)	**17**
Invasive/non-native species	0% (0)	6% (1)	12% (2)	12% (2)	12% (2)	59% (10)	**17**
Nonpoint source pollution (sedimentation and nutrients)	0% (0)	0% (0)	24% (4)	12% (2)	0% (0)	65% (11)	**17**
Habitat fragmentation	24% (4)	47% (8)	18% (3)	12% (2)	0% (0)	0% (0)	**17**

Successional change	0% (0)	0% (0)	6% (1)	12% (2)	18% (3)	65% (11)	**17**
Diseases (of plants that create habitat)	0% (0)	0% (0)	0% (0)	0% (0)	6% (1)	94% (16)	**17**
Habitat degradation	47% (8)	41% (7)	6% (1)	6% (1)	0% (0)	0% (0)	**17**
Climate change	0% (0)	0% (0)	0% (0)	6% (1)	0% (0)	94% (16)	**17**
Stream channelization	6% (1)	6% (1)	18% (3)	6% (1)	47% (8)	18% (3)	**17**
Impoundment of water/flow regulation	6% (1)	6% (1)	24% (4)	0% (0)	47% (8)	18% (3)	**17**
Agricultural/forestry practices	19% (3)	38% (6)	19% (3)	12% (2)	0% (0)	12% (2)	**16**
Residual contamination (persistent toxins)	0% (0)	0% (0)	19% (3)	25% (4)	0% (0)	56% (9)	**16**
Point source pollution (continuing)	0% (0)	6% (1)	18% (3)	18% (3)	0% (0)	59% (10)	**17**
Mining/acidification	6% (1)	0% (0)	12% (2)	29% (5)	0% (0)	53% (9)	**17**
Drainage practices (stormwater runoff)	6% (1)	18% (3)	18% (3)	6% (1)	18% (3)	35% (6)	**17**
Unknown	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	**2**
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	**0**
					Total Respondents		**272**

11. Other HABITAT threats to ALL Amphibians in ALL Habitats in Indiana.

No responses were entered for this question.

Total Respondents **0**

(skipped this question) 22

12. Please briefly describe the top two HABITAT threats to ALL Amphibians in ALL Habitats in Indiana identified above.

1. Forestry practices that open the forest canopy around cave entrances can greatly impact the habitat for this species, drying out the entrance to the point it is not useable habitat by the salamanders.
2. Loss of ephemeral wetland habitat, invasion of wetlands by species like reed canary grass, cattails, purple loosestrife or other invasives that create monocultures, agricultural practices that destroy ephemeral wetlands.
3. Habitat destruction and degradation of ephemeral wetlands

4. Habitat loss & degradation
5. Ephemeral Wetland loss and fragmentation
6. Habitat loss & degradation
7. Habitat loss & degradation
8. Habitat loss & degradation
9. Habitat degradation & fragmentation
10. Habitat degradation and fragmentation due to deforestation.
11. Habitat loss, degradation & fragmentation due to deforestation around rocky outcrops.
12. Habitat degradation & fragmentation
13. Habitat degradation of streams
14. Habitat fragmentation & degradation
15. 1. Cattle grazing, farming, and development activities that affect the persistence of burrows in formally flooded or moist grasslands.
    2. Draining of breeding ponds, ditche etc. or introduction of fish into breeding waters.
16. Habitat degradation or loss and fragmentation of habitat are the largest threats.

Total Respondents	**16**
(skipped this question)	6

13. What current monitoring efforts by state agencies are you aware of for ALL Amphibians in ALL Habitats in Indiana?

	Yes, these efforts occur	Not aware of these efforts occuring	Response Total
Statewide year-round monitoring conducted by state agencies	12% (2)	88% (14)	**16**
Statewide once a year monitoring conducted by state agencies	20% (3)	80% (12)	**15**
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	7% (1)	93% (14)	**15**
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	14% (2)	86% (12)	**14**
Regional or local year-round monitoring conducted by state agencies	12% (2)	88% (14)	**16**

Regional or local once a year monitoring conducted by state agencies	7% (1)	93% (13)	**14**
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	7% (1)	93% (14)	**15**
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	20% (3)	80% (12)	**15**
		Total Respondents	**120**

14. What current monitoring efforts by other organizations are you aware of for ALL Amphibians in ALL Habitats in Indiana?

	Yes, these efforts occur	Not aware of these efforts occuring	Response Total
Statewide year-round monitoring conducted by other organizations	0% (0)	100% (16)	**16**
Statewide once a year monitoring conducted by other organizations	0% (0)	100% (16)	**16**
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (16)	**16**
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (16)	**16**
Regional or local year-round monitoring conducted by other organizations	6% (1)	94% (15)	**16**
Regional or local once a year monitoring conducted by other organizations	38% (6)	62% (10)	**16**
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	25% (4)	75% (12)	**16**
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	56% (9)	44% (7)	**16**
		Total Respondents	**128**

15. How crucial are these monitoring efforts by state agencies for the conservation of ALL Amphibians in ALL Habitats in Indiana?

	Very crucial	Somewhat crucial	Slightly crucial	Not crucial	Unknown	Response Total

Statewide year-round monitoring conducted by state agencies	15% (2)	8% (1)	0% (0)	8% (1)	69% (9)	**13**
Statewide once a year monitoring conducted by state agencies	29% (4)	0% (0)	0% (0)	7% (1)	64% (9)	**14**
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	17% (2)	8% (1)	8% (1)	0% (0)	67% (8)	**12**
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	17% (2)	0% (0)	0% (0)	0% (0)	83% (10)	**12**
Regional or local year-round monitoring conducted by state agencies	17% (2)	8% (1)	0% (0)	8% (1)	67% (8)	**12**
Regional or local once a year monitoring conducted by state agencies	8% (1)	0% (0)	0% (0)	8% (1)	83% (10)	**12**
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	17% (2)	0% (0)	0% (0)	8% (1)	75% (9)	**12**
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	15% (2)	8% (1)	0% (0)	8% (1)	69% (9)	**13**
				Total Respondents		**100**

16. How crucial are these monitoring efforts by other organizations for the conservation of ALL Amphibians in ALL Habitats in Indiana?

	Very crucial	**Somewhat crucial**	**Slightly crucial**	**Not crucial**	**Unknown**	**Response Total**
Statewide year-round monitoring conducted by other organizations	0% (0)	9% (1)	0% (0)	9% (1)	82% (9)	**11**
Statewide once a year monitoring conducted by other organizations	9% (1)	0% (0)	0% (0)	9% (1)	82% (9)	**11**
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	9% (1)	9% (1)	9% (1)	0% (0)	73% (8)	**11**
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	9% (1)	0% (0)	0% (0)	9% (1)	82% (9)	**11**
Regional or local year-round monitoring conducted by other organizations	9% (1)	9% (1)	0% (0)	9% (1)	73% (8)	**11**
Regional or local once a year monitoring conducted by other organizations	38% (5)	15% (2)	0% (0)	8% (1)	38% (5)	**13**

Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	8% (1)	17% (2)	17% (2)	8% (1)	50% (6)	**12**
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	15% (2)	15% (2)	38% (5)	8% (1)	23% (3)	**13**
					Total Respondents	**93**

17. Regional or local state agency monitoring for ALL Amphibians in ALL Habitats in Indiana.

1. None
2. None
3. IDNR has a NAAMP frog call program
4. INDR Nature Preserve Division
5. IDNR Fish & Wildlife Division
6. INDR runs a NAAMP frog monitory program
7. The Wildlife Diversity Section of the DFW coordinates Indiana's North American Amphibian Monitoring and Frog Watch Programs. These two programs collectively are the statewide effort to monitor frog and toad populations in Indiana, including bull frogs. The data can be analysised regionally.
8. Statewide within the range of Crawfish frogs: he Indiana Amphibian Monitoring Program (IAMP) part of the North American Amphibian Monitoring Program and Frog Watch are conducted annually during the crawfish frog breeding season. The data can be analyzed regionally
9. IDNR, Non-game herpetologist incorporates this as part of the annual field season.

Total Respondents	**9**
(skipped this question)	13

18. Regional or local monitoring by other organizations for ALL Amphibians in ALL Habitats in Indiana.

1. NW Indiana (Newton, Jasper, Pulaski, Lake, Porter counties).
2. Newton, Jasper, Pulaski, Starke, Lake & Porter Counties
3. Chicago Wilderness
   Robert Brodman, Saint Joseph's College

4. Spencer Cortwright, IUN
Robert Brodman, Saint Joseph's College

5. Robert Brodman, Saint Joseph's College

6. Brodman, Saint Joseph's College
Cortwright, IUN

7. Robert Brodman, Saint Joseph's College

8. Robert Brodman, Saint Joseph's College in NW Indiana

9. None known

10. Univerisity professors and members of the Herpetology TAC for the State of Indiana as part of their annual field season.

Total Respondents	**10**
(skipped this question)	12

19. Please list organizations that are monitoring ALL Amphibians in ALL Habitats in Indiana.

1. Robert Brodman, Saint Joseph's College

2. Robert Brodman, Saint Joseph's College

3. Chicago Wilderness
Robert Brodman, Saint Joseph's College

4. Spencer Cortwright, IUN
Robert Brodman, Saint Joseph's College

5. Brodman, Saint Joseph's College
Cortwright, IUN

6. None known

Total Respondents	**6**
(skipped this question)	16

20. What are the current monitoring techniques for ALL Amphibians in ALL Habitats in Indiana?

	Frequently, Occasionally	Not used but possible	Not used and not possible	Not	Response

			with existing technology and data	with existing technology and data			
Radio telemetry and tracking	0% (0)	0% (0)	69% (11)	19% (3)	0% (0)	12% (2)	**16**
Modeling	0% (0)	6% (1)	75% (12)	0% (0)	0% (0)	19% (3)	**16**
Coverboard routes	0% (0)	14% (2)	14% (2)	57% (8)	0% (0)	14% (2)	**14**
Spot mapping	0% (0)	0% (0)	33% (5)	0% (0)	0% (0)	67% (10)	**15**
Driving a survey route	12% (2)	6% (1)	0% (0)	62% (10)	0% (0)	19% (3)	**16**
Reporting from harvest, depredation, or unintentional take (road kill, bycatch)	0% (0)	6% (1)	0% (0)	69% (11)	0% (0)	25% (4)	**16**
Mark and recapture	0% (0)	0% (0)	88% (14)	0% (0)	0% (0)	12% (2)	**16**
Professional survey/census	47% (7)	40% (6)	0% (0)	0% (0)	0% (0)	13% (2)	**15**
Volunteer survey/census	19% (3)	6% (1)	50% (8)	12% (2)	0% (0)	12% (2)	**16**
Trapping (by any technique)	33% (5)	13% (2)	40% (6)	0% (0)	0% (0)	13% (2)	**15**
Representative sites	31% (5)	50% (8)	0% (0)	0% (0)	0% (0)	19% (3)	**16**
Probabilistic sites	38% (5)	46% (6)	0% (0)	0% (0)	0% (0)	15% (2)	**13**
Other (please specify below)	0% (0)	33% (1)	0% (0)	0% (0)	0% (0)	67% (2)	**3**
					Total Respondents		**187**

21. Other monitoring techniques for ALL Amphibians in ALL Habitats in Indiana.

1. Bull frog tadpoles and adults are often recorded during amphibian surveys of particular sites, such as a military base or superfund sites. Bull frogs are also encountered and recorded during fish surveys.
2. Sampling for eggs or larva.

Total Respondents **2**

(skipped this question)	20

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

1. Minnow trapping and possible either mark recapture or telemtry
2. Minnow trapping and iether mark recapture or telemtry
3. Frog call surveys and tadpole surveys
4. Professional survey and either mark recapture or telemetry
5. Fall surveys at breeding sites
6. Aquatic surveys for eggs & larva, trapping during breeding migration
7. Aquatic surveys and minnow traps
8. Systematic surveys in & near rocky outcrops
9. Professional surveys
10. Professional Survey
11. Call surveys and systematic sampling
12. More intensive call surveys and larva surveys, especially to determine how far the adults are traveling to deposit their eggs.
13. Pit-fall traps and cover board objects near ephemeral wetland breeding sites.

Total Respondents	**13**
(skipped this question)	9

23. What current HABITAT inventory and assessment efforts or activities by state agencies are you aware of for ALL Amphibians in ALL Habitats in Indiana?

	Yes, these efforts occur	No effort that I'm aware of	Response Total
Statewide annual inventory and assessment conducted by state agencies	6% (1)	94% (15)	**16**
Statewide once a year inventory and assessment conducted by state agencies	6% (1)	94% (15)	**16**
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	6% (1)	94% (15)	**16**

Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	12% (2)	88% (14)	**16**
Regional or local year-round inventory and assessment conducted by state agencies	6% (1)	94% (15)	**16**
Regional or local once a year inventory and assessment conducted by state agencies	6% (1)	94% (15)	**16**
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	6% (1)	94% (15)	**16**
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	19% (3)	81% (13)	**16**
		Total Respondents	**128**

24. What current HABITAT inventory and assessment efforts or activities by other organizations are you aware of for ALL Amphibians in ALL Habitats 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% (16)	**16**
Statewide once a year inventory and assessment conducted by other organizations	0% (0)	100% (16)	**16**
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (15)	**15**
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	7% (1)	93% (14)	**15**
Regional or local year-round inventory and assessment conducted by other organizations	19% (3)	81% (13)	**16**
Regional or local once a year inventory and assessment conducted by other organizations	31% (5)	69% (11)	**16**
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	31% (5)	69% (11)	**16**
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	56% (9)	44% (7)	**16**
		Total Respondents	**126**

25. How crucial are these HABITAT efforts by state agencies for the conservation of ALL Amphibians in ALL Habitats 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	18% (2)	9% (1)	9% (1)	0% (0)	64% (7)	**11**
Statewide once a year inventory and assessment conducted by state agencies	9% (1)	9% (1)	0% (0)	0% (0)	82% (9)	**11**
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	9% (1)	0% (0)	9% (1)	0% (0)	82% (9)	**11**
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	9% (1)	0% (0)	9% (1)	0% (0)	82% (9)	**11**
Regional or local year-round inventory and assessment conducted by state agencies	0% (0)	18% (2)	0% (0)	0% (0)	82% (9)	**11**
Regional or local once a year inventory and assessment conducted by state agencies	9% (1)	0% (0)	9% (1)	0% (0)	82% (9)	**11**
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	9% (1)	0% (0)	9% (1)	0% (0)	82% (9)	**11**
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	9% (1)	9% (1)	9% (1)	0% (0)	73% (8)	**11**
				Total Respondents		**88**

26. How crucial are these HABITAT efforts by other organizations for the conservation of ALL Amphibians in ALL Habitats in Indiana?

	These efforts are very crucial	These efforts are somewhat crucial for	These efforts are slightly	These efforts are not crucial	Unknown	Response Total

	for this HABITAT	this HABITAT	crucial for this HABITAT	for this HABITAT		
Statewide year-round inventory and assessment conducted by other organizations	0% (0)	9% (1)	0% (0)	0% (0)	91% (10)	**11**
Statewide once a year inventory and assessment conducted by other organizations	9% (1)	9% (1)	0% (0)	0% (0)	82% (9)	**11**
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	9% (1)	0% (0)	9% (1)	0% (0)	82% (9)	**11**
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	9% (1)	0% (0)	9% (1)	0% (0)	82% (9)	**11**
Regional or local year-round inventory and assessment conducted by other organizations	17% (2)	17% (2)	0% (0)	0% (0)	67% (8)	**12**
Regional or local once a year inventory and assessment conducted by other organizations	25% (3)	17% (2)	8% (1)	0% (0)	50% (6)	**12**
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	9% (1)	9% (1)	27% (3)	0% (0)	55% (6)	**11**
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	17% (2)	17% (2)	50% (6)	0% (0)	17% (2)	**12**
				Total Respondents		**91**

27. Regional or local state agency HABITAT inventory and assessment for ALL Amphibians in ALL Habitats in Indiana.

1. DFW - nongame
2. Frog call surveys include rural and agricultural areas throughout the state.
3. None known
(Bull frogs are amphibian habitat generalist and fairly mobile. I know of no habitat inventory protocol for bull frogs in developed land habitat.)
4. None:
Crawfish frog habitat is not well understood and is not currently being inventoried to my knowledge. Grasslands may be monitored by not all grasslands are crawfish frog habitat.

Total Respondents	**4**
(skipped this question)	18

28. Regional or local HABITAT inventory and assessment by other organizations for ALL Amphibians in ALL Habitats in Indiana.

1. Indiana Karst Conservancy and local grottos
2. Kankakee Sands and other Conservancy preserves - staff evaluate the restored/created habitat to judge its ability to support Plains leopard frog and other species of concern.
3. NW Indiana (Newton, Jasper, Pulaski, Lake & Porter Counties)
4. Newton, Jasper, Starke, Pulaski, Lake & Porter counties
5. Chicago Wilderness & Saint Joseph's College have frog call monitoring programs in NW IN.
6. Cortwright monitors populations in Brown County & Porter County
   Brodman monitors them in Owens County
7. Brodman in NW Indiana
8. Brodman, Saint Joseph's College in NW Indiana
   Cortwright, IUN in Brown County
9. Robert Brodman, Saint Joseph's College in NW Indiana
10. None known
11. None:
    Crawfish frog habitat is not well understood and is not currently being inventoried to my knowledge. Grasslands may be monitored by not all grasslands are crawfish frog habitat.

Total Respondents	**11**
(skipped this question)	11

29. Please list organizations that are monitoring this HABITAT for ALL Amphibians in ALL Habitats in Indiana.

1. Indiana Karst Conservancy and local grottos
2. TNC.
3. Robert Brodman, Saint Joseph's College
4. Robert Brodman, Saint Joseph's College
5. None known

6.	None: Crawfish frog habitat is not well understood and is not currently being inventoried to my knowledge. Grasslands may be monitored by not all grasslands are crawfish frog habitat.
7.	IDNR, Non-game Herpetologist; University Professors, members of the Herpetology TAC Committee for the State of Indiana

Total Respondents **7**

(skipped this question) 15

30. What are the current HABITAT inventory and/or assessment techniques for ALL Amphibians in ALL Habitats 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
GIS mapping	6% (1)	0% (0)	75% (12)	0% (0)	0% (0)	19% (3)	**16**
Aerial photography and analysis	0% (0)	25% (4)	56% (9)	0% (0)	0% (0)	19% (3)	**16**
Systematic sampling	38% (6)	31% (5)	12% (2)	0% (0)	0% (0)	19% (3)	**16**
Property tax estimates	0% (0)	0% (0)	0% (0)	60% (9)	0% (0)	40% (6)	**15**
State revenue data	0% (0)	0% (0)	0% (0)	60% (9)	0% (0)	40% (6)	**15**
Regulatory information	0% (0)	0% (0)	0% (0)	60% (9)	0% (0)	40% (6)	**15**
Participation in landuse programs	0% (0)	0% (0)	0% (0)	53% (8)	0% (0)	47% (7)	**15**
Modeling	0% (0)	6% (1)	69% (11)	0% (0)	0% (0)	25% (4)	**16**
Voluntary landowner reporting	0% (0)	0% (0)	6% (1)	44% (7)	0% (0)	50% (8)	**16**
Other (please specify below)	0% (0)	60% (3)	0% (0)	0% (0)	0% (0)	40% (2)	**5**
						Total Respondents	**145**

31. Other HABITAT inventory and assessment techniques for ALL Amphibians in ALL Habitats in Indiana.

1. Visual estimation - has the entrance been changed in anyway from its historical configuration (forest canopy opened up, entrance enlarged or blocked, etc.)
2. Visual estimate of amount of appropriate habitat being provided in restored areas.
3. If there was a significant decline in bull frog habitat on state owned properties the state would hear about it from frog hunters.
4. None known
5. Pit-fall trapping and cover board objects adjacent to ephemeral wetlands; mark and recapture

Total Respondents **5**

(skipped this question) 17

32. What one or two HABITAT inventory and assessment techniques would you recommend for effective conservation of ALL Amphibians in ALL Habitats in Indiana?

1. Systematic sampling (intesive) and GIS (less intensive)
2. suvery (intensive) and GIS (less intenstive)
3. Systematic surveys & GIS
4. Surveys
5. systematic sampling and GIS
6. Systematic sampling & GIS
7. Systematic sampling & GIS
8. Sysematic sampling & GIS
9. Systematic survey & GIS
10. Systematic survey & GIS
11. Urban residents could be encouraged to participate in the Frog Watch program.
12. Crawfish frog habitat may be described by a combination of hydrology, soil type, proximity to breeding waters, and vegetation. These factors should be investigated to develop a model for crawfish frog habitat.
13. Pit-fall traps and cover boards can be used to assess population size and use of ephemeral wetlands for breeding; Mark and recapture can be used to determine migration patterns and use of specific ephemeral wetlands for breeding

Total Respondents	**13**
(skipped this question)	9

33. What is the current body of science for ALL Amphibians in ALL Habitats in Indiana?

	Response Total	Response Percent
Complete, up to date and extensive	**0**	**0%**
Adequate	**2**	**12%**
Inadequate	**13**	**81%**
Nonexistent	**1**	**6%**
Other (please explain below)	**0**	**0%**
Total Respondents		**16**
(skipped this question)		6

34. Please provide a citation (title, author, date, publisher) that would give the best overview of ALL Amphibians in ALL 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 = The Status of Amphibians in Rural Northwest Indiana;
Author = Brodman, R., and M. Kilmurry;
Date = 1998;
Publisher = Iowa University Press, Iowa City, Iowa

Title = Discovery of green salamanders in Indiana and a distributional survey. In Status & Conservation of Midwestern Amphibians;
Author = Robert Madej;
Date = 1998;
Publisher = University of Iowa Press, Iowa City

Title = Amphibians and Reptiles of Indiana;
Author = Sherman A. Minton, Jr.;
Date = 2001;
Publisher = Indiana Academy of Sciences

Total Respondents	**10**

(skipped this question) 12

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

Title = Multivariate analyses of the influences of water chemistry and habitat parameters on the abundances of pond-breeding amphibians.;
Author = Robert Brodman et al;
Date = 2003;
Publisher = Journal of Freshwater Ecology 18: 425-436.

Title = Ten- to eleven-year population trends of two pond-breedong amphibian species, red-spotted newts and green frogs. In Status & Conservation of Midwester;
Author = Spencer Cortwright;
Date = 1998;
Publisher = University of Iowa Press, Iowa City

Title = Green salamander: Family plethodontidae, Aneides aeneus Cope and Packard, 1881.;
Author = Pauley, T. K. and M.B. Watson;
Date = 2005;
Publisher = In: Amphibian Declines: The Conservation Status of United States Species. M. Lannoo, (ed.), University of

Author = www.natureserve.org/explorer

Total Respondents **6**

(skipped this question) 16

36. What is the current HABITAT body of science for ALL Amphibians in ALL Habitats in Indiana?

	Response Total	Response Percent
Complete, up to date and extensive	**0**	**0%**
Adequate	**0**	**0%**
Inadequate	**13**	**81%**
Nonexistent	**3**	**19%**
Other (please explain below)	**0**	**0%**

Total Respondents **16**

(skipped this question) 6

37. Please provide a citation (title, author, date, publisher) that would give the best HABITAT overview of ALL Amphibians in ALL 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.

Total Respondents	**1**
(skipped this question)	21

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

Total Respondents	**0**
(skipped this question)	22

39. What are the research needs for ALL Amphibians in ALL Habitats in Indiana?

	Urgently needed	Greatly needed	Needed	Slightly needed	Not needed	Unknown	Response Total
Life cycle	6% (1)	6% (1)	56% (9)	25% (4)	6% (1)	0% (0)	**16**
Distribution and abundance	31% (5)	31% (5)	25% (4)	12% (2)	0% (0)	0% (0)	**16**
Limiting factors (food, shelter, water, breeding sites)	69% (11)	6% (1)	19% (3)	6% (1)	0% (0)	0% (0)	**16**
Threats (predators/competition, contamination)	69% (11)	6% (1)	19% (3)	6% (1)	0% (0)	0% (0)	**16**
Relationship/dependence on specific habitats	62% (10)	19% (3)	0% (0)	12% (2)	6% (1)	0% (0)	**16**
Population health (genetic and physical)	38% (6)	31% (5)	12% (2)	12% (2)	0% (0)	6% (1)	**16**
Other (please specify below)	0% (0)	33% (1)	0% (0)	0% (0)	0% (0)	67% (2)	**3**
					Total Respondents		**99**

40. Other research needs for ALL Amphibians in ALL Habitats in Indiana.

1. Quite little is known about much of the basic natural history for amphibians
2. Very little is known about the basic natural history, population ecology and abundance in Indiana of the lesser siren.
3. None known
4. Amphibians are in great need of study on all aspects of its ecology.
5. Information on metapopulation dynamics and migration distances to and from ephemeral wetlands are needed. Information on how many ephemeral wetland habitats within the landscape are needed to maintain healthy populations of the Spotted salamander s is also needed. Information on buffer size and vegetation composition around ephemeral wetlands is needed.

Total Respondents	**5**
(skipped this question)	17

41. What are the HABITAT research needs for ALL Amphibians in ALL Habitats in Indiana?

	Urgently needed	Greatly needed	Needed	Slightly needed	Not needed	Unknown	Response Total
Successional changes	0% (0)	6% (1)	69% (11)	19% (3)	0% (0)	6% (1)	**16**
Distribution and abundance (fragmentation)	50% (8)	31% (5)	12% (2)	6% (1)	0% (0)	0% (0)	**16**
Threats (land use change/competition, contamination/global warming)	62% (10)	19% (3)	12% (2)	6% (1)	0% (0)	0% (0)	**16**
Relationship/dependence on specific site conditions	56% (9)	19% (3)	6% (1)	6% (1)	6% (1)	6% (1)	**16**
Growth and development of individual components of the habitat	6% (1)	25% (4)	44% (7)	6% (1)	6% (1)	12% (2)	**16**
Other (please specify below)	0% (0)	33% (1)	0% (0)	0% (0)	0% (0)	67% (2)	**3**
					Total Respondents		**83**

42. Other HABITAT research needs for ALL Amphibians in ALL Habitats in Indiana.

1. Factors that limit the distribution of sirens in Indiana
2. None known
3. Crawfish frog habitat needs to be adequately described.

4.	Information on metapopulation dynamics and migration distances to and from ephemeral wetlands are needed. Information on how many ephemeral wetland habitats within the landscape are needed to maintain healthy populations of the amphibian species is also needed. Information on buffer size and vegetation composition around ephemeral wetlands is needed.	
	Total Respondents	**4**
	(skipped this question)	18

43. How well do the following conservation efforts address the threats to ALL Amphibians in ALL Habitats in Indiana?

	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
Habitat protection (use below for details)	44% (7)	31% (5)	0% (0)	0% (0)	25% (4)	**16**
Population management (hunting, trapping)	0% (0)	0% (0)	6% (1)	62% (10)	31% (5)	**16**
Population enhancement (captive breeding and release)	0% (0)	0% (0)	0% (0)	75% (12)	25% (4)	**16**
Reintroduction (restoration)	0% (0)	0% (0)	0% (0)	81% (13)	19% (3)	**16**
Food plots	0% (0)	0% (0)	0% (0)	81% (13)	19% (3)	**16**
Threats reduction	6% (1)	6% (1)	0% (0)	25% (4)	62% (10)	**16**
Native predator control	0% (0)	0% (0)	0% (0)	38% (6)	62% (10)	**16**
Exotic/invasive species control	0% (0)	12% (2)	0% (0)	25% (4)	62% (10)	**16**
Regulation of collecting	0% (0)	19% (3)	0% (0)	50% (8)	31% (5)	**16**
Disease/parasite management	0% (0)	0% (0)	0% (0)	56% (9)	44% (7)	**16**
Translocation to new geographic range	0% (0)	6% (1)	0% (0)	69% (11)	25% (4)	**16**
Protection of migration routes	0% (0)	0% (0)	0% (0)	38% (6)	62% (10)	**16**
Limiting contact with pollutants/contaminants	0% (0)	0% (0)	0% (0)	50% (8)	50% (8)	**16**
Public education to reduce human disturbance	0% (0)	12% (2)	6% (1)	25% (4)	56% (9)	**16**
Culling/selective removal	0% (0)	0% (0)	0% (0)	88% (14)	12% (2)	**16**
Stocking	0% (0)	0% (0)	0% (0)	88% (14)	12% (2)	**16**
Other (please specify below)	25% (1)	0% (0)	0% (0)	0% (0)	75% (3)	**4**
					Total Respondents	**260**

44. Other current conservation practices for ALL Amphibians in ALL Habitats in Indiana.

1. Too little is known
2. Bull frog tadpoles could be introduced into an area as by-product to fish stocking or from realeased pet tadpoles.
3. Study burrow making crayfish and their burrows.
4. Wetland restoration

Total Respondents	**4**
(skipped this question)	18

45. What one or two specific practices would you recommend for more effective conservation of ALL Amphibians in ALL Habitats in Indiana?

1. Protect cave entrances from inappropriate management activities.
2. Potection of ephermeral wetlands and wetland complexes.
3. Habitat protection is the key, but we need to better understand factors that limit siren abundnace & distribution.
4. Protection of ephemeral wetlands and control of purple loosesrife
5. Ephermeral Wetland and forested upland habitat protection
6. Protection of fishless breeding habitat, wetland restoration
7. Habitat protection
8. The main threat to green salamander populations is deforestation resulting in loss, degradation or fragmentation of habitat. Logging activities should be managed to keep at least 100m of buffered forest habitat around rock outcrops and cliffs.

   Little is known about the population biology, lifespan, mortality rates, dispersal, colonization of habitats, metapopulation dynamics, and the extent of arboreal activity.
9. Habitat protection
10. Habitat protection
11. Protection & restoration of ephermeral wetlands within the historic range of amphibians.
12. None needed

13.	1. Promote non-disturbance in known crawfish frog habitat. 2. Identification of breeding sites and protect the sites from disturbance and the introduction of fish.
14.	1.Habitat protection needs to be improved greatly. Ephemeral wetlands are not protected or valued as much as other wetlands via regulation. 2.Restoration of ephemeral wetlands and retention of these habitats within the landscape.

Total Respondents	**14**
(skipped this question)	8

46. How well do the following conservation efforts address the HABITAT threats to ALL Amphibians in ALL Habitats in Indiana?

	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
Habitat protection through regulation	31% (5)	38% (6)	0% (0)	6% (1)	25% (4)	**16**
Habitat protection on public lands	56% (9)	31% (5)	0% (0)	0% (0)	12% (2)	**16**
Habitat protection incentives (financial)	6% (1)	25% (4)	6% (1)	12% (2)	50% (8)	**16**
Habitat restoration through regulation	0% (0)	19% (3)	0% (0)	12% (2)	69% (11)	**16**
Habitat restoration on public lands	6% (1)	38% (6)	0% (0)	6% (1)	50% (8)	**16**
Habitat restoration incentives (financial)	0% (0)	12% (2)	6% (1)	12% (2)	69% (11)	**16**
Artificial habitat creation (artificial reefs, nesting platforms)	0% (0)	12% (2)	0% (0)	19% (3)	69% (11)	**16**
Selective use of functionally equivalent exotic species in place of extirpated natives	0% (0)	0% (0)	6% (1)	31% (5)	62% (10)	**16**
Succession control (fire, mowing)	0% (0)	0% (0)	12% (2)	19% (3)	69% (11)	**16**
Corridor development/protection	0% (0)	6% (1)	0% (0)	19% (3)	75% (12)	**16**
Managing water regimes	0% (0)	12% (2)	6% (1)	12% (2)	69% (11)	**16**
Pollution reduction	0% (0)	6% (1)	0% (0)	12% (2)	81% (13)	**16**
Protection of adjacent buffer zone	6% (1)	25% (4)	0% (0)	6% (1)	62% (10)	**16**
Restrict public access and disturbance	0% (0)	6% (1)	0% (0)	12% (2)	81% (13)	**16**
Land use planning	0% (0)	12% (2)	0% (0)	12% (2)	75% (12)	**16**
Technical assistance	0% (0)	6% (1)	6% (1)	19% (3)	69% (11)	**16**
Cooperative land management agreements (conservation easements)	0% (0)	12% (2)	0% (0)	12% (2)	75% (12)	**16**
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	100% (3)	**3**

Total Respondents **275**

47. Other current HABITAT conservation practices for ALL Amphibians in ALL Habitats in Indiana.

1. Many of the current 'conservation practices' and incentive programs promoted by biologists seem to be aimed at ducks and actually manage against amphibians.
2. The development and proliferation of storm water retention ponds.

Total Respondents **2**

(skipped this question) 20

48. What one or two specific HABITAT practices would you recommend for more effective conservation of ALL Amphibians in ALL Habitats in Indiana?

1. Protect cave entrances from disturbance
2. - When creating wetlands under a landowner incentive program, create ephemeral wetlands whenever possible rather than duck ponds.
3. Habitat protection on private & public lands
4. Habitat protection. However more research is needed to address the effectiveness of habitat restoration on siren conservation.
5. Ephermeral wetland protection and restoration
6. Forested emphermeral wetland protection and forest protection
7. Habitat protection & restoration
8. Habtitat protection
9. The main threat to green salamander populations is deforestation resulting in loss, degradation or fragmentation of habitat. Logging activities should be managed to keep at least 100m of buffered forest habitat around rock outcrops and cliffs.
10. Wetland protection
11. Habitat protection
12. Protection and restoration of ephemeral wetlands.
13. None needed
14. Public ownership (purchase) of know crawfish frog habitat and maintenance of the hydrology of the site and associated breeding waters.

15.	Restoration and protection of ephemeral wetlands; protection of buffers needed for amphibians migrating to the ephemeral wetland for breeding;

Total Respondents	**15**
(skipped this question)	7

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

1.	Step one is the need for more information about this species and its abundance in Indiana.
2.	We need to learn a lot more about lesser sirens in order to develop a good conservation design.
3.	The distribution of spotted salamanders in Indiana is more spotty than one might expect.
4.	Research on metapopulation dynamics and colonization of new breeding habitat is needed.
5.	Newts have a spotty distribution in Indiana. We need to better understand the factors that lead to this.
6.	Little is known about the population biology, lifespan, mortality rates, dispersal, colonization of habitats, metapopulation dynamics, the extent of arboreal activity, and the phylogeography of significant evolutionary-units throughout the range.
7.	Four-toed salamanders have a very spotty distribution that is poorly understood. They are often not found in habitats that seem ideally suited but then found in what one might call an inferior site.
8.	Too little in known about amphibians, especially Indiana populations.
9.	It is not known if Rana blairi exists in Indiana. The only known specimen from Indiana were collected and deposited in museums prior to the species even being described. To the best of my knowledge, the most recently documented Rana blairi from Indiana was about 30 years ago.
10.	Bull frogs are mobile, hearty, omnivorousand/indiscriminate predator, and habitat generalist. They are believed to be detrimental to other frogs. They do not require management at this time and should be monitored as an environmental sentinel. If bull frogs start declining then something serious is happening to the environment.
11.	This is a very under-studied species. Research needs to be conducted and management information developed for public land managers and private land owners (education).

Total Respondents	**11**

6. Please rank the following threats to ALL birds in ALL habitats in Indiana.

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total
Invasive/non-native species	0% (0)	10% (5)	40% (20)	20% (10)	20% (10)	10% (5)	**50**
High sensitivity to pollution	0% (0)	2% (1)	22% (11)	35% (17)	16% (8)	24% (12)	**49**
Bioaccumulation of contaminants	0% (0)	6% (3)	22% (11)	32% (16)	12% (6)	28% (14)	**50**
Predators (native or domesticated)	0% (0)	22% (11)	34% (17)	30% (15)	10% (5)	4% (2)	**50**
Dependence on other species (mutualism, pollinators)	0% (0)	0% (0)	2% (1)	16% (8)	71% (35)	10% (5)	**49**
Diseases/parasites (of the species itself)	0% (0)	6% (3)	10% (5)	40% (20)	12% (6)	32% (16)	**50**
Regulated hunting/fishing pressure (too much)	0% (0)	2% (1)	4% (2)	14% (7)	76% (37)	4% (2)	**49**
Species over population	4% (2)	8% (4)	4% (2)	6% (3)	72% (36)	6% (3)	**50**
Unintentional take/ direct mortality (e.g., vehicle collisions, power line collisions, by-catch, harvesting equipment, land preparation machinery)	0% (0)	6% (3)	12% (6)	36% (18)	34% (17)	12% (6)	**50**
Unregulated collection pressure	0% (0)	0% (0)	0% (0)	4% (2)	88% (43)	8% (4)	**49**
Dependence on irregular resources (cyclical annual variations) (e.g., food, water, habitat limited due to annual variations in availability)	0% (0)	14% (7)	30% (15)	20% (10)	18% (9)	18% (9)	**50**
					Total Respondents		**546**

7. Please also rank these threats to ALL birds in ALL habitats in Indiana.

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total
Habitat loss (breeding range)	34% (17)	34% (17)	18% (9)	10% (5)	4% (2)	0% (0)	**50**
Habitat loss (feeding/foraging areas)	28% (14)	34% (17)	22% (11)	10% (5)	6% (3)	0% (0)	**50**
Small native range (high endemism)	2% (1)	6% (3)	12% (6)	10% (5)	67% (33)	2% (1)	**49**
Near limits of natural	0% (0)	2% (1)	10% (5)	24% (12)	62% (31)	2% (1)	**50**

geographic range							
Large home range requirements	0% (0)	2% (1)	10% (5)	20% (10)	61% (30)	6% (3)	**49**
Viable reproductive population size or availability	6% (3)	10% (5)	14% (7)	26% (13)	30% (15)	14% (7)	**50**
Specialized reproductive behavior or low reproductive rates	2% (1)	4% (2)	14% (7)	12% (6)	60% (30)	8% (4)	**50**
Degradation of movement/migration routes (overwintering habitats, nesting and staging sites)	6% (3)	38% (19)	24% (12)	14% (7)	10% (5)	8% (4)	**50**
Genetic pollution (hybridization)	2% (1)	2% (1)	16% (8)	8% (4)	56% (28)	16% (8)	**50**
Unknown	0% (0)	5% (1)	5% (1)	11% (2)	11% (2)	68% (13)	**19**
Other (please specify below)	0% (0)	24% (4)	6% (1)	6% (1)	0% (0)	65% (11)	**17**
					Total Respondents		**484**

8. Other threats to ALL birds in ALL habitats in Indiana.

1. The impacts of herbicides and pesticides drifting over from nearby agricultural lands in unknown.
2. In addition to habitat loss another problem is natural succession in the remaining shrub/scrub habitats.
3. Disturbance by recreational boating.
4. Lack of periodic vegetative disturbance(Man-made or natural every 5-10 yrs)that adequately opens the forest canopy well distributed throughout predominately forested environemnts, espeically in the large contigous forsted areas of the state in public ownership which form the core or heart of the residual and current grouse range. Potential habitat on private lands is fragmented in distribution due to small ownership and different ownerhsip objectives that does not provide a consistenet continuum of accpetable habitat for successful population dispersal. A recent population model analysis based on current habitat conditions and actual grouse population data for Indiana projects that ruffed grouse will potentially disaapear as a viable species in much of their current range by 2007. Ruffed grouse population indices are now at the lowest levels recorded in over 40+ yrs.
5. "Urbanization and domestication of "wild" Mallards leading to the hybridization w/ domestic stock of ducks. The threat is one of unusual circumstance. As opposed to typical habitat loss or fragmentation, this threat constitutes displacement of Mallards into undesirable/"unnatural" areas creating nuisance problems and genetic integrity concerns. The "developed" land itself creates wild scale loss of "high quality" habitat for Mallards. However, Mallard ducks are adaptable creatures and have adapted to this "developed" environment. Nonetheless, their adapativeness could also be their downfall in "developed" lands.

6. Urban Canada Geese are a real problem in Indiana. I deal specifically with Ft. Wayne (Allen County). Canada geese have benefitted from the way humans have altered the landscape within Urban areas. Human-goose conflicts within the urban enviroment will increase.

7. Fire suppression

8. Human interaction wtih species,trapping ,relocation, scarring
Reproductive intervention by humans

9. Fire suppression is a major threat to many, many wildlife species in the state. Savanna habitats are seriously degraded because fire suppression has allowed shade tolerant species to dominate the understory, changing the open savanna structure into a dense forest with an impenetrable understory. Fire keeps the structure open and results in a varied mosaic of habitats, including fire killed trees which provide both food and shelter.

10. Devalueing of wildlife species due to overpopulation
restricted management options

11. X

12. Unknown

13. Unknown

14. Continued loss and degradation of emergent wetland habitat in portions of the state due to development and poor agricultural practices.

15. Serious reduction in timber management and sales on public lands, consequently ES habitats are disappearing in t5he forests. Private timber sales and management is too haphazard to replace the severe losses of young forests on public lands..

16. The lack of public knowledge/information regarding the importance of disturbances and early successional habitat in forested areas is the main contributing factor to the near extirpation of the ruffed grouse. The lack of early successional habitats in forested areas is causing major declines in the ruffed grouse population.

17. Early harvesting of hay crops.

18. Brown-headed cowbird nest parasitism

19. Mowing in June, July and August.

20. We need to know how the Cerulean Warbler is affected by silviculture and other land management, and how these effect demography.

21. Brood parasitism by Brown-headed Cowbird likely has moderate to strong negative impact on population's success.

22. Brood parasitism by Brown-headed Cowbirds in some Cerulean Warbler populations due to fragmentation of forested habitat

23. Tolerance by building managers of nesting sites.

24. unknown	
25. unknown	
Total Respondents	**25**
(skipped this question)	31

9. Please briefly describe the top two threats to ALL birds in ALL habitats in Indiana identified above.

1.	The primary threat is the loss of these farm programs. An additional threat would be the loss or shortening of the primary nesting season dates established by the USDA. Mowing or haying during the quail nesting season would be allowed on enrolled acreage if these dates were eliminated or shortened.
2.	Loss of the habitat in general would be the greatest threat and natural succession of the remaining habitat would be a secondary threat.
3.	Loss or degradation of nesting habitat. Loss or degradation of brood-rearing and foraging areas.
4.	1) Lack of periodic vegetative disturbance(Man-made or natural every 5-10 yrs)that adequately opens the forest canopy well distributed throughout predominately forested environemnts, espeically in the large contigous forsted areas of the state in public ownership which form the core or heart of the residual and current grouse range. 2) Potential habitat on private lands is fragmented in distribution due to small ownership and different ownerhsip objectives (lack of active timber mgmt) that does not provide a consistenet continuum of accpetable habitat for successful population dispersal. A recent population model analysis based on current habitat conditions and actual grouse population data for Indiana projects that ruffed grouse will potentially disaapear as a viable species in much of their current range by 2007. Ruffed grouse population indices are now at the lowest levels recorded in over 40+ yrs.
5.	1) Genetic pollution 2) Population explosions and accompanying diseases, nuisance concerns, etc.
6.	The top two threats to Canada Geese in Developed Land habitats are: Overpopulation and aggressive behavior during courtship/nesting
7.	Loss of Quality nesting and brood habitat. Habitat fragmentation.
8.	Habitat loss (loss of large nesting trees)
9.	Habitat Loss-Urbanization Habitat Loss-Breeding,feeding,foraging
10.	1. Loss of brood rearing habitat. 2. Loss of high quality nesting habitat.
11.	This species is more of an obligate to open areas with scattered dead trees than most Indiana species. Outright loss of this habitat configuration is probably the leading threat to the Red-headed Woodpecker. West Nile Virus is probably currently the second greatest threat.

12. Habitat loss to development and farming (esp. brooding areas, foraging areas, and escape cover)

Predators (esp. domesticated animals)

13. Habitat loss
Degradation of movement/migration routes

14. Water Quality
Human intervention during nesting process.

15. Over population
Migratory habitat loss

16. Fire suppression. See above.

17. Habitat loss
Degradation of movement/migration routes

18. overpopulation
urbanization

19. Loss of shallow marshes due to drainage for development & farming.
Loss of winter feed due to fall tillage.

20. Unknown

21. urbanization
overpopulation

22. Habitat loss through annual cycle
predators

23. Habitat loss due to human/economic growth factors.
Lack of management to maintain/create these types of habitats.

24. 1. General habitat loss due to clean farming practices and residential development.
2. Isolation of habitat or islands of habitat with no connecting travel lanes.

25. - continuing loss and/or degradation of emergent wetlands

- possible disease outbreaks due to large concentrations of birds often in small areas

26. Loss of habitat due to development and poor agricultural practices.
Degradation of habitat by invasive plant species.

27. 1. Loss of early successional forest age class.
2. Preservationist (anti-management folks) and their influence on the politics of timber management and legal challanges to sound timber/wildlife managenent activities.

28. The lack of public knowledge/information regarding the importance of disturbances and early successional habitat in forested areas is the main contributing factor to the near extirpation of the ruffed grouse. The lack of early successional habitats in forested areas is causing major declines in the ruffed grouse population.

29. The near daily loss of emergent type wetlands and the adjacent foraging areas of native vegetation is the greatest threats to some wildlife species. Despite the "no net loss" policies of state and federal government, we are still losing wetlands daily.

30. Loss of large blocks of mature forest and increases in forest fragmentation that causes and increase in cowbird nest parasitism and increases edge nest predators (e.g., bluejays). This causes a decrease in recruitment.

31. Lack of large areas in native grass and mowing during the breeding season.

32. 1. Habitat loss due to wetland drainage.
2. Habitat degradation due to sedimentation, pollution, and invasion by exotic species.

33. 1. We still have very little information on Cerulean Warblers. We need to assess basic demography in Indiana and across the breeding range, learn how this species responds to land management, develop an understanding of post-fledging habitat use, and determine the effect of the brown-headed cowbird on this species.

2. Because there are an area-sensitive species, a loss of large tracts of mature forest on both the breeding and wintering grounds is a critical threat.

34. Habitat loss and fragmentation create small, isolated patches where nest predation and brood parasitism tend to increase.
The timing and frequency of haying, as well as the cover type (alfalfa) can negatively affect nest success and limit productivity.

35. House Sparrow preemption of nests.
Vandalism potential at nesting colonies.

36. Brown-headed Cowbird brood parasitism is likely a significant negative impact.
Nest predation may also be important.
Habitat fragmentation may exacerbate both of these.

37. Eastern Towhee are considered a habitat generalist that uses early successional habitats within deciduous forests. With prevailing land management that does not generate early succession habitat (such as maturation of forest on former farm lands), habitat is reduced. A second top threat is probably loss of nest and nesting females to cats, chipmunks, snakes and other ground predators.

38. Loss of contiguous blocks of mature forest
Low reproductive output - possibly 'sink' populations due to poor habitat quality

39. Availability of undisturbed nesting sites.
Collisions with buildings, powerlines, other structures.

40. Human disturbance.
Modification/degradation of habitats.

41. quality of habitat. Low population size/edge of range.

42. Adequate habitat (primarily American sycamores along riparian areas) in breeding areas.

43. availability and quality of suitable nesting/feeding habitat.

44. Loss and degradation of breeding and foraging habitats along river corridors and uplands.

45. Availability of habitat.
Mowing grasslands.

46. loss of early successional habitat.
hybridization with blue-winged warbler.

47. 1. Loss of mature floodplain forest as nesting habitat.
2. Loss of feeding/foraging areas.

48. Potential habitat loss due development and lack of management.

49. Unclear, but loss of wintering habitat may be a primary threat.
Breeding habitat - lack of gaps in large forest patches.
Predation on nests/eggs.

Total Respondents	**49**
(skipped this question)	7

10. Please rank the following threats to the HABITAT of ALL birds in ALL habitats in Indiana.

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total
Commercial or residential development (sprawl)	25% (13)	41% (21)	24% (12)	6% (3)	4% (2)	0% (0)	**51**
Counterproductive financial incentives or regulations	2% (1)	31% (16)	29% (15)	10% (5)	14% (7)	14% (7)	**51**
Invasive/non-native species	4% (2)	12% (6)	35% (18)	18% (9)	18% (9)	14% (7)	**51**
Nonpoint source pollution (sedimentation and nutrients)	0% (0)	10% (5)	22% (11)	29% (15)	18% (9)	22% (11)	**51**
Habitat fragmentation	18% (9)	32% (16)	32% (16)	8% (4)	8% (4)	2% (1)	**50**
Successional change	20% (10)	24% (12)	24% (12)	20% (10)	12% (6)	2% (1)	**51**
Diseases (of plants that create habitat)	0% (0)	2% (1)	16% (8)	24% (12)	33% (17)	25% (13)	**51**
Habitat degradation	22% (11)	39% (20)	29% (15)	8% (4)	2% (1)	0% (0)	**51**
Climate change	0% (0)	2% (1)	8% (4)	30% (15)	16% (8)	44% (22)	**50**
Stream channelization	6% (3)	24% (12)	10% (5)	18% (9)	37% (19)	6% (3)	**51**
Impoundment of water/flow regulation	2% (1)	16% (8)	14% (7)	24% (12)	33% (17)	12% (6)	**51**

Agricultural/forestry practices	20% (10)	37% (19)	25% (13)	8% (4)	6% (3)	4% (2)	**51**
Residual contamination (persistent toxins)	0% (0)	2% (1)	27% (14)	29% (15)	16% (8)	25% (13)	**51**
Point source pollution (continuing)	0% (0)	6% (3)	18% (9)	39% (20)	14% (7)	24% (12)	**51**
Mining/acidification	0% (0)	4% (2)	16% (8)	20% (10)	35% (17)	24% (12)	**49**
Drainage practices (stormwater runoff)	2% (1)	10% (5)	20% (10)	18% (9)	33% (17)	18% (9)	**51**
Unknown	0% (0)	0% (0)	10% (2)	15% (3)	5% (1)	70% (14)	**20**
Other (please specify below)	20% (3)	13% (2)	7% (1)	0% (0)	0% (0)	60% (9)	**15**
					Total Respondents		**847**

11. Other HABITAT threats to ALL birds in ALL habitats in Indiana.

1. If the farm bill programs (e.g. CRP) were to be eliminated the negative effects on Indiana's northern bobwhite population would be substantial.
2. Public resistance and acceptance of periodic vegetative disturbance (timber management)is necessary because the forest cover across the landscape no longer exists in the same continuum and natural forces no longer operate (or are allowed to operate, e.g. regional firestorms)as they did prior to settlement. The public needs to accept that man-made disturbances (e.g. even-age timber management)can be used to mimic natural disturbances on a smaller & controlled scale to create a diversity of habitats in the residual forested landscape where once such natural disturbances operated at a larger scale in a realtively continuous forested landscape assuring early successional forest species viability. Another threat is excessive environmental review and assessment which makes timber management on public lands so costly in agency resources that it is deemed unaffordable within budgeted resources and attracts public ire as being too costly.
3. The developed land itself creates a threat to "quality habitat" for Mallards. The Mallards are simply placed in an urban/suburban setting creating a whole host of problems and for humans and Mallards alike (genetic pollution, nuisance ducks, possible fecal contamination, etc.)
4. Loss of disturbance regimes that maintained the open structure of savannas (and swamp-forests) where the Red-headed Woodoecker resides.
5. Drainage of wetland areas.
6. Fire suppression is the major threat. Lack of fire also results in an increase of shade-tolerant invasive species like garlic mustard and Asian bush honeysuckle, further degrading the savanna habitat.
7. X
8. None
9. Unknown

10.	- legal jurisdiction issues presently unclear, draft of state isolated wetland law out for comment.
11.	Loss of wetlands due to off site changes in the water table, i.e. multiple well sites in suburban/rural areas.
12.	Eastern hardwood forests, including those in Indiana, are relatively young and even-aged with less wildlife species diversity, vertical structure, natural canopy gaps, large woody debris, and other structural features than pre-European settlement forests. The influence of Native Americans, and particularly the subsequent wave of European expansion across the Midwest, left permanent changes across the landscape of Indiana, changes reflected in the extirpated flora and fauna of the region. Furthermore, the suppression of natural disturbances such as fire has resulted in a shift in wildlife species composition, structural complexity, and landscape pattern across much of the region. Fire-intolerant species such as sugar maple and American beech have become established at the expense of fire-adapted oak and hickory species, especially after fire control measures were. Before Eurpean settlement, fires, beavers, floods, and windstorms created extensive openings. The restoration of natural landscapes requires the re-introduction or simulation of these disturbances.
13.	Potential for pollution reducing productivity of aquatic habitats over which Cliff Swallows feed.
14.	Not clear what is causing decline of the Cerulean Warbler; regionally brood parasitism and forest fragmentation may be negative impacts. It may be possible some species geographic range is shifting (climate?). Exact habitat associations of some species are not known -- not clear what is optimal habitat in Indiana in my view.
15.	unknown
16.	unknown

Total Respondents	**16**
(skipped this question)	40

12. Please briefly describe the top two HABITAT threats to ALL birds in ALL habitats in Indiana identified above.

1.	Succession of the grassland habitat is a major threat if mid-contract activies are not performed. Another threat is mowing or haying during the primary nesting season. These activities are not currently allowed until after July 15 but mowing during late July and early August still destroys some nests and young.
2.	Successional change and fragmentation are the 2 greatest threats on the previous list.
3.	Residential development around lake shorelines. Degradation of aquatic plants and wetlands around lake shorelines.
4.	This is somewhat repetitive of the previous questions but here we go again: 1) lack of active timber management that adequately opens or removes the overhead forest canopy and allows for natural regeneration back into a forest cover. 2) the lack of public understanding and acceptance of timber management, especially even-age timber management. 2) the lack of public understanding and acceptance that vegetative disturbance whether natural or man-made

5.	1)Urban sprawl creating attractive areas for Mallards to become "more domesticated" (i.e retention/detention ponds). 2)Feeding of birds by people. 3)Destruction of beneficial areas for Mallards (and other puddle ducks), ie wetlands, streams, small ponds, etc. These areas are converted to retention/detention ponds.
6.	Commercial and residential development with lakes and ponds offer all the resources Canada Geese need to survive. With an overpopulation of Canada Geese in Urban areas; it's hard to say there is a habitat threat.
7.	Habitat Fragmentation & Urban sprawl. Clean Farming.
8.	Stream channelization removing nesting sites and destroying brood habitat. Soil runoff caused by poor agricultural practices and urban development.
9.	Commerical and or residential development Habitat fragmentation
10.	1. Channelization removes and/or changes the vegetative and invertabrate communities. Channelization also alters the natural water flow which results in a much degraded habitat. 2. The loss of bottomland hardwoods continues to be a threat. These area provide a high quality food source and nesting sites for woodies.
11.	Conversion of savanna to agricultural and development uses. Loss of open structure in existing savannas due to loss of disturbances such as fire.
12.	Any changes in farming practices that causes the loss of escape cover (including treeline, fenceline, and wood's edge). Habitat loss to development.
13.	Agricultureal Practices Urban Development
14.	Canada Geese are their own worst enemy. Their concentrations by large numbers of geese on small wetlands have the capacity to pollute the water and cause increased erosiuon due to their feeding habits. The destruction of natural wetland habitats by developement, agriculture and continued road construction.
15.	Regulations urban development
16.	Fire suppression is resulting in successional change to more shade-tolerant forests. Forestry practices are not emphasizing the need for fire in savanna areas enough.
17.	Drainage Practices Stream Channelization
18.	Agriculture urban sprawl
19.	Commercial or residential development by filling or draining wetlands. Stream and lake "renovation" have degraded habitat back to where it was when the original habitat destruction occured.

	the original habitat destruction occured.
20.	Development encroachment on some colonies Destruction of nesting trees
21.	urban sprawl retention ponds
22.	agricultural practices drainage practices
23.	Ag/Forestry practices - Lack of active management to create/maintain these types of habitats. Successional change - Due to lack of mgt./disturbance of vegetation.
24.	1. Destruction of habitat by commercial and residential development. 2. Habitat fragmentation that limits seasonal movements and population expansion.
25.	- presently little or no protection of isolated wetlands - habitat degradation due to increased sediment/nutrient loads
26.	Loss of habitat due to development and poor agricultural practices. Degradation of plant community by exotic plants invading wetland habitats.
27.	loss of early successional forest habitats fragmentation resulting in islands of habitat too far removed from others for immigration or emmigration
28.	The answers listed above indicate the absence of early successional habitat in forests, i.e. absence of clear-cutting, and other disturbance types in forested habitats is the major cause of ruffed grouse habitat declines. Forestry practices that do NOT lead to early successional habitat development are the problem. Grouse and many songbirds, need early forest successional stages and due to the current policies of the USFS and some state properties, the grouse is being "not-managed" to extirpation.
29.	The loss of wetlands by draining to accomadate commercial and residential developement still occurs at an alarming rate. We are also losing our quality wetlands as native vegetation is being replaced by the uncontrolled spread of nonnative/invasive plant species.
30.	Loss of high quality forest habitat (over mature uneven-aged forest) and forest fragmentation (lots of cowbirds and bluejays). This results in lower quality habitat available to ceruleans.
31.	Loss of large areas of warm season grasses and early mowing/haying.
32.	1. Intensive agriculture and land use development have put a lot of pressure on remaining wetlands. 2. Several invasive plant species have altered and degraded many wetlands throughout Indiana.
33.	1. We still do not know the specific habitat preferences for some species. The types of habitats where some species were especially abundant in the past (i.e. old-growth bottomland forest) no longer exist. This area needs more research. 2. The cerulean's dependence on large tracts of mature deciduous forests, make the species especially sensitive to continuing forest fragmentation and isolation. The mechanism by which fragmentation affects populations in Indiana is unknown, but the response of this species to habitat

fragmentation affects populations in Indiana is unknown, but the response of this species to habitat fragmentation may be related to other factors associated with fragment size. Brood parasitism by the Brown-headed Cowbird (Molothrus ater), and high rates of nest predation by generalist predators such as Blue Jay (Cyanocitta cristata) and raccoon (Procyon lotor) are likely factors. Fragmentation of forest in Indiana especially in predominately agricultural landscapes has resulted in small patches of forest surrounded by open habitat that cowbirds require for feeding and nest searching.

34. Conversion of hayfields to row-crop or urban cover types
Frequent haying, mowing, or over-grazing (though some disturbance is necessary every 1-5 years to maintain the proper vegetation structure).

35. Changes in design of bridges and causeways to make them less suitable for nest placement.

36. Fragmentation of canopied forest habitats
Brown-headed Cowbird brood parasitism.

37. Primary sources of loss of young forest habitats in Indiana are urban development / sprawl into remaining forest areas, and maturation of existing forest out of young forest age classes.; Primary sources of loss of young forest habitats in Indiana are urban development / sprawl into remaining forest areas, and maturation of existing forest out of young forest age classes.

38. Habitat fragmentation
Agricultural/forestry practices

39. Reduction in quantity and quality of prey populations.
Design of buildings that do not provide nesting ledges.

40. Factors that affect food availability
Modification of stream shoreline habitats.

41. Specific dune habitat configuration. Threats by gulls and human disturbance.

42. Loss of floodplain sycamores and upland pine forests.

43. Loss of cavity trees and harvest of older forests.

44. Loss and habitat degradation of forested habitat along riparian areas and in uplands.

45. Mowing during breeding season.
Conversion of grasslands to row-crops or housing developments.

46. loss of early successional woody habitat.
habitat loss to development

47. habitat fragmentation
agriculture/forestry practices

48. Conversion of habitat to other than pine forests
Lack of active habitat management

49. loss and fragmentation of forested wetlands.

Total Respondents **49**

(skipped this question)	6

13. What current monitoring efforts by state agencies are you aware of for ALL birds in ALL habitats in Indiana?

	Yes, these efforts occur	Not aware of these efforts occuring	Response Total
Statewide year-round monitoring conducted by state agencies	26% (13)	74% (37)	**50**
Statewide once a year monitoring conducted by state agencies	36% (16)	64% (28)	**44**
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	30% (13)	70% (31)	**44**
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	43% (19)	57% (25)	**44**
Regional or local year-round monitoring conducted by state agencies	16% (7)	84% (36)	**43**
Regional or local once a year monitoring conducted by state agencies	36% (16)	64% (28)	**44**
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	16% (7)	84% (37)	**44**
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	23% (10)	77% (33)	**43**
		Total Respondents	**356**

14. What current monitoring efforts by other organizations are you aware of for ALL birds in ALL habitats in Indiana?

	Yes, these efforts occur	Not aware of these efforts occuring	Response Total
Statewide year-round monitoring conducted by other organizations	9% (4)	91% (43)	**47**
Statewide once a year monitoring conducted by other organizations	58% (29)	42% (21)	**50**
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	13% (6)	87% (41)	**47**
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	13% (6)	87% (40)	**46**

Regional or local year-round monitoring conducted by other organizations	13% (6)	87% (41)	**47**
Regional or local once a year monitoring conducted by other organizations	28% (13)	72% (34)	**47**
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	19% (9)	81% (38)	**47**
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	23% (11)	77% (36)	**47**
		Total Respondents	**378**

15. How crucial are these monitoring efforts by state agencies for the conservation of ALL birds in ALL habitats in Indiana?

	Very crucial	Somewhat crucial	Slightly crucial	Not crucial	Unknown	Response Total
Statewide year-round monitoring conducted by state agencies	18% (9)	10% (5)	8% (4)	40% (20)	24% (12)	**50**
Statewide once a year monitoring conducted by state agencies	30% (13)	9% (4)	14% (6)	25% (11)	23% (10)	**44**
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	16% (7)	21% (9)	33% (14)	30% (13)	**43**
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	5% (2)	19% (8)	19% (8)	35% (15)	23% (10)	**43**
Regional or local year-round monitoring conducted by state agencies	5% (2)	11% (5)	7% (3)	45% (20)	32% (14)	**44**
Regional or local once a year monitoring conducted by state agencies	11% (5)	16% (7)	20% (9)	30% (13)	23% (10)	**44**
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	5% (2)	7% (3)	17% (7)	38% (16)	33% (14)	**42**
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	2% (1)	5% (2)	20% (9)	39% (17)	34% (15)	**44**
				Total Respondents		**354**

16. How crucial are these monitoring efforts by other organizations for the conservation of ALL birds in ALL habitats in Indiana?

	Very crucial	Somewhat crucial	Slightly crucial	Not crucial	Unknown	Response Total
Statewide year-round monitoring conducted by other organizations	6% (3)	10% (5)	2% (1)	46% (22)	35% (17)	**48**
Statewide once a year monitoring conducted by other organizations	14% (7)	31% (15)	16% (8)	14% (7)	24% (12)	**49**
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	9% (4)	11% (5)	43% (20)	38% (18)	**47**
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	9% (4)	9% (4)	45% (21)	38% (18)	**47**
Regional or local year-round monitoring conducted by other organizations	2% (1)	11% (5)	9% (4)	40% (19)	38% (18)	**47**
Regional or local once a year monitoring conducted by other organizations	9% (4)	11% (5)	13% (6)	36% (17)	32% (15)	**47**
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	4% (2)	9% (4)	15% (7)	36% (17)	36% (17)	**47**
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	4% (2)	9% (4)	15% (7)	40% (19)	32% (15)	**47**
				Total Respondents		**379**

17. Regional or local state agency monitoring for ALL birds in ALL habitats in Indiana.

1. The Indiana Division of Fish and Wildlife conducts a biennial mailing survey to small game hunters to estimate harvest. Additionally, the division conducts and annual spring whistle counts to provide an index to the spring breeding population. However, neither of these methods focus directly on farm bill habitats.

2. The Indiana Division of Fish and Wildlife (INDFW) conducts annual spring whistle counts on 77 established routes across the state. The INDFW also conducts biennial surveys of small game license holders to assess bobwhite harvest. However, neither of these surveys are focues directly towards shrub/scrub habitat.

3. Fish and Wildlife properties in northern Indiana

8 Roadside spring drumming survey (drumming indices) conducted in primarily in souhtcentral Indiana

Indiana.

Activity Center counts on the 900 acre Maumee Grouse Study Area in Jackson/Brown counties.

5. Regionally (throughout the state)-waterfowl breeding status surveys, population surveys
Regionally (throughout the state)-Statewide trapping, banding, and recapture efforts

6. The division of Fish & Wildlife conducts Canada Goose banding yearly. This consists of neck collars and leg bands. Water fowl surveys are also conducted. Hunter harvest are reported.

7. Interlake Property, Division of Outdoor Recreation ownership.

8. State monitoring- banding and nest box surveys.

9. Tri-County Fish and Wildlife Area, Division of Fish and Wildlife.

10. Several Fish & Wildlife Areas acroos the state perform annual wood duck banding. These properties include Hovey Lake FWA, Glendale FWA, Minnihaha FWA, Willow Slough FWA, Jasper=Pulaski FWA, LaSalle FWA, Pigeon River FWA, Tri-County FWA, and there may be others.
Many of these properties also conduct nest box monitoring activities on an annual basis.
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.

11. I am not aware of any concerted monitoring for the Red-headed Woodpecker by state agencies.

12. Routes ran throughout the state by Division of Fish and Wildlife biologists.

13. Fish and Wildlife areas and Reservoirs as part of the weekly Waterfowl survey from Aug to Jan.

14. Hovey Lake
Tri county
Jasper Pulaski
Pigeon River
Winimac
Willow Slough
LaSalle

15. At present only when a permit for work in a wetland is applied for.
Smaller more numerous wetlands have little oversite.

16. State wide for existing and new colonies every 5 years

17. Quail Whistling counts - in selected counties
Hunter/Harvest surveys - by geographic regions
Bird Breeding survey - survey blocks

18. Winamac FWA conducts annual bobwhite whistle call survey on that property.

19. - weekly waterfowl counts at selected sites

- neck collar observations statewide as encountered

- mid winter waterfowl survey of selected sites

20. Selected State Fish and Wildlife Areas and Reservoir properties operated by the Department of Natural Resources conduct counts during the fall migration period.

21. unknown

22. In southern Indiana in the unglaciated forested region.

23. All State Fish and Wildlife properties

24. Local breeding bird surveys done on State properties and private land. State cooperates in national breeding bird survey. State biologists also survey in local habitats (e.g.,Patoka River)

25. Surveys on state properties, and thru efforts such as the Breeding Bird Atlas projects

26. State Fish & Wildlife properties conduct waterfowl inventories on their respective areas, generally from Aug 15 thru January. Additionally, other DNR reservoirs conduct counts over the same period.

27. IDNR's Nongame and Endangered Wildlife Program

28. None exist.

29. Indiana Breeding Bird Atlas project through DNR determines statewide distribution periodically. Does not produce quantitative measure of population size. These are not tied to this habitat type, but frequency of the other Cerulean habitats in the BBS coverage is low so most data refer to this habitat.

30. State-wide breeding bird atlas efforts are coordinated by the state DNR. This atlas effort was done in the 1980s, and is being redone now. Also the state DNR nongame bird program coordinates publication of a summer bird count that generates some data on towhee numbers (along with all other summer birds. No analysis is done, however.

31. DNR monitors most nest sites in the state and obtains information from others.

32. Breeding Bird Atlas statewide every 20 years

33. Awareness of reports by bird watchers

34. periodic statewide Breeding Bird Atlas.

35. Breeding Bird Atlas - statewide

36. statewide Breeding Bird Atlas; periodic local studies in southern Indiana

37. none

38. none

39. None known

40. None known

41. statewide Breeding Bird Atlas

Total Respondents	**41**
(skipped this question)	15

18. Regional or local monitoring by other organizations for ALL birds in ALL habitats in Indiana.

1. The breeding bird survey is conducted by the National Audubon Society and observers counts the number of bobwhites seen along with other bird species. Again this survey is not directly focues on farm bill habitats.
2. F&W properties in northern Indiana, natural lakes, nature preserves.
3. Incidental observations on Christmas Bird Counts (extremely minor)

   Species occurrance noted during the Statewide Breeding Bird Atlas Project (only one ever done).
4. Breeding surveys, population surveys
5. I believe Ducks Unlimited conducts waterfowl surveys
6. Unknown
7. Muskatatuck NWR also perform wood duck banding operations.
8. The national Breeding Bird Survey includes routes in Indiana that incoporate sites occupied by the Red-headed Woodpecker. This annual survey will therefore potentially count Red-headed Woodpeckers at a few sites yearly.
9. Quail Unlimited chapters
10. Lake associations busineeses and anyone living around a emergent wetland with a yard with Canada Goose complaints will monitor populations in order to prove they have a problem so they can destroy nests or eggs.
11. Muscatatuck NWR
12. Some species are not monitored. Habitat changes requiring permits are checked by, IDNR, IDEM, ACOE (in some cases).
13. unknown
14. Not aware of any.
15. Unknown
16. - christmas bird count
17. Not aware of any efforts.

18. unknown

19. On state properties or USFS land where populations have been known to exist.

20. The major state watersheds. Particularly the Kankakee and St Joseph river watersheds in the north, the Tippecanoe and Wabash river in central and the Wabash Ohio river watersheds in the south.

21. Audubon supports May Day count throughout state which detects cerulean warblers. TNC is working on developing a research project in the state for ceruleans.

22. BBS routes and work done on Strip mine lands in SW IN, and Big Oaks NWR

23. Different Audubon members and clubs may be involved in Christmas Bird Counts and with an intensive Bird-a-Thon in the spring.
Various University personel may also be involved in surveying wetlands periodically throughout the year.

24. 1. BBS routes provide some information for this species. However, most routes are located along roads and do not adequately monitor interior forest species such as the cerulean.

2. The Hoosier National Forest conducts breeding bird point counts each year along points located in interior forest blocks or varying fragment size. Although the cerulean is not the focus of this study, data is collected on its occurrence.

3. Cornell Lab of Ornithology collects data on the cerulean warbler for their program "Birds in Forested Landscapes." I am unsure whether data has been collected and submitted in Indiana.

4. Ball State has been conducting studies on the Hoosier and Big Oaks for this species. Currently, students from this university are working in conjunction with the Hoosier.

25. Breeding Bird Survey routes are scattered throughout the state depending on volunteer participation.
Local intensive surveys, nest monitoring, or mark-recapture studies.

26. USGS roadside Breeding Bird Survey. These are not tied to this habitat type, but frequency of the other Cerulean habitats in the BBS coverage is low so most data refer to this habitat.

27. Other bird monitoring efforts that collect data nationwide generate information on eastern towhees. These include the Breeding Bird Surveys, Christmas Bird Counts (towhees are rare in winter, though), Cornell nest record program. The Hoosier National Forest conducts breeding bird monitoring on the forest since 1991.

28. Building managers and volunteers report nesting activity at many nests.

29. federal Breeding Bird Survey, state May Day counts, Summer Bird Counts

30. Indiana Dunes National Lakeshore biologists stay abreast of sightings along Lake Michigan

31. federal Breeding Bird Survey statewide; statewide May Day Bird Counts, Summer Bird Counts.

32. federal Breeding Bird Surveys - statewide. Regional May Day Bird Counts, Summer Bird Counts, Christmas Bird Counts

33. statewide Breeding Bird Survey. Periodci area surveys in the Hoosier National Forest.

34. statewide Breeding Bird Survey, May Day Bird Counts, Summer Bird Counts

35. federal Breeding Bird Survey statewide; May Day Bird Count, Summer Bird Count

36. None known

37. None known

38. statewide Breeding Bird Surveys, May Day Counts, Summer Bird Counts. Directed research (Hoosier National Forest, Big Oaks NWR).

Total Respondents	**38**
(skipped this question)	18

19. Please list organizations that are monitoring ALL birds in ALL habitats in Indiana.

1. I am only aware of the breeding bird survey conducted by the National Audubon Society.

2. The National Audubon Society conducts the annual breeding bird survey.

3. Audubon Society, Ducks Unlimited, Indiana Division of Fish and Wildlife

4. Audubon Christmas Bird Counts

5. IDNR-Division of Fish and Wildlife
IDNR-Division of Parks and Reservoirs
U.S. FWS
Ducks Unlimited
Waterfowl USA

6. US Fish & Wildlife Service
Indiana Division of Fish & Wildlife
Ducks Unlimited

7. Unknown

8. IDNR
USFWS

9. The U.S. Geological Survey in Porter, Indiana has conducted studies of oak savanna birds, including the Red-headed Woodpecker.

10. Quail Unlimited

11. BBS

12. Div of Fish and Wildlife
Div of Reservoirs

	Div of Reservoirs.
13.	USFWS
14.	To some extent: Waterfowl USA, Ducks Unlimited, The Nature Conservancy, The Audubon Society.
15.	Indiana Department of Natural Resources, Division of Fish & Wildlife
16.	IDNR/Division of Fish & Wildlife
17.	Unknown
18.	- Audubon - US Fish and Wildlife Service
19.	Not aware of any organizations.
20.	unknown
21.	IDNR, Div. Fish and Wildlife
22.	I believe that to some level, the Indiana Audubon Society, Ducks Unlimited and Waterfowl USA do some monitoring of the Canada goose.
23.	USFWS, INDNR, TNC, Audubon, American Bird Conservancy, MAPS program (Point Reyes Bird Observatory), Local bird clubs, NRCS (thru WRP program monitoring)
24.	INDNR, USFWS, TNC, USFS, Indiana State University
25.	Various Audubon Chapters? University Staff?
26.	1. Hoosier National Forest 2. Ball State University 3. USFWS - Big Oaks
27.	Indiana Academy of Science, Indiana Audubon Society, an local chapters of NAS worked with IDNR to complete Breeding Bird Atlas (1985-1990) USGS Bird Banding Lab coordinates BBS Universities such as Purdue complete local-level research projects
28.	Federal Breeding Bird Survey serves this function. But does not focus on suitable habitat; yet, occurrence on these surveys would be tied to nearby presence of this breeding habitat.
29.	Indiana Department of Natural Resources (breeding bird atlas project) USGS roadside bird surveys
30.	USGS coordinates the Breeding Bird Survey, National Audubon Society coordinates the Christmas Bird Counts, Cornell's Laboratory of Ornithology collects the nest records, federal agencies do monitoring on lands they manage within the state (e.g., Hoosier NF).

31.	Ball State University, Department of Biology has been monitoring Cerulean Warbler populations at Big Oaks National Wildlife Refuge, Hoosier National Forest, and Yellowwood and Morgan-Monroe state forests during the last 5 years
32.	Private companies (NIPSCO, Ispat Inland, building managers).
33.	USGS (Breeding Bird Survey) and volunteers with Indiana Audubon Society
34.	Bird watchers. USGS biologists.
35.	bird-watchers, USGS,volunteers
36.	USGS, birding groups, National Audubon Society
37.	USFS, universities
38.	USGS, birding organizations
39.	USGS, birding groups
40.	DNR Division of Fish and Wildlife through the Breeding Bird Atlas U.S. Geological Survey's Breeding Bird Survey
41.	DNR Division of Fish and Wildlife USGS Breeding Bird Survey
42.	USFWS, USGS, USFS, Indiana Audubon Society

Total Respondents	**42**
(skipped this question)	14

20. What are the current monitoring techniques for ALL birds in ALL habitats 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
Radio telemetry and tracking	0% (0)	5% (2)	67% (29)	5% (2)	12% (5)	12% (5)	**43**
Modeling	13% (6)	42% (19)	16% (7)	2% (1)	0% (0)	27% (12)	**45**
Coverboard routes	0% (0)	0% (0)	9% (2)	27% (6)	5% (1)	59% (13)	**22**
Spot mapping	15% (6)	22% (9)	27% (11)	2% (1)	5% (2)	29% (12)	**41**

Driving a survey route	73% (36)	10% (5)	8% (4)	2% (1)	0% (0)	6% (3)	**49**
Reporting from harvest, depredation, or unintentional take (road kill, bycatch)	58% (22)	18% (7)	5% (2)	8% (3)	0% (0)	11% (4)	**38**
Mark and recapture	24% (11)	31% (14)	29% (13)	0% (0)	7% (3)	9% (4)	**45**
Professional survey/census	41% (18)	39% (17)	7% (3)	0% (0)	2% (1)	11% (5)	**44**
Volunteer survey/census	49% (20)	20% (8)	17% (7)	0% (0)	0% (0)	15% (6)	**41**
Trapping (by any technique)	16% (7)	30% (13)	34% (15)	0% (0)	7% (3)	14% (6)	**44**
Representative sites	18% (6)	32% (11)	18% (6)	0% (0)	0% (0)	32% (11)	**34**
Probabilistic sites	6% (2)	35% (11)	13% (4)	0% (0)	0% (0)	45% (14)	**31**
Other (please specify below)	8% (1)	17% (2)	0% (0)	0% (0)	0% (0)	75% (9)	**12**
					Total Respondents		**489**

21. Other monitoring techniques for ALL birds in ALL habitats in Indiana.

1. I'm not aware of any bobwhite monitoring that focuses directly on populations in farm bill habitats.
2. N/A
3. nest box survey
4. Unknown
5. Distance sampling
6. aerial surveys
7. aerial surveys
8. Nest box surveys
9. aerial surveys
10. X

11. unknown
12. aerial breeding survey
13. aerial surveys
14. Unknown
15. Nest monitoring, territory mapping, call playback, and color banding (same as mark recapture?)
16. Nest monitoring
17. Surveys for colonies and periodic censuses of nests/ populations.
18. Point count surveys.
19. Nest search and monitoring
20. None known
21. unknown
22. nest searches and monitoring.

Total Respondents	**22**
(skipped this question)	34

22. What one or two monitoring techniques would you recommend for effective conservation of ALL birds in ALL habitats in Indiana?

1. To monitor bobwhite populations specificially in farm bill habitats I would suggest selecting a random sample of contracts and conducting flushing transects. Another intensive method would be to have hunters complete "report cards" when hunting on farm bill acreage. A less intensive method would be to request that landowners conduct whistle counts on their enrolled lands each spring.
2. I would like to see a radio telemetry study of bobwhites in Indiana because we are lacking most of the baseline data for bobwhites in Indiana. Much of the information we use to manage quail populations comes from studies in other states. I think the whistle counts that are already conducted provide a less intensive (but important) method of tracking the statewide population.
3. Professional surveys or counts on F&W areas during migration periods (tracts annual migration trends and is index to population levels). Harvest surveys on F&W areas (tracts annual numbers taken) "Wildlife Investigational Techniques" by The Wildlife Society.
4. Roadside Drumming indices.
5. 1)Mark and Recapture
2)Modelling-To determine population dynamics and evaluate genetic integrity of Mallards in developed lands versus "wild" Mallards (i.e Mallards in undeveloped areas).

6. Neck collars and leg bands - Driving surveys

7. Fall Covey counts.

8. brood surveys

9. Mark/Recapture-Banding (intensive), Ducks,Geese&Swans of North America, Frank C. Bellrose
Harvest data collection (less intensive) Wildlife Management Vol 2, Reuben Edwin Trippensee

10. 1. Continued participation in HIP is perhaps the most cost effective method for monitoring the flyway population.
2. Banding operations help in determining the status of populations on a local or statewide level

11. Point counts in potential habitats using distance sampling. This technique is relatively simple to implement and provides density information rather than an index. Observers count birds from points randomly located in the studied habitat and measure or estimate distance to observed birds. Calculation of density from the data, however, does require some technical expertise.

Buckland, S. T., D. R. Anderson, et al. (2001). Introduction to distance sampling. Oxford, UK, Oxford University Press.

12. Survey Routes

13. Banding
Brood surveys

14. Mark and recapture. Means to track wildlife species movement and association with non target species and times of interaction with non target spp.
Mark and harvest. Same as above but also eliiminates and reduces concentrations in non desiralbe areas.

15. population surveys

16. Brood counts
Increased banding efforts

17. aerial surveys
banding and neck collaring

18. Nesting & brood counts state wide.

19. Continue current state surveys every 5 years

20. monitoring throughout annual cycle

21. aerial survey
banding

22. Annual Quail Whistling Counts
Annual Hunter/Harvest Surveys

23. 1. Harvest survey
2. Whistle call survey

24. - banding and/or neck collaring. Procedures in place, nationally accepted, good national data base maintained.

- weekly waterfowl counts at selected sites. Samples most of the major concentration areas. Very good historical data for trend analysis.

25. Spring drumming routes - used nationally for spring breeding trend data.

On particular or "study areas", complete spring drumming counts for accurate breeding densities. Assumes a low # of non-drumming males and requires at least three opportunities, on good mornings, to hear a drumming bird in any portion of the study area

26. Driving routes, hunter bag surveys

27. point counts during breeding season

28. Mark (band) and recapture and/or harvest can provide the best means of monitoring. This is done at both the national and state levels. The bird banding lab in Maryland monitors all federal banded birds. The Wildlife Management Techniques Manual published by the Wildlife Society is a commonly used resource.

29. A study that experimentally tests how forest management influences demography and presence and absence. This species needs basic life history studied, too.

30. Professional and Volunteer survey and census

31. 1. The use of GIS technology may be an economical and efficent method to monitor and classify wetlands throughout Indiana. Selective sampling within each geographical region may provide baseline data of mallard use and abundance.
2. A more intensive approach may involve DNR staff, volunteers, and University staff that would conduct a statewide inventory of wetlands during one week in April.

32. We would benefit from obtaining basic demography data on this species. Mist-netting is not particularly feasible because the species stays so high in the canopy. Due to the difficulty of locating nests of ceruleans and of capturing adults, especially females, determination of reproductive success is problematic. Assessing survivorship of eggs, nestlings, and fledglings is also difficult. Until such reproductive success and survivorship information is available, the dynamics of populations will continue to be unknown.

Point counts, spot mapping, and territory mapping provide important information about ceruleans. Banding individual birds could supply information on site fidelity and survivorship.

Regular monitoring of migratory stopover and winter habitats will also be an important part of the conservation of the cerulean warbler.

33. Establish more Breeding Bird Survey routes http://www.pwrc.usgs.gov/bbs/
Conduct point counts on private lands. If possible estimate nest success too.

34. Surveys for colonies and periodic censuses of nests/ populations.

35. Roadside bird surveys on selected routes maximizing forest habitats.
Repeated point count surveys in representative forest sites

	Repeated point count surveys in representative forest sites.
36.	Primary technique used is point counts of singing birds in breeding season, either by roadside counts (BBS) or set survey points (e.g., Hoosier NF monitoring). Roadside surveys are probably most effective because towhees are edge/early successional species, using habitats found near roads. Long term banding programs (e.g., MAPS) provide demographic information not gained with other monitoring, but are more intensive.
37.	Professional Survey/Census - To locate Cerulean Warblers Nest search and monitoring - To assess productivity to determine if Indiana has a 'source' or 'sink' population of Cerulean Warblers Hutto, R.L., S.M. Pletschett, and T.P. Hendricks. 1986. A fixed-radius point-count method for nonbreeding and breeding season use. Auk 103:593-602.
38.	Nest monitoring of all known nests (or representative sample) with 2-3 visits according to USFWS protocol.
39.	Directed surveys (canoe surveys, migration counts) most intensive. General breeding bird surveys less intensive
40.	Because the Piping Plover rarely occurs in Indiana, keep track of all reports by birders and have Indiana Dunes personnel systmatically survey appropriate habitat along Lake Michigan.
41.	Roadside surveys, canoe surveys, local, more intensive studies
42.	federal Breeding Bird Surveys annually statewide.
43.	Road/streamside surveys in appropriate habitat.
44.	Roadside surveys; spot-mapping on smaller areas
45.	spot-mapping in appropriate habitats
46.	Sampling potential nesting areas for some bird species to obtain additional information on the species abundance and distribution.
47.	Sampling of mature pine forest habitat to better determine distribution
48.	point counts in large areas; spot mapping, nest monitoring.
	Total Respondents **48**
	(skipped this question) 8

23. What current HABITAT inventory and assessment efforts or activities by state agencies are you aware of for ALL birds in ALL habitats in Indiana?

	Yes, these efforts occur	No effort that I'm aware of	Response Total
Statewide annual inventory and assessment conducted by state agencies	6% (3)	94% (47)	**50**

Statewide once a year inventory and assessment conducted by state agencies	0% (0)	100% (50)	**50**
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	8% (4)	92% (46)	**50**
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	24% (12)	76% (38)	**50**
Regional or local year-round inventory and assessment conducted by state agencies	6% (3)	94% (47)	**50**
Regional or local once a year inventory and assessment conducted by state agencies	2% (1)	98% (49)	**50**
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	2% (1)	98% (49)	**50**
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	14% (7)	86% (43)	**50**
		Total Respondents	**400**

24. What current HABITAT inventory and assessment efforts or activities by other organizations are you aware of for ALL birds in ALL habitats 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	8% (4)	92% (46)	**50**
Statewide once a year inventory and assessment conducted by other organizations	6% (3)	94% (47)	**50**
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	20% (10)	80% (40)	**50**
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	14% (7)	86% (43)	**50**
Regional or local year-round inventory and assessment conducted by other organizations	6% (3)	94% (47)	**50**
Regional or local once a year inventory and assessment conducted by other organizations	6% (3)	94% (46)	**49**
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	4% (2)	96% (48)	**50**

Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	16% (8)	84% (42)	**50**
		Total Respondents	**399**

25. How crucial are these HABITAT efforts by state agencies for the conservation of ALL birds in ALL habitats 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	20% (10)	4% (2)	8% (4)	39% (19)	29% (14)	**49**
Statewide once a year inventory and assessment conducted by state agencies	15% (7)	4% (2)	9% (4)	39% (18)	33% (15)	**46**
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	9% (4)	19% (8)	7% (3)	33% (14)	33% (14)	**43**
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	12% (5)	10% (4)	48% (20)	31% (13)	**42**
Regional or local year-round inventory and assessment conducted by state agencies	7% (3)	7% (3)	12% (5)	42% (18)	33% (14)	**43**
Regional or local once a year inventory and assessment conducted by state agencies	5% (2)	12% (5)	7% (3)	44% (19)	33% (14)	**43**
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	5% (2)	12% (5)	7% (3)	42% (18)	35% (15)	**43**
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	16% (7)	9% (4)	44% (19)	30% (13)	**43**
				Total Respondents		**352**

26. How crucial are these HABITAT efforts by other organizations for the conservation of ALL birds in ALL habitats 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 year-round inventory and assessment conducted by other organizations	6% (3)	6% (3)	6% (3)	43% (20)	38% (18)	**47**
Statewide once a year inventory and assessment conducted by other organizations	6% (3)	4% (2)	6% (3)	43% (20)	40% (19)	**47**
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	6% (3)	23% (11)	6% (3)	21% (10)	43% (20)	**47**
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	2% (1)	9% (4)	6% (3)	43% (20)	40% (19)	**47**
Regional or local year-round inventory and assessment conducted by other organizations	4% (2)	4% (2)	9% (4)	41% (19)	41% (19)	**46**
Regional or local once a year inventory and assessment conducted by other organizations	7% (3)	2% (1)	9% (4)	41% (19)	41% (19)	**46**
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	2% (1)	11% (5)	4% (2)	40% (19)	43% (20)	**47**
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	2% (1)	13% (6)	9% (4)	38% (18)	38% (18)	**47**
				Total Respondents		**374**

27. Regional or local state agency HABITAT inventory and assessment for ALL birds in ALL habitats in Indiana.

1. I'm not aware of any regularly scheduled assessment of farm bill lands for northern bobwhites.
2. I am not aware of any agency monitoring this habitat type but I would like to see remotely sensed data used to track statewide and regional changes in acreage over the last 30+ years.

data used to track statewide and regional changes in acreage over the last 30+ years.

3. Natural lakes in northern Indiana

4. The Continuous Statewide Forest Inventory jointly conducted by the US Forest Service and the Indiana Div. of Forestry, IDNR.

5. N/A

6. I'm not aware of any

7. Interlake Property

8. Unknown

9. Nearly all of the river and stream habitats in Indiana fall under state and/or federal jurisdiction, so obtaining and maintiaining accurate and current information on these habitats is always occurring on a statewide basis.

10. Indiana DNR/DNP has inventoried habitats across the state over the past three decades. Savannas mainly occur in the northern third of the state.

11. Statewide

12. On state land.

13. unknown

14. Unknown

15. - isolated wetlands law

16. Do not occur to my knowledge.

17. On state and national forest. There is no need to do habitat evaluations at this point. As a specialist species and tied very closely to early successional forest habitats, we know the reason for the decline in grouse populations, and we know nothing is being done to provide habitat for the ruffed grouse and other early forest successional species.

18. I am not aware of any monitoring of emergent wetlands that occur at the state government level.

19. The state examines habitat on state properties periodically and uses GAP and other habitat modeling programs to assess forest habitats.

20. Habitats on State areas are occasionally surveyed for quality and quantity.

21. The Managers of public properties are responsible for maintenance and assessment of wetland habitat on their areas.

22. There are none that I know.

23. Annual and 5-year-census, county-level reports of acreage planted to various hay cover types and acreage harvested.

24. None known to me.

25. Forest inventory plots in established forest management lands give some information on trends in early succession habitat. But I am unaware of any regular coordinated effort by state or other agencies to monitor young forest age classes. Analysis of remote sensing data can provide some trend information where young forest classes can be mapped.

26. Opportunisitc statewide determination of potential nest sites in Indiana with the idea of erecting a nest box.

27. unknown

28. Lake Michigan shoreline/Gibson Lake

29. unknown

30. None

31. unknown

32. none

33. none

34. None known

35. None known

Total Respondents	**35**
(skipped this question)	21

28. Regional or local HABITAT inventory and assessment by other organizations for ALL birds in ALL habitats in Indiana.

1. The Farm Service Agency keeps track of the location and acreage associated with each contract.

2. I'm not aware of any other agency monitoring this habitat type but it is likely that one of the state universities has remotely sensed data that could be used to monitor changes in acreage over a number of years.

3. none

4. N/A

5. I'm not aware of any

6. Unknown

7. Unknown

8. Many local zoning boards, planning commissions and drainage boards also keep and maintain their own records in regard to land use patterns within these habitats.

9. In the northern third of the state.

10. Unknown

11. None that I am aware of.

12. unknown

13. Statewide by regions

14. Unknown

15. - Indiana wetland inventory maps
- county aerial photos for NRCS
- soils mapping county maps

16. Do not occur to my knowledge.

17. I am assuming that some monitoring of emergent wetlands occur in other organizations as some of them are involved in the restoration and/or purchasing of wetlands.

18. TNC and USFWS and Forest Service uses habitat models to examine forest habitat in Indiana (Hoosier NF and Big Oaks NWR).

19. USFWS, USFWS, TNC, Indiana State University have surveyed quality and quantity of habitats for HESP's.

20. NRCS and other Federal offices dealing with compliance review may be involved in inventory of habitat types as they pertain to the Farm Bill. However, these folks are not making habitat assessments as it relates specifically to mallards.

21. 1. Hoosier National Forest and Ball State University are collecting data on habitat use by cerulean warblers on the northern portion of the Forest.

2. Cornell's "Birds in Forested Landscapes" collects some data on habitat use. I am not sure if data has been submitted from Indiana.

22. None known to me.

23. see above

24. unknown

25. Lake Michigan shoreline

26. statewide aerial imagery of habitats in Indiana

27. Periodical aerial imagery

28. USDA, USGS? statewide

29. statewide aerial imagery of habitats, land uses

30. statewide aerial imagery

31. None known

32. None known

33. satelitte imagery of vegetation, land uses.

Total Respondents	**33**
(skipped this question)	23

29. Please list organizations that are monitoring this HABITAT for ALL birds in ALL habitats in Indiana.

1. The Indiana Division of Fish and Wildlife will be initiated some type of bobwhite monitoring program to determine the success of the newest continuous CRP practice (CP33). The Farm Service Agency monitors acreage and location of tracts enrolled in each USDA program. The Natural Resource Conservation Service provides technical support or administers most farm programs and I believe they conduct regular inspections.

2. Indiana Division of Fish and Wildlife

3. N/A

4. I'm not aware of any

5. Unknown

6. Unknown

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

8. Indiana DNR/DNP, The Nature Conservancy, Chicago Wilderness, U.S. Geological Survey, National Park Service, U.S. Fish and Wildlife Service.

9. Quail Unlimited

10. None that I am aware of.

11. unknown

12. USDA/Forest Service/NC Research Station

13. Unknown

14. - US Fish and Wildlife Service
    - Natural Resource Conservation Service
    - Indiana Department of Environmental Management

15. Do not occur to my knowledge.

16. Ducks Unlimited and Waterfowl USA

17. INDNR, USFWS, USFS, TNC

18. INDNR, USDA, USFS, TNC, Indiana State University

19. None that I'm aware of.

20. 1. Hoosier National Forest
    2. Ball State University
    3. Cornell Lab of Ornithology

21. USDA National Agricultural Statistics Service for Indiana http://www.nass.usda.gov/in/

22. None known to me.

23. see above

24. Ball State University, Department of Biology has been monitoring Cerulean Warbler populations at Big Oaks National Wildlife refuge, Hoosier national Forest, and Yellowwood and Morgan-Monroe state forests during the last 5 years

25. None

26. unknown

27. Unknown.

28. unknown

29. USDA?, USGS?

30. USFS, USDA?

31. USDA?

32. USDA?

33. None known

34. None known

35. USDA?

Total Respondents	**35**
(skipped this question)	21

30. What are the current HABITAT inventory and/or assessment techniques for ALL birds in ALL habitats 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
GIS mapping	19% (9)	33% (16)	21% (10)	2% (1)	0% (0)	25% (12)	**48**
Aerial photography and analysis	21% (10)	38% (18)	19% (9)	2% (1)	2% (1)	19% (9)	**48**
Systematic sampling	4% (2)	26% (12)	33% (15)	0% (0)	0% (0)	37% (17)	**46**
Property tax estimates	3% (1)	3% (1)	0% (0)	5% (2)	0% (0)	89% (33)	**37**
State revenue data	0% (0)	0% (0)	0% (0)	5% (2)	0% (0)	95% (36)	**38**
Regulatory information	5% (2)	16% (6)	3% (1)	5% (2)	0% (0)	70% (26)	**37**
Participation in landuse programs	9% (4)	23% (10)	16% (7)	2% (1)	0% (0)	50% (22)	**44**
Modeling	2% (1)	40% (18)	24% (11)	0% (0)	0% (0)	33% (15)	**45**
Voluntary landowner reporting	2% (1)	22% (9)	17% (7)	0% (0)	0% (0)	59% (24)	**41**
Other (please specify below)	0% (0)	18% (3)	0% (0)	0% (0)	0% (0)	82% (14)	**17**
						Total Respondents	**401**

31. Other HABITAT inventory and assessment techniques for ALL birds in ALL habitats in Indiana.

1. I recently correlated the number of acres enrolled in USDA programs with our annual bobwhite whistle indices on a statewide scale. I am planning on modeling regional bobwhite indices and USDA idled acreage

idled acreage.

2. N/A

3. Unknown

4. Remote sensing

5. I am not aware of any inventory or assessment techniques used specifically for Canada Goose Habitat in Indiana.

6. X

7. unknown

8. Unknown

9.

10. Visual driving surveys and soil surveys.

11. Samples at known nest sites are compared with random sites at Big Oaks NWR

12. There have been several Master's projects on habitat selection for the Cerulean Warbler in Indiana. These studies have collected the following information on habitat use: diameter at breast height (DBH) and identification of tree species in a nested plot at the center of a territory, number of saplings (trees <3cm DBH), number and DBH of standing dead trees (snags), Canopy cover, ground cover, canopy height, percent canopy coverage and ground cover, canopy height, and vertical stratification of foliage

13. "Habitat" for some bird species is defined primarily by suitable nesting sites near water. Volunteer participation in building a database of known breeding colonies and volunteer periodic censusing of colony sizes.

14. unknown

15. Unknown

Total Respondents	**15**
(skipped this question)	41

32. What one or two HABITAT inventory and assessment techniques would you recommend for effective conservation of ALL birds in ALL habitats in Indiana?

1. Flush counts or more intensive whistle counts on farm program lands would be a useful method of evaluating their quality when compared to the same indices on non-farmbill lands.

2. I would like to see remotely sensed data used to monitor changes in statewide and regional acreage and distribution. It would be interesting and useful to see how trends in shrub/scrub habitat relate to the INDFW bobwhite whistle indices.

3. GIS mapping(electronic data base of current habitat) Aerial photography and analysis (examine changes in habitat) "Wildlife Investigational Techniques" by The Wildlife Society.

4. Statewide Forest Inventory

5. N/A

6. Aerial Photography and modeling

7. Grassland maping by major plant species type.

8. gis mapping
aerial photo. and analysis

9. G.I.S. (intensive) Wildlife Management Techniques Manual, Fourth Edition, Sanford D. Schemnitz
Aerial (less intensive) Same

10. Developing and maintaing accurate GIS data sets on the habitat is very important.

11. Systematic aerial photography/remote sensing every 5-10 years.
Permanent plot monitoring to assess changes in canopy cover and woody species size and composition.

12. Participation in land use programs.

13. Spring counts- aerial

14. GIS mapping would be the most cost affective means for creating an inventory of emergent plant spp. that would support Canada Geese in emergent wetlands
Systemnatic water sampling of high use areas would determine nutrient loading and water quality.
US Fish and Wildlife Service Draft Environmentalo Impact Statement, Resident Canads Goose Management, Feb.2002.

15. spring, summer, fall and winter surveys

16. aerial surveys
reports from state fwas

17. Wetlands should be monitored by overhead photo methods with ground truth checks.
This should occur on a regular basis with aggressive enforcement against illegal wetlands destruction.

18. none

19. aerial spring surveys

20. spring aerial surveys

21. GIS analysis of habitat types

22. Unknown

23. - analysis of county aerial photos as these are done on a somewhat regular basis
- updating and ground truthing Wetland Inventory maps

24. GIS and current aerial photos

25. Aerial photography and analysis and soil surveys are already being done and could provide a cheap way to monitor and assess emergent wetlands. Any of the USDA's soil surveys for the individual counties can be used as a resource.

26. GIS modeling, and intensive study to determine habitat quality (source vs. sink)

27. GIS mapping and participation in landuse programs (CRP)

28. GIS technology appears to be the system of choice. NRCS offices have statewide distribution and a close relationship with landowners so I would recommend utilizing their resources if possible.

29. 1. I think that a crucial piece of habitat data for the cerulean warbler is the size and distribution of canopy gaps within territories. At this point, researchers have not determined an effective means to quantify this data.

2. Another important habitat inventory would be looking at landscape characteristics of cerulean occurrence and distribution in relation to forest fragmentation. Monitoring should incorporate the occurrence of the species in relation to landscape characteristics such as proportion of agricultural use, tract size and shape, and amount of edge.

30. Survey of hay harvest dates and frequencies each year

31. "Habitat" for this species is defined primarily by suitable nesting sites near water. Volunteer participation in building a database of known breeding colonies and volunteer periodic censusing of colony sizes.

32. Habitat association studies to determine which habitat types used/ preferred in IN.
GIS/aerial photo analysis to map these habitat types.

33. As stated before, I am unaware of efforts to monitor young age classes of forest. GIS mapping can certainly generate amounts and trends of habitat if forest type and age are mapped. Aerial photography can be used when young age classes appear distinct from other habitat classes.

34. Systematic sampling/survet techniques - To locate Cerulean Warblers
Hutto et al. 1986. Auk 103:593-602

35. Only casual assessment needed.

36. aerial imagery to identitfy and quantify habitat.

37. aerial photography and ground visits to determine habitat suitability.

38. Aerial imagery of riparian and pine habitats coupled with habitat modeling.

39. Aerial imagery and modeling

40. Aerial imagery coupled with modeling.

41. Aerial imagery couple with modeling.

42. aerial/satellite imagery coupled with modeling

43. unknown

44. Statewide inventory and mapping of mature pine forest communities to determine more accurate potential distribution of pine warbler. References suggested would be Flora of Indiana by Charles Deam 1940 and unpublished data/files from Division of Forestry.

45. satelitte imagery coupled with modeling.

Total Respondents	**45**
(skipped this question)	11

33. What is the current body of science for ALL birds in ALL habitats in Indiana?

	Response Total	Response Percent
Complete, up to date and extensive	**4**	**8%**
Adequate	**18**	**38%**
Inadequate	**14**	**29%**
Nonexistent	**7**	**15%**
Other (please explain below)	**5**	**10%**

1. We know quite a bit about habitat use patterns of the Red-headed Woodpecker but much less about the effects of landscape fragmentation.
2. Inadequate - Most research not specific to Indiana
3. Questions 34 and 35 are blank as can find no references specific to Indiana. Information for Indiana is found in IDF&W Research notes
4. Atlas of Breeding Birds in Indiana and the USGS Breeding Bird Survey
5. Breeding Bird Atlas and Breeding Bird Survey data

34. Please provide a citation (title, author, date, publisher) that would give the best overview of ALL birds in ALL habitats in Indiana, if available. This resource may be used if further detail is needed.

Appendix E-74: Birds

Title = Bobwhite Quail Investigation;
Author = Maurice C. Reeves;
Date = 1954;
Publisher = Indiana Department of Conservation

Title = Ducks, Geese & Swans of North America;
Author = Frank C. Bellrose;
Date = 1976;
Publisher = Stackpole Books

Title = Population status of ruffed grouse in Indiana;
Author = Steven E. Backs;
Date = Annual Progress Reports;
Publisher = Indiana Div. Fish and Wildlife

Title = Managing Canada Geese in Urban Environments;
Author = Arthur E. Smith, Scott R. Craven and Paul D. Curtis;
Date = 1199;
Publisher = Cornell Cooperative Extension

Title = Ducks,Geese &Swans of North America;
Author = Frank C. Bellrose;
Date = 1976;
Publisher = Stack Pole Books

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

Title = Red-headed Woodpecker (Melanerpes erythrocephalus). In The Birds of North America, No. 518;
Author = Smith, K. G., J. H. Withgott, and P. G. Rodewald.;
Date = 2000;
Publisher = The Birds of North America, Inc., Philadelphia, PA.

Title = 2003 Breeding Population Index of Northern Bobwhite Quail;
Author = James C. Pitman;
Date = July 16, 2004;
Publisher = IDNR F&W

Title = Canada Goose Management;
Author = Clarence Schoenfield/Ruth L. Hine;
Date = 1977;
Publisher = University of Wisconsin, Stevens Point

Title = Spring Breeding Duck Survey;
Author = Kristen Chodacheck;
Date = 2003;
Publisher = IDNR

Title = The Birds of Indiana;
Author = Russel E. Mumford, Charles E. Keller;
Date = 1984;
Publisher = Indiana University Press

Appendix E-74: Birds

Title = Unknown/Quail Investigations;
Author = Maurice Reeves;
Date = Unknown/Old;
Publisher = IDNR/Divsion of Fish & Wildlife

Title = Ruffed Grouse Restoration in IN;
Author = Steve Backs;
Date = 1984;
Publisher = N. Central Section of the Wildlife Soc.

Title = Cerulean Warbler MS Thesis;
Author = Kirk Roth;
Date = 2004;
Publisher = Ball State University

Title = HESPS in mine land MS Thesis;
Author = Travis Devault;
Date = 2000;
Publisher = Indiana State Univ

Title = Habitat Selection and Territory Size of Cerulean Warblers in Southern Indiana;
Author = Cynthia M. Basile;
Date = 6/02;
Publisher = N/A

Title = Eastern Towhee, Birds of North American account #262;
Author = Greenlaw, J.S.;
Date = 1996;
Publisher = The Birds of North America, Inc.

Title = Habitat selection and reproductive success of Cerulean Warblers in Southern Indiana;
Author = Kamal Islam and Kirk L.Roth;
Date = December 2004;
Publisher = Department of Biology Technical Report No. 4, Ball State University, submitted to U.S. Fish & Wildlife Service, Fort Snelling, MN

Title = Peregrine Falcon nesting and management in Indiana;
Author = Castrale, J.S., and A. Parker;
Date = 1999;
Publisher = Indiana Audubon Quaterly 77:65-74.

Title = Atlas of Breeding Birds in Indiana;
Author = Castrale, J.S., E. Hopkins, C.E. Keller;
Date = 1998;
Publisher = IDNR

Title = Piping Plover Recovery Plan;
Author = USFWS;
Date = unknown;
Publisher = USFWS

Title = Breeding Bird Atlas of Indiana;
Author = Castrale, J.S., E. Hopkins, C. Keller;
Date = 1988;
Publisher = IDNR

Title = BNA Account - Golden-winged Warbler;
Author = JL Confer;
Date = 1992;
Publisher = American Ornithologists' Union

Title = Cerulean Warbler Status Assessment;
Author = Paul Hamel;
Date = 2000;
Publisher = US Fish & Wildlife Service

Total Respondents	**34**
(skipped this question)	22

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

Title = On the edge: a guide to managing for bobwhite quail;
Author = T. Dailey and T. Hutton;
Date = 2003;
Publisher = Missouri Department of Conservation

Title = The historic and present distribution of ruffed grouse in Indiana;
Author = Steven E. Backs;
Date = 1984;
Publisher = Ind. Acad. Sci. 93:161-166.

Title = Prevention and Control of Wildlife Damage;
Date = 1994;
Publisher = University of Nebraska

Title = Waterfowl & Wetlands an Intergarted review;
Author = Theodore A. Bookout;
Date = 1979;
Publisher = LaCrosse Printing

Title = Ducks, Geese and Swans of North america;
Author = Bellrose;
Date = 1976;
Publisher = Stackpole Books

Title = Population Ecology of the Bobwhite;
Author = John L Roseberry;
Date = 1984;
Publisher = SIU Press

Title = Managing Canada Geese in Urban Environments;
Author = Smith/Craven/Curtis;
Date = 1999;
Publisher = Jack Berryman Institute Publication #16/ Cornell University Cooperative Extension, Ithaca, NY

Appendix E-74: Birds

Title = Waterfowl Ecology & Management;
Author = Compiled by: Ratti, Flake, Wentz;
Date = 1982;
Publisher = The Wildlife Society

Title = Characteristics of Drumming Habitat of Grouse in IN;
Author = Backs, Kelly, Major, Miller;
Date = 1984;
Publisher = Proceedings of Indiana Academy of Science: 94:227-230

Title = Birds of Indiana;
Author = Mumford;
Date = ?;
Publisher = Indiana University Press?

Title = Cerulean Warbler MS Thesis;
Author = Cindy Basile;
Date = 2002;
Publisher = Ball State University

Title = Forest and Grassland Bird Productivity;
Author = Robb et. al.;
Date = 1998;
Publisher = USFWS internal report

Title = Master's Thesis (Title Unknown);
Author = Kirk Roth;
Date = 6/2004

Title = Effects of management practices on grassland birds: Bobolink;
Author = Dechant, J.A., M.L. Sondreal, D.H. Johnson, L.D. Igl, C.M. Goldade, A.L. Zimmerman and B.R. Euliss;
Date = 2001;
Publisher = Northern Prairie Wildlife Research Center

Title = Decline of the Rufous-sided Towhee in the eastern United States;
Author = Hagan, J.M.;
Date = 1993;
Publisher = Auk 110:863-874.

Title = Relative abundance and habitat selection of Cerulean Warblers in Southern Indiana;
Author = Kamal Islam and Cynthia Basile;
Date = December 2002;
Publisher = Department of Biology Technical Report No. 1, Ball State university, final report submitted to U.S. Fish & Wildlife Service, Fort Snelling, MN

Title = Midwest Peregrine Falcon Restoration - 2004 Annual Report;
Author = Tordoff, H.B., J.A. Goggin, J.S. Castrale;
Date = 2004;
Publisher = The Raptor Center at the Univ. of Minnesota

Title = BNA Account - Yellow-throated Warbler;
Author = G.A. Hall;
Date = 1996;
Publisher = American Ornitholgists' Union

Title = BNA Account - Pileated Woodpecker;
Author = E.L. Bull and J.A. Jackson;
Date = 1995;
Publisher = American Ornitholgists' Union

Title = BNA Account - Red-shouldered Hawk;
Author = ST Crocoll;
Date = 1994;
Publisher = American Ornithologists' Union

Title = BNA Account - Savannah;
Author = Wheelwright and Rising;
Date = 1993;
Publisher = American Ornithologists' Union

Title = Birds of Indiana;
Author = R Mumford and C. Keller;
Date = 1984;
Publisher = Indiana Univerisity Press

Title = BNA Species Account - Cerulean Warbler;
Author = Paul Hamel;
Date = 2000;
Publisher = American Ornitholgists' Union

36. What is the current HABITAT body of science for ALL birds in ALL habitats in Indiana?

	Response Total	Response Percent
Complete, up to date and extensive	1	2%
Adequate	18	38%
Inadequate	16	33%
Nonexistent	9	19%
Other (please explain below)	4	8%

1. Unknown-Developed land "IS NOT" quality habitat AT ALL for Mallards. Therefore, it should not be addressed or perceived as such.
2. The body of science is better than adequate, it is quite extensive and up to date, but by no means is it complete.
3. unknown
4. I am not aware of any current body of science for emergent wetlands as it applies to Canada geese.

37. Please provide a citation (title, author, date, publisher) that would give the best HABITAT overview of ALL birds in ALL habitats in Indiana, if available. This resource may be used if further detail is needed.

Title = Vegetation management practices on conservation reserve program fields to improve northern bobwhite habitat quality;
Author = Greenfield, K. C.; W. B. Burger Jr.; M. J. Chamberlain, E. W. Kurzejeski;
Date = 2002;
Publisher = Wildlife Society Bulletin

Title = Statewide Forest Inventory;
Author = ?;
Date = periodic;
Publisher = US Forest Service/IDNR

Title = Managing Canada Geese in Urban Environments;
Author = Arthur E. Smith, Scott R. Craven and Paul D. Curtis;
Date = 1999;
Publisher = Cornel Cooperative Extension

Title = Soil Survey's of Indiana Counties;
Author = U.S. Dept. of Agriculture, SCS;
Date = 1990;
Publisher = U.S. Dept. of Agriculture

Title = Wetlands;
Author = Mitsch & Gosselink;
Date = 1993;
Publisher = Van Nostrand Rheinhold

Title = Surviving where ecosystems meet: ecotonal animal communities of midwestern oak savannas and woodlands;
Author = Temple, Stanley A.;
Date = 1998;
Publisher = Transactions of the Wisconsin Academy of Sciences, Arts and Letters 86:206-222

Title = Some Aspects of the Relationship between Land and Utilization and Bobwhite Quail;
Author = John L. Roseberry;
Date = 1960;
Publisher = SIU Press

Title = Canada Gose Management;
Author = uk;
Date = uk;
Publisher = uk

Title = Waterfowl & Wetlands- Integrated Review;
Author = Edited : Bookhout;
Date = 1979;
Publisher = The Wildlife Society

Title = Cerulean Warbler MS Thesis;
Author = Kirk Roth;
Date = 2004;
Publisher = Ball State University

Title = Strip mine grassland birds;

Author = Travis Devault;
Date = 2000;
Publisher = Indiana State Univ.

Title = The natural regions of Indiana;
Author = Homoya, M.A., D.B. Abrell, J.R. Aldrich, and T.W. Post;
Date = 1985;
Publisher = Proceedings of the Indiana Academy of Science 94:245-268

Title = Indiana Natural Heritage Data Center Community Classifications;
Publisher = Unpublished Data

38. If possible, please provide a second citation (title, author, date, publisher) that would give another good HABITAT overview of ALL birds in ALL habitats in Indiana. This resource may also be used if further detail is needed.

Title = Management of Seasonally Flooded Impoundments;
Author = Leigh H. Fredrickson, T. Scott Taylor;
Date = 1982;
Publisher = U.S. Fish and Wildlife Service

Title = Southern Forested Wetlands;
Author = Messina & Conner;
Date = 1998;
Publisher = CRC Press LLC

Title = Savannas, barrens, and rock outcrop plant communities of North America;
Author = Anderson, Roger C., Fralish, James S. , and Baskin, Jerry M.;
Date = 1999;
Publisher = Cambridge University Press

Title = The Bobwhite Quail - Its Life and Management;
Author = Walter Rosene;
Date = 1969;
Publisher = Rutgers University Press

Title = Creating Freshwater Wetlands;
Author = Hammer;
Date = 1997;
Publisher = CRC Press

Title = Cerulean Warbler MS Thesis;
Author = Cindy Basile;
Date = 2002;
Publisher = Ball State University

Title = The Natural Regions of Indiana;
Author = Homoyo, Abrell, Aldrich, and Post;
Date = 1985;
Publisher = Indiana Academy of Science

39. What are the research needs for ALL birds in ALL habitats in Indiana?

	Urgently needed	Greatly needed	Needed	Slightly needed	Not needed	Unknown	Response Total
Life cycle	8% (4)	10% (5)	29% (14)	14% (7)	39% (19)	0% (0)	**49**
Distribution and abundance	12% (6)	27% (13)	39% (19)	14% (7)	8% (4)	0% (0)	**49**
Limiting factors (food, shelter, water, breeding sites)	20% (10)	27% (13)	31% (15)	12% (6)	10% (5)	0% (0)	**49**
Threats (predators/competition, contamination)	16% (8)	18% (9)	45% (22)	12% (6)	8% (4)	0% (0)	**49**
Relationship/dependence on specific habitats	20% (10)	14% (7)	35% (17)	16% (8)	14% (7)	0% (0)	**49**
Population health (genetic and physical)	6% (3)	12% (6)	39% (19)	18% (9)	22% (11)	2% (1)	**49**
Other (please specify below)	12% (2)	25% (4)	0% (0)	0% (0)	19% (3)	44% (7)	**16**
					Total Respondents		**310**

40. Other research needs for ALL birds in ALL habitats in Indiana.

1. I would like to see some research to determine the extent to which mowing and haying negatively impact production following the end of the primary nesting season (as defined by the USDA). Following July 15 in Indiana landowners can mow or hay there enrolled lands. I believe a substantial proportion of bobwhites are still nesting at that time.
2. Whether the distribution of early successional habitat is now so poor and low (as are ruffed grouse populations)that the dissappearance of ruffed grouse from local areas now expand into a more regional or complete extinction.
3. 1)To determine the genetic integrity of Mallards in Developed Areas.
   2)To determine effective management tools and a management plan of Mallards in Developed Lands.
4. Movement pattern of urban Canada Geese.
   Affinity for Canada Geese hatched in an urban enviroment to move or migrate back to a similar environment.
5. How to reduce clean farming and increasing field size.
6. Unknown
7. Detailed demographic data need to be gathered and the effects of habitat structure and fragmentation on those demographic parameters understood.

8.	harvest survival/nest success
9.	Research is needed to justify extending or modifying the hunting seasons to eliminate the problem of the so callled nuisance goose in urban areas, around lakes and golf courses.
10.	Ways to reduce urban populations
11.	food availability throughout annual cycle ways to deter use
12.	X
13.	unknown
14.	Dispersal and repopulation methods of isolated habitats.
15.	- impact of high snow goose populations on Canada geese nesting sites - develop more effective dispersal, relocation or removal techniques gor maxima geese
16.	We don't need more reserch. We need habitat management for early successional forest species, including but not limited to the ruffed grouse.
17.	Effects of Forestry practices on demography and presence and absence of cerulean warblers (TNC) proposed study
18.	Timing of agricultural practices in relation to the timing of breeding. Reproductive loss due to agricultural practices
19.	The eastern towhee is a well-known, fairly common species. The general life-history literature is extensive. Population trends, habitat needs and threats are not well defined for Indiana. The documented population declines in databases such as the Breeding Bird Surveys are poorly explained.
20.	unknown
21.	unknown

Total Respondents	**21**
(skipped this question)	35

41. What are the HABITAT research needs for ALL birds in ALL habitats in Indiana?

	Urgently needed	Greatly needed	Needed	Slightly needed	Not needed	Unknown	Response Total
Successional changes	8% (4)	26% (13)	34% (17)	14% (7)	16% (8)	2% (1)	**50**
Distribution and abundance (fragmentation)	18% (9)	32% (16)	36% (18)	8% (4)	6% (3)	0% (0)	**50**

Threats (land use change/competition, contamination/global warming)	20% (10)	28% (14)	32% (16)	14% (7)	6% (3)	0% (0)	**50**
Relationship/dependence on specific site conditions	14% (7)	16% (8)	41% (20)	16% (8)	12% (6)	0% (0)	**49**
Growth and development of individual components of the habitat	10% (5)	18% (9)	36% (18)	16% (8)	16% (8)	4% (2)	**50**
Other (please specify below)	6% (1)	25% (4)	6% (1)	0% (0)	12% (2)	50% (8)	**16**
					Total Respondents		**265**

42. Other HABITAT research needs for ALL birds in ALL habitats in Indiana.

1. Seeding mixtures and mid-contract management activities currently utilized on farm bill lands need to be evaluated to determine their value to bobwhite nesting and brood rearing.
2. 1) To determine the long term effects of Mallards in Developed Lands on the overall Mallard population
2) To device management tools and concepts to help professionals manage better for Mallards in Developed Lands
3. How to create and maintain quality grassland habitat on a permanant basis.
4. Unknown
5. Affects of channelization on streambank communities and the affects on adjacent oxbows, bottomland hardwoods and other riparian areas
6. Relationship of fire to habitat structure needs to be better elucidated.
7. Habitat needs should be researched in an attempt to find and propogate habitats that are esthetically pleasing to humans for urban settings yet displeasing to geese.
8. Ways to exclude geese
9. availability throughout annual cycle
10. X
11. unknown
12. Location and distribution of shrub/scrub habitat.
13. We do not need research on grouse habitat. We know what they need, it just needs to be provided before the ruffed grouse is extirpated.
14. We need to research how to keep emergent wetlands more attractive to Canada geese to reduce their use of manmade habitats in the urban community.

15. Effects of forestry practices on cerulean warbler presence or absence and on demography

16. Timing and frequency of haying and other agricultural disturbances

17. Forest succession is well understood in Indiana. But the relationship between towhee occupancy and habitat age is not explicitly well studied here.

18. unknown

19. unknown

Total Respondents	**19**
(skipped this question)	37

43. How well do the following conservation efforts address the threats to ALL birds in ALL habitats in Indiana?

	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
Habitat protection (use below for details)	42% (20)	54% (26)	2% (1)	0% (0)	2% (1)	**48**
Population management (hunting, trapping)	20% (10)	24% (12)	16% (8)	37% (18)	2% (1)	**49**
Population enhancement (captive breeding and release)	0% (0)	4% (2)	12% (6)	82% (40)	2% (1)	**49**
Reintroduction (restoration)	2% (1)	4% (2)	14% (7)	73% (36)	6% (3)	**49**
Food plots	12% (6)	27% (13)	16% (8)	39% (19)	6% (3)	**49**
Threats reduction	6% (3)	41% (20)	8% (4)	20% (10)	24% (12)	**49**
Native predator control	0% (0)	33% (16)	10% (5)	39% (19)	18% (9)	**49**
Exotic/invasive species control	2% (1)	41% (20)	10% (5)	22% (11)	24% (12)	**49**
Regulation of collecting	17% (8)	29% (14)	15% (7)	29% (14)	10% (5)	**48**
Disease/parasite management	2% (1)	14% (7)	16% (8)	39% (19)	29% (14)	**49**
Translocation to new geographic range	0% (0)	10% (5)	14% (7)	69% (34)	6% (3)	**49**
Protection of migration routes	22% (11)	31% (15)	10% (5)	20% (10)	16% (8)	**49**
Limiting contact with pollutants/contaminants	2% (1)	39% (19)	14% (7)	20% (10)	24% (12)	**49**
Public education to reduce human disturbance	10% (5)	55% (27)	6% (3)	16% (8)	12% (6)	**49**

Culling/selective removal	2% (1)	16% (8)	8% (4)	73% (36)	0% (0)	**49**
Stocking	2% (1)	0% (0)	12% (6)	84% (41)	2% (1)	**49**
Other (please specify below)	8% (1)	8% (1)	8% (1)	17% (2)	58% (7)	**12**
					Total Respondents	**794**

44. Other current conservation practices for ALL birds in ALL habitats in Indiana.

1. Instead of the word "protection" perhaps "enahncement" would be a better choice as the "protection" of habitat for ruffed grouse requires active vegetative management. While hunting is not responsibile for the declining population trends and hunting pressure is self-limiting/regulated by diminishing returns, the question does eventually come to the point (with the continuous decline of habitat and subsequently low populations) where one must ask if there is an available surpluss or are we shooting the last grouse in an area that was doomed anyway due to the lack of habitat.
2. Habitat Alteration
3. Unknown
4. Fire management in savannas
(Water level management in swamp forests)
5. FIRE!!! How can this critical process not be listed as one of the standard conservation practices in your template?
6. X
7. unknown
8. Unknown
9. N/A
10. What is needed is habitat management in the form of producing early successional forest stages in large tracts throughout the forested regions of the state, especially on public lands. If this is not provided, the grouse will soon be extirpated.
11. Restoration of native grasslands, and increased enrollment in Conservation Reserve Program provide refuges from agricultural disturbances (provided the proper vegetation structure is maintained).
12. None known to me.
13. Education of public to reduce losses due to exotic predators such as cats is probably important to some local populations.
14. unknown
15. unknown

Total Respondents	**15**
(skipped this question)	41

45. What one or two specific practices would you recommend for more effective conservation of ALL birds in ALL habitats in Indiana?

1. I would require mid-contract management (e.g. disking or burning) between 3-5 years after establishement on all farm bill acreage planted to grasses.

2. The most important practice that would benefit bobwhites in shrub/scrub habitat would be to spend more time educating the public about what constitutes suitable quail habitat.

3. Habitat protection (without habitat the Mallard won't do well) Population management (makes use of surplus numbers and regulates take) "The Mallard" by John Madson Olin Mathieson Chemical Corporation.

4. Active timber management, especially on the larger blocks of public forest lands, especially those timber management practices that remove at least 75% of the overhead canopy.

5. 1)HUNTING (first and foremost)
2)Habitat Alteration

6. See question 49

7. Permanant protection of grassland habitat.

8. Habitat Protection (intensive) Reproduction and Protection, Ducks,Geese & Swans of North America, Bellrose
Protection of Migrating Routes (intensive) Same

9. To best benfit the Wood Duck, one must first improve the habitat. This particular question seems redundant with #48. Therefore refer to my answer in box number 48.

10. Restoration of former savanna sites.
Long-term fire management of existing savanna sites.

11. Restoration of Habitat

12. Hen houses
habitat conservation
buffer zones

13. Modification of hunting seasons and opening of urban areas to hunting to reduce numbers of so called nuisance geese populations in leu of nest destruction and egg shaking.

14. Population reduction

15. Using prescribed fire to manage savanna habitats is crucial and is not happening on nearly enough acres in the state.

16. Habitat protection
nest boxes

17. Enhancement of migratory/staging habitat
enhancement of breeding habitat where populations do not conflict with landuse

18. Restoring wetlands & providing quality upland nesting cover adjoining these wetlands.
Reduce fall tillage near wetlands.

19. continue 5 year surveys

20. removal of habitat in urban zones

21. Habitat protection throughout annual cycle

22. Habitat protection, development and maintenance.

23. 1. Establishment of more shrub/scrub habitat.
2. Vegetative succession control to provide early successional plant species.

24. - develop practices and procedures to increase harvest of local birds

25. Habitat decline must be addressed - methods to initiate active timber/wildlife management on the landscabe is necessary to stem the serious decline of ruffed grouse in the state.

26. Immediate production of early successional stages of vegetation on public lands. Forstry practices such as clear-cutting and certain select cutting methods are needed to provide the habitat that is essential to returning ruffed grouse populations to earlier levels.

27. Habitat protection and exotic/invasive species control are both nationally and regionally accepted and funded. However, there has been limited success with these methods in Indiana. I do not know of any reference or resource discussing this.

28. Increasing the area of mature forest in the landscape and decreasing fragmentation. The conservation of existing forest land is also critical.

29. Protection of habitat and restoration of habitat

30. 1. Nesting habitat needs to be improved in areas where posssible, thereby reducing nest depredation.
2. The traditional migration corridors of Indiana should be improved and enhanced through water level management where possible.

31. 1. We desperately need to learn how silvicultural activities and land management affect this species. Are there silvicultural activities (such as single-tree selection) that actually improve cerulean warbler habitat.

2. Increasing the size and reducing the fragmentation of forest blocks within the state will likely improve habitat for this wildlife species.

32. Time and haying and grazing around the breeding cycle - before May or after June.

33. Continued use of bridge architecture that favors nest placement.

34. Maintenance of contiguous forest areas.

35. The major need is regional land management plans that retain young forest age classes and mixes of habitats within regional landscapes. Second practice may be exotic plant control. Garlic mustard and Amur honeysuckle have the ability to change vegetative structure of ground and understory layers. As ground nester and ground forager, towhees could be affected, but this is unstudied.

36. Habitat protection (maintenance of old-growth/mature forest components in Indiana)
Additional research (nest productivity, annual monitoring of populations to assess trends in population numbers)
Hamel, P.B. 2000. Cerulean Warbler (Dendroica cerulea). In The Birds of North America, no. 511 (A. Poole and F. Gill, Eds.). The Birds of North America, Inc., Philadelphia.
Islam, K. and K.L. Roth. 2004. Habitat Selection and Reproductive Success of Cerulean Warblers in Southern Indiana. Final report submitted to U.S. Fish and Wildlife Service, Fort Snelling, MN, December 2002. Department of Biology Technical Report No. 4, Ball State University, Muncie, Indiana 51pp.
Islam, K. and C. Basile. 2002. Relative abundance and habitat selection of Cerulean Warblers in Southern Indiana. Final report submitted to U.S. Fish and Wildlife Service, Fort Snelling, MN, December 2002. Department of Biology Technical Report No. 1, Ball State University, Muncie, Indiana 76pp.

37. Education/awareness of falcon needs for feeding and nesting.

38. Prevention of stream channelization and other (pollution) habitat factors.
Limit disturbance in nesting/migration habitat.

39. Protection of potential habitat. Limiting disturbance by humans and predators if birds ever recolonize Indiana's Lake Michigan shoreline.

40. Conservation of habitats.

41. Conservation of forests and wise timber management empahsizing older forests.

42. Incentives to conserve wooded riparian corridors and responsible forestry practices.

43. Conservation and active management of grassland habitats.

44. Habitat protection and habitat manipulation.

45. Acquisition and protection of nesting habitat (mature floodplain forest)

46. Prescription burning to maintain sparse understory in mature pine forests may potentially help some species, for example on DNR lands. Suggested reference: Rodewald, P.G., J.H. Withgott, and K.G. Smith. 1999. Pine Warbler (Dendroica pinus). In The Birds of NOrth America, No. 438 (A. Poole and F. Gill, eds.). The Birds of North America, In., Philadelphia, PA.

47. Protection and habitat restoration in forested wetlands.

Total Respondents	**47**
(skipped this question)	9

46. How well do the following conservation efforts address the HABITAT threats to ALL birds in ALL habitats in Indiana?

	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
Habitat protection through regulation	16% (8)	67% (33)	2% (1)	8% (4)	6% (3)	**49**
Habitat protection on public lands	37% (18)	47% (23)	6% (3)	6% (3)	4% (2)	**49**
Habitat protection incentives (financial)	22% (11)	53% (26)	4% (2)	10% (5)	10% (5)	**49**
Habitat restoration through regulation	22% (11)	35% (17)	8% (4)	22% (11)	12% (6)	**49**
Habitat restoration on public lands	41% (20)	43% (21)	4% (2)	6% (3)	6% (3)	**49**
Habitat restoration incentives (financial)	33% (16)	39% (19)	4% (2)	8% (4)	16% (8)	**49**
Artificial habitat creation (artificial reefs, nesting platforms)	19% (9)	21% (10)	6% (3)	52% (25)	2% (1)	**48**
Selective use of functionally equivalent exotic species in place of extirpated natives	4% (2)	22% (11)	8% (4)	53% (26)	12% (6)	**49**
Succession control (fire, mowing)	33% (16)	40% (19)	6% (3)	15% (7)	6% (3)	**48**
Corridor development/protection	20% (10)	45% (22)	4% (2)	20% (10)	10% (5)	**49**
Managing water regimes	19% (9)	25% (12)	6% (3)	35% (17)	15% (7)	**48**
Pollution reduction	2% (1)	48% (23)	2% (1)	19% (9)	29% (14)	**48**
Protection of adjacent buffer zone	21% (10)	56% (27)	4% (2)	8% (4)	10% (5)	**48**
Restrict public access and disturbance	14% (7)	45% (22)	16% (8)	14% (7)	10% (5)	**49**
Land use planning	32% (15)	40% (19)	9% (4)	9% (4)	11% (5)	**47**
Technical assistance	11% (5)	77% (36)	2% (1)	4% (2)	6% (3)	**47**
Cooperative land management agreements (conservation easements)	32% (15)	47% (22)	2% (1)	6% (3)	13% (6)	**47**
Other (please specify below)	9% (1)	0% (0)	0% (0)	9% (1)	82% (9)	**11**
				Total Respondents		**833**

47. Other current HABITAT conservation practices for ALL birds in ALL habitats in Indiana.

1. Under the habitat through "protection and regulation", some states have "polciies or regulations" that specifically mandate that a certain percentage of their public lands will be maintained in early successional and transitional forest types
2. N/A

3. Unknown

4. I apologize - I finally found fire in the list!

5. X

6. unknown

7. Unknown

8. There are very few if any "current habitat conservation practices" being implemented for the ruffed grouse. That is the major problem with the critically low population levels for this species.

9. preventing the early mowing/haying of CRP land or other habitat

10. unknown

11. unknown

Total Respondents	**11**
(skipped this question)	45

48. What one or two specific HABITAT practices would you recommend for more effective conservation of ALL birds in ALL habitats in Indiana?

1. Making mid-contract management mandatory on enrolled acreage.

2. Setting back succession with burning or disking are the 2 most productive habitat practices. The INDFW already provides financial incentive to maintain or establish bobwhite habitat on priveate land. These incentives do help some to provide quality bobwhite habitat.

3. Habitat protection through regulation (only sure way to protect habitat without public ownership) Purchase more public land.

4. I thought I answered this already but here we go:

ACTIVE TIMBER MANAGMENT THAT REMOVES AT LEAST 75% OF THE EXISTING FOREST CANOPY ON A PROPORTION OF THE FORESTED LANDSCAPE EVERY 5-10 YEARS ON A 80-120 YEAR ROTATION (DEPENDING SITECONSTRAINTS AND MGMT OBJECTIVES) USING PRIMARILY EVEN-AGE TIMBER MANAGEMENT TECHNIQUES.

5. Habitat Alteration

6. See question 49

7. Habitat protection through regulation, (less intensive)cover a large geographic area. Ducks,Geese & Swans of North America, Bellrose
Habitat Protection through incentives, (intensive), best landowner cooperation, Same

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.

9. Purchase of remnant savannas, restoration of savannas that have undergone succession to forest or have been farmed.

10. More incentives to restore habitat.

11. Landowner programs
buffers
habitat conservation regulations

12. Control of plant species that spread by vegetative means that from thick colonies such as catttail.

13. Landscaping to exclued geese

14. Burn more. And get rid of the invasive species degrading savanna habitats, including those invasive species deliberately plant by wildlife agencies.

15. Elimination of ditches and stream channelization

16. food plots
refuge areas

17. Regulations are needed to protect small wetlands.
Habitat restoration programs for private land owners. (Financial help)

18. continue efforts to protect and enhance wetland and ripairian habitats.

19. Removal of habitat in urban zones

20. Habitat protection incentives
habitat protection regulations

21. Woodland edge feathering
Shrub corridor/hedgerow development

22. 1. Provide financial incentives to establish habitat.
2. Technical assistance to maintain habitat in shrub/scrub type.

23. - providing additional financial incentives on private lands for easements to protect existing wetlands or to restore wetlands

24. TIMBER MANAGEMENT

25. Implement forestry practices that will benefit early successional species including grey fox, bobcat, and woodcock, as well as ruffed grouse.
Educate the public so they understand that "nature knows best" and that "letting things go back to nature" are ignorant and foolish concepts. Educate the public to understand that habitat management in this day and age is necessary if we are to provide habitat for specialist species whose populations are in peril.

26. Habitat protection and restoration through incentives are the best means to conserve the Canada Goose in emergent wetlands. However, it is difficult for the government to compete financially with developers. I know of no resource for further information.

27. Land use planning and habitat protection and restoration on public and private land.

28. Protection/restoration of habitat and preventing early mowing/haying

29. 1. Lobby for legislation that would protect any remaining wetlands.
2. Actively manage the water levels if at all possible to insure ducklings will fledge and to encourage use by spring and fall migrants.

30. Due to natural succession and the reduction of natural disturbance, sugar maple and American beech are increasing in stand density and basal area at the expense of the oak-hickory overstory throughout many of the forests in the state. A shift in forest composition from oak-hickory to maple-beech dominated forests has implications for many wildlife species. This shift could result in a reduction of species richness and abundance within forest bird communities and may negatively influence the cerulean warbler. Differences in foliage and bark structure may affect arthropod (spiders and related species) availability for this species. And, the short-petioled leaves and furrowed bark of oak trees compared to maples may provide better foraging opportunities for these birds.

31. Provide incentives to prevent landowners from haying or grazing during the breeding season. Educate landowners about the importance of their land to the persistence of some species.

32. Critical habitat for Cliff Swallows is nesting sites, most are on public (DOT) structures (bridges). Much less important is water quality, etc. for feeding areas.

33. Promotion of older growth forest on public and private lands.

34. Encouragement of forest management plans that retains / creates mix of young and older forest should retain towhees in regional avifaunas. Forest habitat restoration provides habitat in early stages.

35. Habitat protection (maintenance of old growth/mature forest components in Indiana)
Aditional research (nest productivity, annual monitoring of populations to assess trends)
Hamel P.B. 2000. (see complete citation elsewhere)
Islam and Roth. 2004. (see complete citation elsewhere)
Islam and Basile. 2002. (see complete citation elsewhere)

36. Education/awareness programs for building managers.

37. Water regime management for migration habitat.
Protection of nesting habitat along streams.

38. Habitat protection and management.

39. Incentives to conserve floodplain forests.

40. Incentives to preserve forests and use good timber managements practices.

41. Incentives to conserve wooded riparian corridors.

42. Incentives for conserving and managing grasslands.

43. retard succession to desired habitat stage; incentives to conserve shrubby habitats.

44. Maintain mature floodplain forest
Encourage tree plantings in floodplain areas where forest has been removed

45. Potentially prescribed burning on public lands to maintain mature forests with sparse understory. Rodewald et al. 1999. Pine Warbler in Birds of North America

46. incentives and restrictions to prevent forested wetland loss and encourage conservation.

Total Respondents	**46**
(skipped this question)	10

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

1. A substantial proportion of Indiana's non-farm program early successional habitat has been lost over the last 30 years and the farm bill grasslands now constitute a substantial proportion of the bobwhites habitat in the state.

2. No

3. Ruffed grouse should be veiwed as an interior forest dependent species requring early successional forests. While their populations will also benefit to some degree from the transitional habitats that develope from abandoned fields going into forested cover, they are primarily dependent on the larger tracts of contiguous forests. They are not an "edge" species even though that is commonly found in the popular literature and some older technical publications. Grouse are often found on forest edges because that is the only early successional habitat they can find. they are also more vulnerable to natural and man-induced (hunting)predation when forced up to the edge or limit of good or marginal habitat.

4. The information and comments that I have provided are true and accurate to the best of my knowledge. However, I don't feel that this was the best platform to have conveyed information on Mallards in Developed Habitats. Mallards in developed lands is a topic unlike that of most species threatened by habitat loss and it's accompanying problems. Rather, Mallards in Developed Lands is a situation which must be dealt with in a responsible manner if we are to maintain the integrity of Mallards in a "natural" or less developed setting in Indiana. As the size and distribution of developed lands in Indiana grows, this situation becomes more and more complex for a multitude of reasons (genetic pollution, fecal contamination, habitat loss or destruction, nuisance animal complaints, nutrient loading, etc.) I tried to convey that message in the format provided in this survey. However, Mallards in Developed Lands is not always a positive situation (which I tried to convey throughout this survey). Nonetheless, it is a crucial issue which must be addressed by the DFW. Proper planning and management now on the part of the DFW may result in "quality" Mallard habitat in Developed lands (in the future), better understanding of current Mallard and Developed Land dynamics, and a reduction of problems and conflicts in this current genre. This is my hope as well as justification for the answers and comments I provided on this topic.

   This survey was hard to complete for Canada Geese in Developed land Habitats. What is effective conservation? I consider the large numbers of Canada Geese in urban enviroments (developed lands) a real problem. So do many residents of Fort Wayne. Urban goose-human conflicts are on the rise. Each year the Division of Fish & Wildlife issues more and more egg/nest destruction and

	rise. Each year the Division of Fish & Wildlife issues more and more egg/nest destruction and trap/transport permits. Urban areas attract geese by offering lakes and ponds, short lush lawns, protection and even those individuals that intentionally feed geese. Effective conservation for urban geese should deal with how to limit numbers through education and habitat modifications. I.e.: if a retention pond must be constructed, install habitats around the pond that help limit geese. Urban geese can nest in inappropriate sites, demonstrate aggressive behavior, cause damage to lawns, beaches, sidewalks, parking lots, etc. In my opinion, the best conservation practice would be to limit Canada Goose numbers in developed land habitats.
6.	I think we know what needs to be completed but the question is how to get the Private landownership to practice what is needed on a large scale.
7.	Kettle Lakes are limited in number, although habitat surrounding them can be manipulated. No new Kettle Lakes can be created so it is critical to provide protection through, regulations, incentives and management.
8.	In many ways, savanna is a mixture of forest and grassland habitats so conserving those habitat types will aid savanna species. However, there are species, such as the Red-headed Woodpecker, that specifically benefit from oak savanna. Understanding the conservation value, for different species, of habitats along the grassland-forest gradient can help guide our allocation of resources to produce different landscape compositions.
9.	Provide information on habitat creation and farming techniques. Provide incentives to create/maintain such habitat
10.	no
11.	There is currently an overpopulation of Canada geese in developed lands. State, municipal, and federal governments and private landowners need to work together to reduce the population of nusiance geese.
12.	This is the last one I'll have time to do and I'd like to add some general comments. The unfortunate reality is that the biggest legacy of wildlife biologists in Indiana is the list of invasive species they have unleashed on this state. Asian bush honeysuckle, Japanese honeysuckle, multiflora rose, autumn olive - this list goes on and on. Where is the accountability for the incredible damage these species are now causing to wildlife in the state? Where is the effort to undo this damage? For those of us spending hundreds of thousands of dollars each year to control these species so that we can provide wildlife habitat in Indiana it is very disheartening to have no wildlife biologists step up and admit those species were a mistake and work alongside us to control these problems. And the phrase "Selective use of functionally equivalent exotic species in place of extirpated natives" may be the most insulting statement I've ever read. That is the whole problem with wildlife biology in this state - they think that statement makes sense!! It is time for biologists to join all the other natural resource managers on this issue.
13.	Indiana needs to take a more active role in protecting and restoring emergent wetlands. Probably the upward spiral of land value will insure the loss of our last quality habitat. To this date jobs and revenue are number one on our priorities. We will destroy any stream or wetland for a new residence, more agricultural production, or a factory. I fear we may be to late. As I see what has occured during my 35 year as a land manager in Indiana I sometimes feel we have already lost the battle.
14.	no
15.	Shrub/scrub habitats alone will not support a viable Northern Bobwhite population. Other essential habitats would include: wildlife friendly clump grasses/legumes/forbs, annual crops and/or moderately disturbed ground. All of these habitat types must be in close proximity to shrub/scrub

moderately disturbed ground. All of these habitat types must be in close proximity to shrub/scrub habitats to meet the birds living requirements.

16. None.

In Indiana we need to consider two distinct groups of Canada geese. I have tried to address both groups in the information provided above.

17. The geese migrating down from the traditional nesting grounds in Canada face high snow goose populations, degradition and destruction of existing wetlands, short stopping and a warming winter weather pattern. These have had a severe influence on traditional migration patterns and routes.

The Maxima geese being yearround residents are much more prone to goose - human conflicts. Also tend to gather in large numbers on small water bodies leading to possible disease outbreaks.

18. Indina mirrors other states, especially on the southern periphery of the ruffed grouse range in the severe reduction of suitable habitats and consequently, populations. As land abandonment and reverting farmlands are a thing of the past, only timber management on public (especially) and private lands can rebalance successional age classes in forest lands to benefit grouse and a host of other early successional species.

19. No additional comments.

20. There is still a lot unknown about cerulean warblers. We need to improve our knowledge and to see what is limiting population growth (could be wintering area habitat loss or poor survival in addition to breeding habitat problems). We need to encourage a forest landscape wherever possible (that includes actively managed forest lands) to increase the amount of forest in the landscape and actively encourage a percantage of that landscape to be in mature forests.

21. CRP has been beneficial for HESP's in Indiana. We need to continue to encourage incentives to private landowners to keep land in grassland habitat that is beneficial to HESP's.

22. By some estimates, Indiana has lost up to 90% of it's original wetlands. This habitat loss has resulted in a dramatic decline of resident mallards. Of more importance to Indiana should be the development/maintenance of waterfowl marshes that might be used by spring and fall migrants. Development of this plan should go beyond state boundaries. Currently, migrants are more important than residents.

23. Recently The Nature Conservancy has held meetings with many agencies and universities to determine the feasibility of conducting a landscape ecology project for the cerulean warbler. This project would focus on the response of this species to silvicultural practices and could yield very useful information. Basic demography data could also be collected. With proper funding, many other species that use this habitat type could be studied as well. A key issue to cerulean warbler conservation is research. Before effective conservation strategies can be developed, a lot of questions will need to be answered.

24. Bobolinks may disperse from breeding sites in response to nest failure. Two spatially separated populations may be demographically linked by dispersal, so what happens on one field may affect birds on another field. Although the dispersal ability of the species has not been well-quantified, its at least on the scale of a county, if not multiple counties. Management and conservation should occur at these larger spatial scales. Managing a network of different grassland types using different disturbance regimes so that some populations nest successfully every year could provide a balance between agricultural production and Bobolink production.

Eastern towhee is a non-endangered but declining species across much of the United States. It is not the focus of specific monitoring efforts (because it is not on threatened lists), but it has shown

26.	not the focus of specific monitoring efforts (because it is not on threatened lists), but it has shown sharp declines. Indiana populations on the Breeding Bird Survey show a negative (-1%/year) but nonsignificant decline. The species is best used as an indicator on young forest age-classes within a management district or region. In terms of breeding habitat, this species appears to be closely tied to native Virginia pine in southern Indiana and in some mature pine plantations at scattered locations around the state. At some point in the future, many of the pine plantations that were established since the 1930's will undoubtedly be replaced by native deciduous forest. Thus, it may be prudent to conduct more intensive inventories of native Virginia pine and its distribution as well as assessing the habitat and potential management strategies for pine warbler.	
	Total Respondents	**26**
	(skipped this question)	30

6. Please rank the following threats to ALL fish in ALL habitats in Indiana.

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total
Invasive/non-native species	7% (3)	14% (6)	28% (12)	26% (11)	9% (4)	16% (7)	**43**
High sensitivity to pollution	18% (8)	34% (15)	34% (15)	7% (3)	0% (0)	7% (3)	**44**
Bioaccumulation of contaminants	2% (1)	9% (4)	32% (14)	34% (15)	7% (3)	16% (7)	**44**
Predators (native or domesticated)	0% (0)	7% (3)	26% (11)	35% (15)	26% (11)	7% (3)	**43**
Dependence on other species (mutualism, pollinators)	0% (0)	0% (0)	17% (7)	7% (3)	45% (19)	31% (13)	**42**
Diseases/parasites (of the species itself)	0% (0)	0% (0)	12% (5)	39% (16)	7% (3)	41% (17)	**41**
Regulated hunting/fishing pressure (too much)	2% (1)	2% (1)	19% (8)	23% (10)	47% (20)	7% (3)	**43**
Species over population	2% (1)	2% (1)	7% (3)	5% (2)	81% (35)	2% (1)	**43**
Unintentional take/ direct mortality (e.g., vehicle collisions, power line collisions, by-catch, harvesting equipment, land preparation machinery)	0% (0)	0% (0)	5% (2)	28% (12)	63% (27)	5% (2)	**43**
Unregulated collection pressure	0% (0)	0% (0)	5% (2)	21% (9)	70% (30)	5% (2)	**43**
Dependence on irregular resources (cyclical annual variations) (e.g., food, water, habitat limited due to annual variations in availability)	19% (8)	7% (3)	23% (10)	19% (8)	16% (7)	16% (7)	**43**
					Total Respondents		**472**

7. Please also rank these threats to ALL fish in ALL habitats in Indiana.

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total
Habitat loss (breeding range)	21% (9)	23% (10)	26% (11)	14% (6)	7% (3)	9% (4)	**43**
Habitat loss (feeding/foraging areas)	21% (9)	26% (11)	23% (10)	16% (7)	7% (3)	7% (3)	**43**
Small native range (high endemism)	2% (1)	10% (4)	7% (3)	14% (6)	60% (25)	7% (3)	**42**

Near limits of natural geographic range	9% (4)	2% (1)	9% (4)	7% (3)	72% (31)	0% (0)	**43**
Large home range requirements	0% (0)	0% (0)	0% (0)	7% (3)	74% (31)	19% (8)	**42**
Viable reproductive population size or availability	9% (4)	9% (4)	21% (9)	21% (9)	37% (16)	2% (1)	**43**
Specialized reproductive behavior or low reproductive rates	16% (7)	7% (3)	21% (9)	16% (7)	30% (13)	9% (4)	**43**
Degradation of movement/migration routes (overwintering habitats, nesting and staging sites)	16% (7)	14% (6)	23% (10)	14% (6)	19% (8)	14% (6)	**43**
Genetic pollution (hybridization)	0% (0)	0% (0)	0% (0)	21% (9)	60% (26)	19% (8)	**43**
Unknown	0% (0)	0% (0)	18% (3)	0% (0)	12% (2)	71% (12)	**17**
Other (please specify below)	0% (0)	20% (3)	0% (0)	0% (0)	7% (1)	73% (11)	**15**
					Total Respondents		**417**

8. Other threats to ALL fish in ALL habitats in Indiana.

1. Stream channelizing
2. High stream flows following spawning can seriouslyh reduce year class strength. This threat can be reduced by reducing ditching in headwaters, installing grass waterways and WASCOBS, maintaining riparian corridors. All of these measures will slow stream flows and reduce siltation.
3. High stream flows for a few months following spawning can seriously reduce year class strength.
4. Egg predators predation, nutritional requirements, early mortality syndrome
5. My area of expertise is effects of contamination on biological organisms, especially aquatic. This makes filling out he survey difficult. My knowleldge is applicable to aquatic habitatis rather than specific fish species in this survey.
6. Commercial over exploitation resulting in low spawner stock abundance.
7. commercial fishing
8. Threats to the Orangethroat Darter are related to threats to the habitat. It prefers high-functioning, high quality riffle habitat in headwater streams. Headwater streams, are not always given as much protection or value as larger rivers downstream. Threats to the species colonization, such as aquatic passage problems through culverts are one threat. Threats to the species watersheds, such as pollution, clearing of the riparian vegetation, creek gravel mining, and channelization are also threats to the habitat of this species.; Threats to the Orangethroat Darter are related to threats to the habitat. It prefers high-functioning, high quality riffle habitat in headwater streams. Headwater streams, are not always given as much protection or value as larger rivers downstream. Threats to the species colonization, such as aquatic passage problems through culverts are one threat. Threats

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Total Respondents	**8**
(skipped this question)	33

9. Please briefly describe the top two threats to ALL fish in ALL habitats in Indiana identified above.

1. 1. Pollution
2. sediment deposition
3. Pollution
4. over population
5. (1) Habitat loss - siltation which reduces wpawning areas and fills pools, loss of instrream cover (snagging and log removal), riparian destruction which allows water to warm and will reduce opportunity for logs and woody debris to enter stream, channelization.
(2) Pollution which triggers fish kills or repels smallmouth from the area.
6. (1) Habitat loss - siltation of spawning areas and pools, loss of instream cover, reparian destruction, channelization
(2) Point source pollution which triggers fish kills or repels rock bass from the area.
7. (1) 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.
(2) 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 crapie can consume.
8. Loss of undisturbed natural lake habitat.
9. Long-term declines in water quality associated with lake eutrophication.
Annual and seasonal variations in habitat availability.
10. Habitat loss and degredation are serios threats to rock bass. They prefer silt free streams to reproduce and thrive. They also relate closely to structure/cover therefore any habitat loss is a threat.

11. -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 apparently little to no reproduction.
-The deliberate stocking of predator fish in cisco lakes has been a threat to this species for years; if this hasn't been stopped, it needs to.

12. 1) competition with invasives, namely gizzard shad
2) water level control regimes at impoundments

13. Lack of successful spawning, possibly related to bioenergetics. Too much egg predation.

14. The acute effects a 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.

15. Habitat loss and pollution

16. 1. Possible lack of reproductive success as indicated by poor length frequency distribution.
2. Possible sensitivity to pollution as indicated by its rarity in the Ohio River reach in Indiana.

17. Pike have suffered a major loss of spawning habitat due to the prevalence of dredging within the watershed. This practice along with levee construction has resulted in the near elimination of instream an emaergent wetland vegetation throughout the majority of the watershed.

18. Overharvest by commercial fishers
Mortality immature or male fish as commercial bycatch

19. Year class failure related to low spawner stock abundance. Competition with non native species for limited available food resources.

20. Habitat degredation, non-point sources runoff resulting from loss of riparian buffers due to developement.

21. Exotic species competition, specifically the round goby.

22. 1. Past pollution problems
2. Dams on rivers block migration

23. High sediment loads during spring rains

24. potential habitat loss

25. habitat loss and pollution

26. 1. Loss of habitat (reproductive/feeding) that is essential for northern pike survival
2. Over harvest and illegal harvest (This doesn't seem to be a major threat as of now)

27. 1)habitat loss/pollution, 2) commercial fishing

28.	1. Non-point sources of pollution, especially sediments and pesticides 2. Point sources of pollution particularly sewage and spills of chemicals being transported along roads and railroads
29.	Habitat Loss - The Eastern Sand darter requires sandy bottoms in fast flowing streams to bury eggs, hide from predators, ambush prey, conserve energy, and maintain position in unstable/shifting sandbars. Low reproductive rates/small populations - reach maturity at age 1, but only lives a few years.
30.	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
31.	Habitat loss - requires shallow clear water with little current in weedy areas over gravel, sand, and silt to feed on insects and lay reproduce Dredging (removal of aquatic vegetation and incresing depth of ditch) Runoff (increases flow of stream, turbidity, and siltation of needed substrates)
32.	Habitat loss (breeding & feeding)- the tadpole madtom feeds in dense vegetation and hides from predators in the leaf litter, dead wood, and other cover. By removing vegetation and cover in the stream, the tadpole madtom also loses spawning areas (tadpole madtoms typically lay eggs under submerged objects). Degradation of the stream channel will also increase the velocity of the current (if straightened or cleared of debris) which will remove the tadpole madtom's preferred current-free, quiet habitat.
33.	breeding and feeding/foraging habitat loss due to sedimentation from farm fields and stream banks as well as the removal of natural riparian vegetation; breeding and feeding/foraging habitat loss due to sedimentation from farm fields and stream banks as well as the removal of natural riparian vegetation
34.	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.
35.	Habitat loss (breeding and foraging/feeding areas): Siltation of small headwater streams is limiting the population of southern redbelly dace because the species spawn over gravel substrates. Also, the removal of vegetation could decrease food availablity to the herbivorous species. They occupy streams that have a permanent flow of clear water; thus siltation or alterations in flow regimes could also affect the species.
36.	Degradation of nesting and staging sites- pools or riffles with slow current beneath flat rocks Low reproductive rates-Males reach sexual maturity at 2 while females can reproduce at 1 and they only have a life span of about 3 years.
37.	The top two threats for the species are threats to migration (aquatic passage problems through stream crossing structures) and threats to the breeding habitat (high quality riffles). Threats to riffle habitat result from water quality degradation and loss of stream channel stability due to land management activities such as dredging, channelization, roads, and clearing of riparian vegetation.; The top two threats for the species are threats to migration (aquatic passage problems through stream crossing structures) and threats to the breeding habitat (high quality riffles). Threats to riffle habitat result from water quality degradation and loss of stream channel stability due to land management activities such as dredging, channelization, roads, and clearing of riparian vegetation.; The top two threats for the species are threats to migration (aquatic passage problems through

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Total Respondents	**37**
(skipped this question)	3

10. Please rank the following threats to the HABITAT of ALL fish in ALL habitats in Indiana.

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total
Commercial or residential development (sprawl)	12% (5)	38% (15)	22% (9)	10% (4)	18% (7)	0% (0)	**40**
Counterproductive financial incentives or regulations	0% (0)	5% (2)	8% (3)	5% (2)	32% (13)	50% (20)	**40**
Invasive/non-native species	10% (4)	8% (3)	28% (11)	30% (12)	10% (4)	15% (6)	**40**
Nonpoint source pollution (sedimentation and nutrients)	29% (12)	37% (15)	29% (12)	5% (2)	0% (0)	0% (0)	**41**
Habitat fragmentation	8% (3)	25% (10)	28% (11)	10% (4)	15% (6)	15% (6)	**40**
Successional change	2% (1)	8% (3)	15% (6)	15% (6)	35% (14)	25% (10)	**40**
Diseases (of plants that create habitat)	0% (0)	0% (0)	2% (1)	12% (5)	38% (15)	48% (19)	**40**
Habitat degradation	29% (12)	29% (12)	32% (13)	7% (3)	0% (0)	2% (1)	**41**
Climate change	2% (1)	0% (0)	18% (7)	15% (6)	28% (11)	38% (15)	**40**
Stream channelization	38% (15)	25% (10)	20% (8)	10% (4)	5% (2)	2% (1)	**40**
Impoundment of water/flow regulation	10% (4)	28% (11)	30% (12)	10% (4)	15% (6)	8% (3)	**40**
Agricultural/forestry practices	10% (4)	39% (16)	29% (12)	15% (6)	7% (3)	0% (0)	**41**
Residual contamination (persistent toxins)	0% (0)	20% (8)	32% (13)	27% (11)	2% (1)	20% (8)	**41**
Point source pollution (continuing)	15% (6)	22% (9)	27% (11)	22% (9)	0% (0)	15% (6)	**41**
Mining/acidification	0% (0)	15% (6)	25% (10)	12% (5)	28% (11)	20% (8)	**40**
Drainage practices (stormwater runoff)	5% (2)	34% (14)	29% (12)	22% (9)	2% (1)	7% (3)	**41**
Unknown	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (12)	**12**

Other (please specify below)	0% (0)	8% (1)	0% (0)	0% (0)	8% (1)	85% (11)	**13**
						Total Respondents	**671**

11. Other HABITAT threats to ALL fish in ALL habitats in Indiana.

1. Riparian cooridor destruction. Loss of shading and sedimentation
2. Sand and gravel operations could destroy preferred habitat
3. Competition with round goby for nearshore habitat.
4. Dumping of refuse in sinkholes, these often contain persistent toxins associated with transformers, tires, appliances, pesticide containers, and electronic devices.

Total Respondents **4**

(skipped this question) 39

12. Please briefly describe the top two HABITAT threats to ALL fish in ALL habitats in Indiana identified above.

1. (1) Habitat degradation by sedimentation, channelization, cover removal, riparian removal.
(2) Point source pollution - These ecoregions 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 communities.
2. (1) Habitat degradation - sedimentation, channelization, cover removal, riparian removal
(2) Point source pollution - waste water treatment plants and confined feeding operations.
3. (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.
4. Shoreline and labebed alterations
5. Habitat degradation
Successional change
6. Any practices that create more erosion/sediment depostion and eliminates instream cover is a serious threat. Therefore, I'd have to say nonpoint source pollution and habitat degredation are the most serious threats.
7. Water quality degradation that leads to cloudy water is the key threat.
8. habitat loss/degredation due to a variety of circumstances
9. Identification of habitat along Indiana's nearshore area.

10. Habitat Degradation and Nonpoint source pollution

11. 1. Stream channelization
2. Non-point source pollution

12. The channelization of many streams in the upper Kankakee watershed and the associated fragmentation of wetland habitat has severely altered the state of the aquatic habitat in general.

13. Habitat Fragmentation
Water Level Variability

14. Competition with non native species for habitat. Need a quality place to live that is not in competiton with round goby.

15. Invasive species, non-point source pollution

16. Invasive species competition, specifically round goby interactions. Stream channelazation resulting in loss of habitat.

17. 1. Sedimentation
2. Dams fragmenting habitat

18. Sedimentation
Loss of habitat due to development in headwater areas

19. loss of riparian zone and siltation

20. loss of high quality riffles and outside bend deep fast runs

21. 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.

22. Both non-point and point sources of pollution associated with the increasing human population of Southern Indiana and the development of the area.

23. Habitat Degradation and stream channelization because this will directly affect the sediment transfer within the stream and microhabitat of the Eastern Sand Darter.

24. Nonpoint source pollution- sedimentation
Agricultural practices- again sedimentation

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

26. Stream channelization (straighting 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 recieving stream)

27. 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

	as well as the removal of natural riparian vegetation especially thru drainage maintenance activities
28.	Habitat degradation and stream channelization as development continues in the Ohio River Drainage Habitat.
29.	Non-point source pollution in the form of sedimentation Destruction of clear shaded waters by forestry/agricultural practices or stream channelization.
30.	Habitat degradation in terms of removal of substrate for spawning and sedimentation for covering the substrate needed to spawn.
31.	Top two threats from the list up above are habitat degradation and stream channelization

Total Respondents	**31**
(skipped this question)	12

13. What current monitoring efforts by state agencies are you aware of for ALL fish in ALL habitats in Indiana?

	Yes, these efforts occur	Not aware of these efforts occuring	Response Total
Statewide year-round monitoring conducted by state agencies	3% (1)	97% (38)	**39**
Statewide once a year monitoring conducted by state agencies	5% (2)	95% (37)	**39**
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	18% (7)	82% (32)	**39**
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	28% (11)	72% (28)	**39**
Regional or local year-round monitoring conducted by state agencies	8% (3)	92% (37)	**40**
Regional or local once a year monitoring conducted by state agencies	25% (10)	75% (30)	**40**
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	74% (29)	26% (10)	**39**
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	82% (32)	18% (7)	**39**
		Total Respondents	**314**

14. What current monitoring efforts by other organizations are you aware of for ALL fish in ALL habitats in Indiana?

	Yes, these efforts occur	Not aware of these efforts occuring	Response Total
Statewide year-round monitoring conducted by other organizations	0% (0)	100% (39)	**39**
Statewide once a year monitoring conducted by other organizations	0% (0)	100% (39)	**39**
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (39)	**39**
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (39)	**39**
Regional or local year-round monitoring conducted by other organizations	8% (3)	92% (37)	**40**
Regional or local once a year monitoring conducted by other organizations	25% (10)	75% (30)	**40**
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	20% (8)	80% (32)	**40**
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	28% (11)	72% (29)	**40**
		Total Respondents	**316**

15. How crucial are these monitoring efforts by state agencies for the conservation of ALL fish in ALL habitats in Indiana?

	Very crucial	Somewhat crucial	Slightly crucial	Not crucial	Unknown	Response Total
Statewide year-round monitoring conducted by state agencies	3% (1)	5% (2)	5% (2)	62% (24)	26% (10)	**39**
Statewide once a year monitoring conducted by state agencies	10% (4)	0% (0)	3% (1)	62% (24)	26% (10)	**39**
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	8% (3)	8% (3)	10% (4)	49% (19)	26% (10)	**39**
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	5% (2)	13% (5)	10% (4)	46% (18)	26% (10)	**39**
Regional or local year-round monitoring conducted by state agencies	2% (1)	12% (5)	8% (3)	55% (22)	22% (9)	**40**
Regional or local once a year monitoring conducted by state agencies	13% (5)	23% (9)	23% (9)	21% (8)	21% (8)	**39**

Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	28% (11)	40% (16)	20% (8)	8% (3)	5% (2)	**40**
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	32% (13)	24% (10)	15% (6)	12% (5)	17% (7)	**41**
					Total Respondents	**316**

16. How crucial are these monitoring efforts by other organizations for the conservation of ALL fish in ALL habitats in Indiana?

	Very crucial	**Somewhat crucial**	**Slightly crucial**	**Not crucial**	**Unknown**	**Response Total**
Statewide year-round monitoring conducted by other organizations	0% (0)	8% (3)	3% (1)	56% (22)	33% (13)	**39**
Statewide once a year monitoring conducted by other organizations	5% (2)	3% (1)	5% (2)	54% (21)	33% (13)	**39**
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	5% (2)	5% (2)	5% (2)	51% (20)	33% (13)	**39**
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	5% (2)	3% (1)	3% (1)	55% (21)	34% (13)	**38**
Regional or local year-round monitoring conducted by other organizations	0% (0)	8% (3)	5% (2)	54% (21)	33% (13)	**39**
Regional or local once a year monitoring conducted by other organizations	8% (3)	12% (5)	15% (6)	40% (16)	25% (10)	**40**
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	10% (4)	8% (3)	10% (4)	41% (16)	31% (12)	**39**
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	8% (3)	8% (3)	15% (6)	38% (15)	32% (13)	**40**
					Total Respondents	**313**

17. Regional or local state agency monitoring for ALL fish in ALL habitats in Indiana.

Appendix E-75: Fish

1. Wabash River
West Fork White River
East Fork White River
Ohio River

2. Patoka River watershed

3. Blue River (Harrison County)
Sugar Creek (Shelby County)
Indian Creek (Greene County)

4. Blue River (Harrison County)

5. Blue River (Harrison County)
East Fork White River
West Fork White River

6. Patoka Lake
Hovey Lake
Dogwood Lake
Lake Sullivan
Many other lakes

7. (1) In early to mid 1990's the Division of Fish and Wildlife conducted a smallmouth bass inventory.
(2) 5 streasm have been sampled every other year from 1998 to 2004 to estimate smallmouth bass populations to determine the effect of smallmouth bass population changes due to the imposition of a 12 inch black bass size limit in 1998.

8. (1) IN early to mid 1990's, Division of Fish and Wildlife conducted fish community inventories on the major streams throughout the state.
(2) Game fish population estimates (including rock bass) have been conducted on 5 streams every other year from 1998 through 2004.

9. IDNR - Division of Fish and Wildlife

10. Division of Fish and Wildlife standardized largemouth bass sampling protocols
Tournament fishing monitoring by the Division of Fish and Wildlife

11. Division of Fish and Wildlife at cisco lakes
Department of Environmental Management water quality monitoring

12. various streams throughout the region, some are sampled more regularly than others

13. NE Indiana by DFW (Jed Pearson)

14. many impoundments throughout the state have general fisheries survey conducted on them and crappie are caught during these

15. Spring assessment out of Michigan City. Fall spawning assessment, Indiana waters of Lake Michigan. 9 month creel survey for harvest information. These efforts are conducted by the IDNR-Fish and Wildlife division.

16. IDNR periodically conducts fish stream surveys. IDEM conducts stream health surveys using fish and invertebrates

and invertebrates.

17. Ohio, White and Wabash rivers

18. 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.

19. White River
Wabash River

20. Lake Michigan proper out of Michigan City.

21. Headwater streams surveys were conducted in 2001 through 2004 by IDNR-Fish and Wildife, Lake Michigan Fisheries Office.

22. IDNR-Fish and Wildlife, Lake Michigan Fisheries office

23. IDEM annual ecoregion sampling

24. IDEM ecoregion sampling

25. INDFW, 1999 Wabash River, 2003 East Fork White River, 2004 West Fork White River, 2004 Main Stem White River, 1993 Patoka River, 2004 Ohio River Cannelton Pool, annual commercial fish harvest monitoring.

26. Ohio River, Newburgh and McApline Tailwater fall/winter annual monitoring, ocassional stream surveys

27. ocassional stream surveys

28. 1. Northern Pike are monitored via general fish surveys conducted to update lake status. There is now monitoring of northern pike on a general schedule.
2. There was a tracking study conducted in two Indaia natural lakes in the late 1990's by the IDNR to better understand reproductive habitat of northern pike.

29. Wabash River, Lafayette area, annual spring monitoring; occasional stream surveys

30. unkown

31. IDEM Probabilistic sampling

32. Indiana DNR Special Studies on T&E species- IDNR, Brant Fisher, did a study on the population of Eastern Sand Darters in Indiana over the past five years. IDNR- regional fish collection surveys may have collected some specimens of the Eastern Sand Darter. Indiana Department of Environmental Management (IDEM) occasionally collected Eastern Sand Darters as part of their Surface Water Quality Monitoring Strategy evaluating fish community structure in certain watersheds every 5 years.

33. 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.

34. IDEM and IDNR collect fish community samples in this area; thus, they may have data on the distribution of Least darters.

35. 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.

36. See IDEM OWQ's Surface Water Qaulity Monitoring Strategy and project work plans and IDNR Fisheries Section Work Plans

37. 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 occured to my knowledge by anyone state or other organization.

38. IDNR I believe has conducted special studies on some species. IDEM has record of some species being caught in that area.

39. 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 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.

Total Respondents	**39**
(skipped this question)	3

18. Regional or local monitoring by other organizations for ALL fish in ALL habitats in Indiana.

1. none
2. none
3. None known to occur that specifically target smallmouth bass.
4. None known to occur that specifically target rock bass.
5. none known
6. West Fork White River & tributaries(Muncie area)
7. not aware of any
8. USFWS and Illinois natural history survey egg and fry assessments at the Port of Indiana. THis is part of a Fish and Wildlife Restoration Grant.
9. In some cities stream health is also assessed by fish and invertebrate surveys.
10. Ohio, White and Wabash rivers

11. Wabash River

12. Out of Michgian City and near Gary by Ball State University.

13. City of Elkhart-Elkhart & St. Joseph counties

14. University of Louisville has been monitoring the Northern Cavefish at irregular intervals and locations in southern Indiana since 1994

15. Ball State University fish sampling

16. While collecting fish community samples to evaluate the community structure and ability of the stream to support a healthy fish community, these organizations may have collected Eastern Sand Darters: Soil and Water Conservation Districts within those Ecoregions, Purdue University, Wildcat Creek Watershed Alliance? I would check with the Scientific Collectors Permit office for a list of organizations collecting in those ecoregions and also check with the IDEM Section 319 webpage for project summaries where fish or habitat in those ecoregions were studied.

17. Elkhart Public Works and Utilities has a fisheries biologist on staff that actively collects fish community samples from the Great Lakes Basin (1-2 times in the summer). He may have data on the hornyhead chub as well.

18. US Environmental Protection Agency; USGS Water Resources Division; Ohio River Valley Water Sanitation Commission; Midwest Biodiversity Institute, US Army Corps of Engineers; Muncie Bureau of Water Quality; City of Elkhart Water Quality; various universities; various consulting firms

19. The Hoosier National Forest conducts yearly fish surveys within two or more 5th level HUCs that encompass the Hoosier National Forest, which includes the Ohio River Drainage, Eastern Corn Belt/Interior Plateau Ecoregions. These above fish surveys are not specific to the Orangethroat Darter, but would include the Orangethroat Darter.; The Hoosier National Forest conducts yearly fish surveys within two or more 5th level HUCs that encompass the Hoosier National Forest, which includes the Ohio River Drainage, Eastern Corn Belt/Interior Plateau Ecoregions. These above fish surveys are not specific to the Orangethroat Darter, but would include the Orangethroat Darter.

Total Respondents	**19**
(skipped this question)	23

19. Please list organizations that are monitoring ALL fish in ALL habitats in Indiana.

1. DNR/DFW

2. DNR/DFW

3. DNR/DFW

4. DNR/DFW

5. DNR/DFW

6. DNR/DFW

7. None known that are specifically targeting smallmouth bass.

8. None known that specifically target rock bass.

9. none known

10. Bass fishing clubs who hold tournaments on Lake Wawasee and Syracuse Lake.

11. Muncie Bureau of Water Quality

12. NA

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

14. IDNR, IDEM, City of Elkhart and South Bend.

15. Electric utilities, Ball State University, Purdue University

16. DNR and IDEM

17. Indiana and Illinois DNR
Purdue University
Ball State University
Southern Illinois University
Cinergy

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

19. IDNR-Fish and Wildlife.

20. City of Elkhart - Elkhart and St. Joseph counties

21. University of Louisville, Biology Department

22. See 17 & 18

23. IDEM monitors fish communities not particular species; however, the Slough darter has been captured by electrofishing in the Ohio River Drainage Habitat.

24. 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

Total Respondents	**24**
(skipped this question)	18

20. What are the current monitoring techniques for ALL fish in ALL habitats in Indiana?

	Not used but	Not used and not

			possible with existing technology and data	possible with existing technology and data	feasible		
Radio telemetry and tracking	0% (0)	12% (4)	53% (18)	6% (2)	12% (4)	18% (6)	**34**
Modeling	6% (2)	17% (6)	36% (13)	8% (3)	6% (2)	28% (10)	**36**
Coverboard routes	0% (0)	0% (0)	0% (0)	0% (0)	10% (2)	90% (19)	**21**
Spot mapping	5% (1)	10% (2)	29% (6)	0% (0)	5% (1)	52% (11)	**21**
Driving a survey route	0% (0)	5% (1)	0% (0)	26% (5)	21% (4)	47% (9)	**19**
Reporting from harvest, depredation, or unintentional take (road kill, bycatch)	17% (5)	28% (8)	10% (3)	17% (5)	10% (3)	17% (5)	**29**
Mark and recapture	22% (8)	30% (11)	24% (9)	3% (1)	8% (3)	14% (5)	**37**
Professional survey/census	57% (23)	30% (12)	5% (2)	0% (0)	0% (0)	8% (3)	**40**
Volunteer survey/census	0% (0)	31% (8)	19% (5)	0% (0)	4% (1)	46% (12)	**26**
Trapping (by any technique)	31% (9)	14% (4)	14% (4)	3% (1)	7% (2)	31% (9)	**29**
Representative sites	37% (13)	37% (13)	11% (4)	0% (0)	0% (0)	14% (5)	**35**
Probabilistic sites	16% (5)	19% (6)	29% (9)	0% (0)	0% (0)	35% (11)	**31**
Other (please specify below)	21% (3)	7% (1)	0% (0)	0% (0)	0% (0)	71% (10)	**14**
						Total Respondents	**372**

21. Other monitoring techniques for ALL fish in ALL habitats in Indiana.

1. 1. Larval sampling to check for reporduction
2. 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. Commerical monitoring was conducted until the halt of the commercial fishing industry in 1996.

3.	Delury or Survey/Removal techniques have been used at Donaldson Cave in the 1990's
4.	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"
5.	Electro-fishing and seining are appropriate methods for monitoring the Orangethroat darter.; Electro-fishing and seining are appropriate monitoring techniques for the Orangethroat Darter.; Electro-fishing and seining are appropriate methods for monitoring the Orangethroat darter.

Total Respondents **5**

(skipped this question) 36

22. What one or two monitoring techniques would you recommend for effective conservation of ALL fish in ALL habitats in Indiana?

1.	Electrofishing swift water habitats Hoop nets
2.	Electrofishing Trap nets
3.	Electrofishing catch rate data Population estimates Angler creel surveys
4.	ELECTROFISHING CATCH RATES POPULATION ESTIMATES
5.	Electrofishing surveys Trap netting surveys Gill netting surveys Angler creel surveys Population estimates
6.	(1) Stream fish community surveys - To determine smallmouth bass distribution and abundance. There may be a correlation of smallmouth abundance to the species richness to the overall fish community. (2) Smallmouth bass population estimates.
7.	Stream fish community surveys. Rock bass population estimates.
8.	(1) Reporting from harvest(angler creel surveys) - This survey will show angler exploitation. (2) Professional survey (fish management surveys) - This survey will show size structure, relative abundance, and provide age and growth information.
9.	Springtime dc electrofishing according to DFW standard protocol Standard DFW creel survey procedures Tournament monitoing by the DFW and bass clubs

10. Occasional gill-netting to verify presence followed by intensive netting to confirm low levels or absence

11. electrofishing surveys

12. I would like to see all the lake trout stocked in Lake Michigan to be coded wire tagged. That will allow for better understanding of survival after stocking and movement of the fish. It will also allow for better understanding of spawning site fidelity.

13. Professional Fish Surveys and Creel Surveys

14. 1. Electrofishing river wide
2. Hoop-netting by scientists and commercial fishermen

15. Periodic electrofishing surveys and mark recapture techniques probably provide the best information about the pike populations.

16. Electrofishing, trap net, and gill nets surveys (intensive); monitoring of commercial catch (less intensive).

Quist, M.C., C.S. Guy, P.J. Braaten, C.L. Pierce, and V.H. Travnichek. 2002. Potential influence of harvest on shovelnose sturgeon populations in the Missouri River system. North American Journal of Fisheries Management 22:537-549.

17. Fall trawl sampling for young of the year production. Possible incorporation of hydracoustic models for the near shore area.

18. Rotational sampling at reference sites along the headwaters. Historical comparisons from the early 80's will be compared with the sampling that was completed 2001-2004.

19. Stream sampling using electrofishing techniques and seining. This should be done every 5 years to get a clear picture of changes that occur to habitat, water quality and invasive species introductions and distribution.

20. Radio telemetry or mark & recapture

21. fall/winter Ohio River tailwater sampling and ocassional stream surveys

22. periodic stream surveys

23. Large fyke-nets are used in Lake Webster (Kosicusko Co.) to collected brood stock for muskellunge. These nets would be useful in capturing northern pike as well. This would allow bioligist to capture enough fish to get a represetative sample of adult fish. There is still no effective method of sampling young esocids without mortality.

24. transect electrofishing sampling, hoop nets where feasible

25. Development of an index of biotic integrity (IBI) for vertebrate cave communities in southern Indiana.
Selection of 5-10 locations for survey/counts every2-5 years. A similar survey schedule has been established for cavefish populations in Mammoth Cave National Park and could be used as a model (both IBI and survey).

26.	See where populations of the darter have been captured in the past and then with sienes or electrofishing equipment mark and recapture the darter to document habitat characteristics, water quality information, and land use characterization where the darters occur. You will need to target the habitat and not the exact location since the sandbars will probably shift over time. Look on the web for mark and recapture surveys as well as other eastern sand darter publications. I found many by just searching the web for Eastern Sand Darter.
27.	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.
28.	Representative sites or look for sites where the habitat is suitable for the least darter and seine in the vegetation over rocky substrate.
29.	seining or kick net electrofishing
30.	electrofishing results from probabilistic and representative sites
31.	Seining or electrofishing representative sites using professionals.
32.	Target the habitat with seining equipment or electrofishing.
33.	Seining at representative sites
34.	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 designing a random sample of all streams within a watershed (5th or 6th level HUC). The size of the stream reach sampled would be 15 times the stream width. Seining would also be an appropriate method for sampling.; 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.

Total Respondents	**34**
(skipped this question)	7

23. What current HABITAT inventory and assessment efforts or activities by state agencies are you aware of for ALL fish in ALL habitats in Indiana?

	Yes, these efforts occur	No effort that I'm aware of	Response Total
Statewide annual inventory and assessment conducted by state agencies	3% (1)	97% (38)	**39**
Statewide once a year inventory and assessment conducted by state agencies	3% (1)	97% (38)	**39**
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	8% (3)	92% (36)	**39**

Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	15% (6)	85% (33)	**39**
Regional or local year-round inventory and assessment conducted by state agencies	3% (1)	97% (38)	**39**
Regional or local once a year inventory and assessment conducted by state agencies	15% (6)	85% (33)	**39**
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	48% (19)	52% (21)	**40**
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	49% (19)	51% (20)	**39**
		Total Respondents	**313**

24. What current HABITAT inventory and assessment efforts or activities by other organizations are you aware of for ALL fish in ALL habitats 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% (38)	**38**
Statewide once a year inventory and assessment conducted by other organizations	3% (1)	97% (37)	**38**
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	5% (2)	95% (36)	**38**
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	5% (2)	95% (36)	**38**
Regional or local year-round inventory and assessment conducted by other organizations	8% (3)	92% (35)	**38**
Regional or local once a year inventory and assessment conducted by other organizations	18% (7)	82% (31)	**38**
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	24% (9)	76% (29)	**38**
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	30% (12)	70% (28)	**40**
		Total Respondents	**306**

25. How crucial are these HABITAT efforts by state agencies for the conservation of ALL fish in ALL habitats 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	3% (1)	5% (2)	3% (1)	47% (18)	42% (16)	**38**
Statewide once a year inventory and assessment conducted by state agencies	5% (2)	0% (0)	8% (3)	45% (17)	42% (16)	**38**
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	5% (2)	11% (4)	5% (2)	39% (15)	39% (15)	**38**
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	5% (2)	13% (5)	5% (2)	37% (14)	39% (15)	**38**
Regional or local year-round inventory and assessment conducted by state agencies	0% (0)	5% (2)	13% (5)	45% (17)	37% (14)	**38**
Regional or local once a year inventory and assessment conducted by state agencies	3% (1)	8% (3)	28% (11)	31% (12)	31% (12)	**39**
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	16% (6)	37% (14)	11% (4)	13% (5)	24% (9)	**38**
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	18% (7)	18% (7)	13% (5)	21% (8)	29% (11)	**38**
				Total Respondents		**305**

26. How crucial are these HABITAT efforts by other organizations for the conservation of ALL fish in ALL habitats in Indiana?

	These efforts are very crucial	These efforts are somewhat crucial for	These efforts are slightly	These efforts are not crucial	Unknown	Response Total

	for this HABITAT	this HABITAT	crucial for this HABITAT	for this HABITAT		
Statewide year-round inventory and assessment conducted by other organizations	0% (0)	3% (1)	5% (2)	39% (15)	53% (20)	**38**
Statewide once a year inventory and assessment conducted by other organizations	3% (1)	0% (0)	5% (2)	37% (14)	55% (21)	**38**
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	3% (1)	3% (1)	11% (4)	32% (12)	53% (20)	**38**
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	3% (1)	0% (0)	11% (4)	34% (13)	53% (20)	**38**
Regional or local year-round inventory and assessment conducted by other organizations	0% (0)	8% (3)	8% (3)	34% (13)	50% (19)	**38**
Regional or local once a year inventory and assessment conducted by other organizations	3% (1)	5% (2)	13% (5)	29% (11)	50% (19)	**38**
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	11% (4)	8% (3)	18% (7)	18% (7)	45% (17)	**38**
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	5% (2)	8% (3)	15% (6)	26% (10)	46% (18)	**39**
					Total Respondents	**305**

27. Regional or local state agency HABITAT inventory and assessment for ALL fish in ALL habitats in Indiana.

1. West Fork White River
   East Fork White River
   Wabash River
2. None
3. Blue River (Harrison County)
   Sugar Creek (Shelby County)
   Indian Creek (Greene County)
4. Blue River (Harrison County)

5. BLUE RIVER (HARRISON COUNTY)

6. none

7. Indiana Dept of Natural Resources - Divison of Fish and Wildlife
Indiana Departement of Environmental Management

8. Indiana Department of Natural Resources - Divison of Fish and Widlife
Indiana Department of Environmental Management

9. None known to occur.

10. Not aware of any

11. IDEM - statewide QHEI
IDNR F&W - regional QHEI

12. NE IN, DFW, Jed Pearson.

13. not familiar with habitat assessments that occur on impoundments

14. Habitat mapping and shoreline aerial imagery.

15. In all major tributaries of Lake Michigan

16. Unknown

17. Habitat evaluations are conducted as part of general stream surveys by DNR biologists. Such surveys have been conducted on the Iroquois River, the Yellow River, and the Kankakee River.

18. Lake Michigan proper along the shoreline in nearshore area less than 30 feet in depth.

19. Trail Creek, East Branch of Little Calumet river, Reynolds Creek, Salt Creek, West Branch of Little Calument River, Deep River.

20. IDEM ecoregion surveys

21. Recently the IDNR has began sampling/mapping emergent plant species in some Indiana natural lakes. These plants may be used as reproductive habiatat for northern pike.

22. I don't know of any Habitat Inventory or Assessment done specifically for the Eastern Sand Darter in the habitat you list; however, I do know that IDEM as well as IDNR and other organizations use the Qualitative Habitat Evaluation Index to document the habitat quality of the streams sampled for aquatic communities.

23. Like I mentioned in my survey for the Eastern Sand Darter, IDEM, IDNR, and Elkhart use the QHEI (Qualitative Habitat Evaluation Index) to assess habitat in streams.

24. As I stated in previous surveys, the QHEI would provide a habitat assessment for sites where least darters were collected.

25. IDEM conducts a habitat assessment while sampling stream for fish community assessments using the QHEI (Qualitative Habitat Evaluation Index)

the QHEI (Qualitative Habitat Evaluation Index).

26. IDEM/OWQ/BSS; IDNR/FWD/FS; ORSANCO;

Total Respondents	**26**
(skipped this question)	17

28. Regional or local HABITAT inventory and assessment by other organizations for ALL fish in ALL habitats in Indiana.

1. West Fork White River
   East Fork White River
   Wabash River
2. none
3. NONE
4. none
5. None known.
6. none known
7. none known
8. Not aware of any
9. Muncie BWQ - WFWR and and tributaries in the Muncie area
10. St. Joseph River
11. Unknown
12. Lake Michigan proper along the shoreline in nearshore area less than 30 feet in depth.
13. City of Elkhart
14. USACOE Ohio River
15. USACOE Ohio River
16. Hoosier National Forest
    Harrison/Crawford State Forest
    Spring Mill State Park
    Caves of south/central Indiana
17. Muncie; Elkhart; USGS/WRD

18. 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	**18**
(skipped this question)	25

29. Please list organizations that are monitoring this HABITAT for ALL fish in ALL habitats in Indiana.

1. DNR/DFW
2. None that I am aware of
3. DNR/DFW
4. DNR/DFW
5. DNR/DFW
6. none
7. None known.
8. none known
9. none known
10. Not aware of any
11. Indiana DNR- FIsh and Wildlife division. USFWS/GLFC
12. IDNR, IDEM, City of Elkhart and South Bend
13. Unknown
14. DNR division of Fish and Wildlife
15. IDNR, USFSW, Ball State, University of Michigan
16. IDNR-Fish and Wildlife, Lake Michigan Fisheries Office
17. IDNR-Fish and Wildlife, USFWS
18. USACOE Ohio River
19. USACOE Ohio River
20. U.S. Forest Service
    Indiana DNR
    University of Louisville

	University of Louisville
21.	IDEM makes assessments of the habitat while doing fish community surveys in the Ohio River Drainage Habitat.
22.	IDEM- Qualitative Habitat Evaluations completed at sites where southern redbelly dace may have been captured as part of the fish community sampling program.
23.	IDEM performs habitat assessments in this area
24.	IDEM, IDNR, USDA Forest Service, USDI Fish and Wildlife Service

Total Respondents	**24**
(skipped this question)	19

30. What are the current HABITAT inventory and/or assessment techniques for ALL fish in ALL habitats 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
GIS mapping	9% (3)	26% (9)	37% (13)	0% (0)	0% (0)	29% (10)	**35**
Aerial photography and analysis	3% (1)	24% (8)	18% (6)	3% (1)	0% (0)	52% (17)	**33**
Systematic sampling	26% (8)	29% (9)	16% (5)	0% (0)	0% (0)	29% (9)	**31**
Property tax estimates	0% (0)	0% (0)	0% (0)	24% (6)	12% (3)	64% (16)	**25**
State revenue data	0% (0)	0% (0)	0% (0)	24% (6)	12% (3)	64% (16)	**25**
Regulatory information	0% (0)	15% (4)	0% (0)	11% (3)	11% (3)	63% (17)	**27**
Participation in landuse programs	0% (0)	11% (3)	15% (4)	4% (1)	11% (3)	59% (16)	**27**
Modeling	3% (1)	26% (8)	19% (6)	0% (0)	6% (2)	45% (14)	**31**
Voluntary landowner reporting	0% (0)	4% (1)	8% (2)	4% (1)	12% (3)	72% (18)	**25**

Other (please specify below)	13% (2)	13% (2)	0% (0)	0% (0)	0% (0)	73% (11)	**15**
						Total Respondents	**274**

31. Other HABITAT inventory and assessment techniques for ALL fish in ALL habitats in Indiana.

1. QHEI
2. QHEI
3. QHEI
4. QHEI
5. none
6. QHEI
7. Bottom mapping of habitat.
8. IBI, and QHEI for representative sites.
9. Qualitative Habitat Evaluation Index(QHEI); REMAP protocols for Northern Forested Streams; stream channel cross-sections and longitudinal profiles; substrate analysis; descriptions of riparian vegetation; water quality parameters are measured using probes and Hydro-labs

Total Respondents	**9**
(skipped this question)	34

32. What one or two HABITAT inventory and assessment techniques would you recommend for effective conservation of ALL fish in ALL habitats in Indiana?

1. QHEI
2. QHEI
   GIS
3. QHEI
   GIS
4. QHEI
5. 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.

6. Qualitative Habitat Evaluation Index (QHEI) in conjunction with at stream fish community survey or sampling specifically for rock bass. This can show which habitat components most strongly correlate with rock bass abundance and/or size structure.

7. 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.

8. Unknown

9. I'm not very familiar with the habitat sampling outside of QHEI. Any assessment of this habitat though should look at both riparian and instream habitat.

10. Digital satellite imagery to conduct bottom contour mapping in nearshore spawning areas.

11. Assessment using the Qualitative Habitat Evaluation Index.

12. 1. Recording GIS information
2. Record habitat when the fish species is collected during a survey.

13. Systematic sampling of the habitat along the length of the stream to provide baseline data for comparison across time.

GIS mapping of restored, fully connected wetland to provide an inventory of available spawning habitat.

14. Systematic Sampling
Telemetry Surveys

15. Lidar mapping would help identify spawning areas within the nearshore zone along Indiana's coastline.

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

17. Sampling.

18. GIS mapping and aerial photography

19. GIS mapping and aerial photography and analysis

20. GIS mapping and aerial photography and analysis

21. 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.

22. Population surveys every five years and development of an IBI to be applied at 5-10 critical locations. These to include Blue Spring Caverns, Spring Mill State Park, and Harrison/Crawford State Forest.

23. more habitat inventories and assessments

Two protocols that I recommend for reference include the following:

1. Harrelson, C.C., C.L. Rawlins, and J.P. Potyondy. 1994. Stream Channel Reference Sites: An Illustrated Guide to Field Technique. USDA Forest Service. General Technical Report RM-245. The above reference offers useful guidance on measuring stream channel cross-sections and substrate within the stream. This information can be used to determine if a stream channel is stable and if the substrate is available within riffle habitats, which are the preferred habitat of the Orangethroat Darter.

2. Simon, T. P. and P.M. Stewart. 1998. Standard Operating Procedures For Development of Watershed Indicators In REMAP: Northern Lakes and Forest Streams.

The above reference is very useful for developing a watershed level sampling design and includes useful methods for measuring stream channel and stream habitat parameters.

3. The Qualitative Habitat Evaluation Index (QHEI) developed by the Ohio EPA is a useful qualitative field method that can be used to prioritize sites within a watershed for stream habitat or water quality improvement.

Total Respondents	**24**
(skipped this question)	19

33. What is the current body of science for ALL fish in ALL habitats in Indiana?

	Response Total	Response Percent
Complete, up to date and extensive	**0**	**0%**
Adequate	**15**	**38%**
Inadequate	**19**	**49%**
Nonexistent	**3**	**8%**
Other (please explain below)	**2**	**5%**

1. Under development. Survey completed but data not processed yet.
2. Unknown in the larger scale

	39
Total Respondents	
(skipped this question)	4

34. Please provide a citation (title, author, date, publisher) that would give the best overview of ALL fish in ALL habitats in Indiana, if available. This resource may be used if further detail is needed.

Response Total	Response Percent

Title = A survey of fish communities and aquatic habitats at Indiana's major steams with emphasis on smallmouth bass distribution and abundance;
Author = Stuart T. Shipman;
Date = 12/1997;
Publisher = DNR fisheries section

Title = Many in AFS journal of fish management and transactions of AFS

Title = Impoundments Strategic Plan;
Author = IDNR - Fish and Wildlife;
Date = 1997;
Publisher = IDNR - Fish and Wildlife

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

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

Title = The Fishes of Missouri;
Author = William L. Plieger;
Date = 1997;
Publisher = Missouri Conservation Commission

Title = Lake Trout Restoration Plan;
Date = In progress

Title = Fishery, Habitat, and Recreational Use Surveys for the Kankakee River;
Author = Price and Robertson;
Date = 2005;
Publisher = DNR - Division of Fish and Wildlife (in review)

Title = Preliminary Results of 2004 Ball State University Yellow Perch Research in Indiana Waters of Lake Michigan;
Author = Paul Allen and Thomas Lauer;
Date = Cctober 2004;
Publisher = Ball State University

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

Title = Wabash River Catfish Reports;
Author = Rob Columbo;
Date = 2002,2003,2004,2005;
Publisher = SIU/INDFW

Title = annual Ohio River sauger reports;
Author = ORFMT;
Date = annually since 1999;
Publisher = ORFMT

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

Title = Distribution and status of the northern cavefish;
Author = Pearson, W. D. and C. Boston;
Date = 1995;
Publisher = Final report to IN Department of Nat. Res.Div. of F&W

Title = Handbook of freshwater fishery biology;
Author = Kenneth D. Carlander;
Date = 1997;
Publisher = Iowa University Press

Title = Fishes of Ohio;
Author = Milt Troutman;
Publisher = OSU Press

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

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

Title = Largemouth bass size limits at Indiana natural lakes - a 30-year history;
Author = Jed Pearson;
Date = 2003;
Publisher = unpublished

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

Title = A fishery survey of the Kankakee River in Indiana;
Author = Robertson and Ledet;
Date = 1981;
Publisher = DNR - Division of Fish and Wildlife

Title = Yellow Perch Research and Management in Lake Michgian, Evaluating Progress in a Cooperative Effort, 1997-2001;
Author = David Clapp and John Dettmers;
Date = November 2004;
Publisher = American Fisheries Society, Fisheries

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

Author = Edward Braun;
Date = 1974;
Publisher = IDNR Division of Fish and Wildlife

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

Title = Age, growth and fin erosion of the northern cavefish, Amblyopsis spelaea, in KY and IN;
Author = Louis, M.;
Date = 1999;
Publisher = Unpubl. M.S. Thesis, University of Louisville

Title = fishes of Tennessee;
Author = Etnire and Starnes

Title = FW fishes of Canada;
Author = Scott & Crossman

36. What is the current HABITAT body of science for ALL fish in ALL habitats in Indiana?

	Response Total	Response Percent
Complete, up to date and extensive	0	0%
Adequate	5	13%
Inadequate	24	62%
Nonexistent	8	21%
Other (please explain below) 1. Under development. Survey completed but data not processed yet.	2	5%
2. Unknown in the larger scale		
Total Respondents	**39**	
(skipped this question)	4	

37. Please provide a citation (title, author, date, publisher) that would give the best HABITAT overview of ALL fish in ALL habitats in Indiana, if available. This resource may be used if further detail is needed.

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

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

Title = Fishery, Habitat, and Recreational Use Surveys for the Kankakee River;
Author = Price and Robertson;
Date = 2005;
Publisher = DNR - Div. of F & W

Title = Fisheries Survey of the East Branch of the Little Calumet River Watershed;
Author = Neil Ledet;
Date = 1978;
Publisher = IDNR-Fish and Wildlife

Title = Ohio River Mainstem Study;
Author = USACOE;
Date = 2000?;
Publisher = USACOE

Title = Cave adaptation in Amblyopsid fishes;
Author = Poulson, T.;
Date = 1963;
Publisher = Amer. Midl. Nat. 70(2):257-290

38. If possible, please provide a second citation (title, author, date, publisher) that would give another good HABITAT overview of ALL fish in ALL habitats in Indiana. This resource may also be used if further detail is needed.

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 = A Fishery survey of the Kankakee River in Indiana;
Author = Robertson and Ledet;
Date = 1981;
Publisher = DNR - Div. of F & W

Title = Stream Survey-Little Calument River East Arm;
Author = Edward Braun;
Date = 1974;
Publisher = IDNR-Fish and Wildlife

Title = A faunal inventory of subterranean streams using a modified index of biotic integrity;
Author = Jones, T.G.;
Date = 1997;
Publisher = Unpubl. Ph.D. Disst. University of Louisville

39. What are the research needs for ALL fish in ALL habitats in Indiana?

	Urgently needed	Greatly needed	Needed	Slightly needed	Not needed	Unknown	Response Total
Life cycle	5% (2)	2% (1)	40% (16)	25% (10)	28% (11)	0% (0)	**40**
Distribution and abundance	3% (1)	26% (10)	38% (15)	21% (8)	13% (5)	0% (0)	**39**
Limiting factors (food, shelter, water, breeding sites)	15% (6)	30% (12)	32% (13)	12% (5)	10% (4)	0% (0)	**40**
Threats (predators/competition, contamination)	15% (6)	30% (12)	22% (9)	18% (7)	15% (6)	0% (0)	**40**
Relationship/dependence on specific habitats	15% (6)	25% (10)	35% (14)	10% (4)	15% (6)	0% (0)	**40**
Population health (genetic and physical)	2% (1)	8% (3)	22% (9)	48% (19)	20% (8)	0% (0)	**40**
Other (please specify below)	10% (1)	10% (1)	0% (0)	0% (0)	20% (2)	60% (6)	**10**
					Total Respondents		**249**

40. Other research needs for ALL fish in ALL habitats in Indiana.

1. How to produce more, larger crappie
2. Limiting factors and impacts of competition and predation

3. Continued research on movement and survival as part of the rehabilitation strategy.

4. Determine population limiting factors in the Ohio River.

5. Population Persistence
Impact of Commercial Harvest

6. 1. Metapopulation dynamics
2. Extent of populations in subterranean systems which annot be entered by humans

Total Respondents **6**

(skipped this question) 37

41. What are the HABITAT research needs for ALL fish in ALL habitats in Indiana?

	Urgently needed	Greatly needed	Needed	Slightly needed	Not needed	Unknown	Response Total
Successional changes	0% (0)	8% (3)	15% (6)	18% (7)	38% (15)	21% (8)	**39**
Distribution and abundance (fragmentation)	8% (3)	18% (7)	31% (12)	21% (8)	18% (7)	5% (2)	**39**
Threats (land use change/competition, contamination/global warming)	23% (9)	23% (9)	26% (10)	21% (8)	5% (2)	3% (1)	**39**
Relationship/dependence on specific site conditions	18% (7)	28% (11)	18% (7)	18% (7)	13% (5)	5% (2)	**39**
Growth and development of individual components of the habitat	19% (7)	8% (3)	27% (10)	16% (6)	16% (6)	14% (5)	**37**
Other (please specify below)	6% (1)	6% (1)	6% (1)	6% (1)	12% (2)	65% (11)	**17**
						Total Respondents	**210**

42. Other HABITAT research needs for ALL fish in ALL habitats in Indiana.

1. Water quality variations and impacts of land us and shoreline alterations

2. Water quality requirements.

3. 1. Assessment of the physical dimensions of the phreatic environment available to cavefishes, and the connections between known windows into the system.
2. Toxin concentrations in cave sediments and their recruitment rates into undergroud waters.

4. Effects of roads and stream crossings on the fish species; Is aquatic passage through culverts and other stream crossing structures adequate or are these crossings causing aquatic habitat

other stream crossing structures adequate or are these crossings causing aquatic habitat fragmentation?

Total Respondents	**4**
(skipped this question)	39

43. How well do the following conservation efforts address the threats to ALL fish in ALL habitats in Indiana?

	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
Habitat protection (use below for details)	21% (7)	62% (21)	3% (1)	9% (3)	6% (2)	**34**
Population management (hunting, trapping)	18% (6)	32% (11)	3% (1)	44% (15)	3% (1)	**34**
Population enhancement (captive breeding and release)	0% (0)	15% (5)	3% (1)	82% (28)	0% (0)	**34**
Reintroduction (restoration)	12% (4)	24% (8)	6% (2)	59% (20)	0% (0)	**34**
Food plots	0% (0)	0% (0)	3% (1)	97% (32)	0% (0)	**33**
Threats reduction	6% (2)	21% (7)	6% (2)	62% (21)	6% (2)	**34**
Native predator control	0% (0)	0% (0)	6% (2)	94% (32)	0% (0)	**34**
Exotic/invasive species control	0% (0)	15% (5)	21% (7)	38% (13)	26% (9)	**34**
Regulation of collecting	9% (3)	44% (15)	15% (5)	29% (10)	3% (1)	**34**
Disease/parasite management	0% (0)	12% (4)	0% (0)	65% (22)	24% (8)	**34**
Translocation to new geographic range	6% (2)	15% (5)	3% (1)	68% (23)	9% (3)	**34**
Protection of migration routes	0% (0)	6% (2)	3% (1)	74% (25)	18% (6)	**34**
Limiting contact with pollutants/contaminants	17% (6)	46% (16)	6% (2)	31% (11)	0% (0)	**35**
Public education to reduce human disturbance	3% (1)	32% (11)	9% (3)	44% (15)	12% (4)	**34**
Culling/selective removal	0% (0)	18% (6)	3% (1)	71% (24)	9% (3)	**34**
Stocking	12% (4)	18% (6)	6% (2)	62% (21)	3% (1)	**34**
Other (please specify below)	0% (0)	0% (0)	0% (0)	8% (1)	92% (11)	**12**
					Total Respondents	**556**

44. Other current conservation practices for ALL fish in ALL habitats in Indiana.

1. Regulation of sport harvest. Closure of commercial fishery to allow spawning stock biomass to increase, thus allowing for the production of offspring that can eventually add to the spawning stock biomass.

2. Habitat protection if it greatly reduced the turbidity in streams for hornyhead chub feeding and breeding behaviors. Also, exotic/invasive species control would help the hornyhead population. The hornyhead chub is sensitive to pollution so limiting contact with pollutants/contaminants would benefit the species. The hornyhead chub is also a popular bait fish, so regulation of collecting would be beneficial to the species.

3. Habitat protection occurs in the form of the Clean Water Act, National Forest Management Act and other state and federal regulations that protect aquatic habitat and aquatic species. These regulations may or may not be enough for the sake of Orangethroat Darter conservation.

Total Respondents	**3**
(skipped this question)	40

45. What one or two specific practices would you recommend for more effective conservation of ALL fish in ALL habitats in Indiana?

1. does not need conserving

2. Pollution control - from waste water treatment plants and confined feeding operations.
Habitat protection and enhancement.

3. Pollution control.
Habitat protection or enhancement.

4. Habitat protection - Actually, I mean habitat enhancement by adding more woody cover to the old impoundments where the former woody cover has decomposed.

5. Habitat management and harvest management

6. Habitat protection and education to reduce habitat disturbance

7. Rock bass appear to be doing very well with little to no intensive management in streams where there is ample instream cover and good water quality. Therefore, habitat protection and contaminant reduction would be my recommendations.

8. -Assure there is no stocking of predator fish in cisco lakes
-Greatly limit/mitigate any new development on cisco lakes, particularly addressing runoff from lawns and other water quality issues
-Work to get any farmlands adjacent to cisco lakes into no-till

9. continued stocking for rehabilitation efforts. Change of the genetic suite of strains to be stocked. Utilize at least one deepwater strain.

10. Habitat protection and Public Education

11. 1. Public education
2. Regulation of collecting

12. Restoring the connection between the streams and the wetlands that were formerly associated with them to allow pike access to spawning areas. Current water management regimes often rely on pumping to fill restored wetlands, thus, fish passage is still restricted.

13. Commercial Harvest Regulation
Habitat Protection

14. Completely eliminate commercial fishing. This appears to have reduced the spawning stock to a level that could not maintain a fishery.

15. Habitat protection through landuse regulation. Agricultural runoff protection through education and landuse planning.

16. Land use planning and education.

17. Protection of migration routes

18. habitat protection/restoration and pollution control

19. 1. Implementation of ecozones in undeveloped areas to conserve that vegetation present.
2. Implement a catch and release only regulation in lakes with low densities.

20. 1. Acqusition and protection of a reserve at Blue Spring Caverns

2. Limit public access to population concentrations already under agency control at Harrison/Crawford State Forest and Spring Mill State Park

21. I am not sure what you are asking in this question. The best way to conserve the eastern sand darter would be to reduce sedimentation covering the sand substrate which the darter needs to survive and reproduce. Current efforts to reduce sedimentation in streams is somewhat effective, but I'm not sure if it is enough to keep the eastern sand darter from disappearing.

22. Habitat protection - erosion controls
Exotic species - possession of exotic species illegal (must dispose of fish properly and not release back to stream)

23. Habitat protection and the possible reintroduction of the least darter into suitable habitats that have been restored.

24. Habitat protection

25. declare moratorium on channel/drainage "improvement" projects that do not mitigate losses;

26. Habitat protection
Threats Reduction

27. Habitat protection

28. Habitat protection and threats reduction

29. 1.Restoration of stream channels..restoring or protecting stream channel function so that riffle habitats are enhanced or protected.
2.Restoration or enhancement of riparian vegetation to enhance or protect stream channels from runoff or impacts to the channel.
3. Maintenance of roads and stream crossings so that stream channel function and aquatic passage are maintained.

Total Respondents	**29**
(skipped this question)	14

46. How well do the following conservation efforts address the HABITAT threats to ALL fish in ALL habitats in Indiana?

	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
Habitat protection through regulation	12% (4)	62% (21)	12% (4)	6% (2)	9% (3)	**34**
Habitat protection on public lands	9% (3)	62% (21)	6% (2)	21% (7)	3% (1)	**34**
Habitat protection incentives (financial)	18% (6)	35% (12)	12% (4)	24% (8)	12% (4)	**34**
Habitat restoration through regulation	12% (4)	33% (11)	6% (2)	30% (10)	18% (6)	**33**
Habitat restoration on public lands	9% (3)	50% (17)	12% (4)	24% (8)	6% (2)	**34**
Habitat restoration incentives (financial)	18% (6)	32% (11)	9% (3)	29% (10)	12% (4)	**34**
Artificial habitat creation (artificial reefs, nesting platforms)	0% (0)	26% (9)	12% (4)	50% (17)	12% (4)	**34**
Selective use of functionally equivalent exotic species in place of extirpated natives	0% (0)	0% (0)	9% (3)	83% (29)	9% (3)	**35**
Succession control (fire, mowing)	0% (0)	3% (1)	9% (3)	79% (26)	9% (3)	**33**
Corridor development/protection	15% (5)	26% (9)	6% (2)	44% (15)	9% (3)	**34**
Managing water regimes	12% (4)	35% (12)	6% (2)	32% (11)	15% (5)	**34**
Pollution reduction	34% (12)	51% (18)	3% (1)	9% (3)	3% (1)	**35**
Protection of adjacent buffer zone	31% (11)	49% (17)	3% (1)	11% (4)	6% (2)	**35**
Restrict public access and disturbance	3% (1)	15% (5)	26% (9)	50% (17)	6% (2)	**34**
Land use planning	12% (4)	68% (23)	6% (2)	12% (4)	3% (1)	**34**
Technical assistance	0% (0)	41% (14)	3% (1)	32% (11)	24% (8)	**34**
Cooperative land management agreements (conservation easements)	18% (6)	47% (16)	6% (2)	21% (7)	9% (3)	**34**
Other (please specify below)	0% (0)	8% (1)	0% (0)	0% (0)	92% (11)	**12**

Total Respondents **591**

47. Other current HABITAT conservation practices for ALL fish in ALL habitats in Indiana.

1. Limiting disturbance through the construction(DOW) permit process.

2. 1. Closing and/or year around gating of caves with large populations of hibernating or reproducing bats will ensure normal trophic cascades for those systems.
2. Restricting recreational caving in some caves might reduce periodic disturbances, increases in turbidity, and remobilization of toxins in sediments.

3. Again, I don't know if these practices are working well in Indiana, but the best way to conserve the critical habitat for the eastern sand darter would be habitat protection on all lands through whatever means necessary, habitat restoration of the floodplain would also be critical to the amount of sedimentation reaching the stream bed, managing water regimes may also impact the settling of sediments in stream (thus dam removal may be appropriate), protection of adjacent buffer zone is key to stopping deleterious effects of erosion and sedimentation in the stream, land use planning and conservation easements would also keep the runoff to a minimum.

4. Habitat protection and restoration on all lands by any means necessary would benefit all fish species (except those that are exotic and more tolerant than others) not just the hornyhead chub. Pollution reduction, protection of adjacent buffer zone, land use planning, and conservation easements would all be beneficial practices to the Hornyhead chub.

5. I am not aware of any of the above for which I marked "not used."

Total Respondents **5**

(skipped this question) 38

48. What one or two specific HABITAT practices would you recommend for more effective conservation of ALL fish in ALL habitats in Indiana?

1. Buffer strips
Bank stabilization

2. Corridor protection

3. Protection of adjacent buffer zones (riparian corridor). More participation would likely occur with financial incentives.

4. Protection of adjacent buffer zones (riparian corridor).

5. (1) Improve land use practices in watershed will reduce sedimentation in impoundments and reduce nutrient inputs. Reducing nutrient inputs will allow a deeper thermocline which is important for crappie growth. Crappie growth suffers when water temperatures become too high.
(2) Habitat restoration in the form of woody debris.

6. Habitat protection and restoration through regulation.

7. Pollution reduction and land-use zoning

8. 1) buffer/riparian zone protection - leads to improved water quality and more instream cover
2) pollution reduction - improved water quality and fewer fish kills

9. in Army Corps of Engineers impoundments alterations in water level control would likely benefit crappie

10. Determine critical habitat then create same.

11. Protection and restoration of Buffer Zones

12. 1. Non-point source pollution reduction
2. 2. riparian conservation easements

13. Wetland restoration projects with connectivity to the stream or "corridor" development that allows passage to wetlands already restored. We need to move toward natural regulation of water levels instead of artificial means.

14. Habitat Protection (minimizing fragmentation)
Managing Water Regimes

15. Habitat creation, ie. artificial structures during lake construction projects

16. Protection of habitat through land use planning. Currently most of the headwaters areas run through agricultural areas and need to maintain riparian buffer strips.

17. restoration of riparian zones, riffle protection/restoration

18. 1. Implementation of ecozones in undeveloped areas to conserve that vegetation present.
2. Reduce inlet and upstream degradation. Increase awareness and cooperation of landowners to create better shoreline and tributary habitat.

19. 1. Establishment of reserve at Blue pring Cavern
2. Restricted entry to selected caves in the Harrison/Crawford State Forest
3. Obtaining conservation easements/agreements with selected cave owners in Orange, Washington, Lawrence, and Harrison Counties.

20. Habitat protection
Land use planning

21. Protection of adjacent buffer zone
Nonpoint Source Pollution reduction

22. Habitat protection through regulation
Protection of adjacent buffer zone

23. Habitat protection
Restrict disturbance to habitat (dredging, removal of debris)

24. Habitat protection

25. Habitat protection and Protection of adjacent buffer zone

26.	Habitat restoration and protection	
27.	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.	
	Total Respondents	**27**
	(skipped this question)	16

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

1.	no
2.	no
3.	no
4.	no
5.	The overall smallmouth bass population in this area is somewhat poor aside from the St. Joseph River. I believe this is mostly due to the lack of habitat and loss of buffer zones. Buffer zones are vital to the health of smallmouth bass populations. They supply and protect habitat that is vital to the survival of the smallmouth bass.
6.	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 heaklthy in the Wabash/White and not other Great Rivers.
7.	Need annual assessments of population abundance and trends, as well as commercial harvest of females for the roe fishery
8.	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 decisions.
9.	It has been over 20 years since the surverys were conducted, prior to the 2001-2004 surverys. It is important that surveys be conducted every 5 years or so to document changes to water quality, habitat and riparian zone protection.
10.	A map of all known sightings of cavefishes, and dye-traced and probable connections between these known locations should be produced. Such a compilation would be invaluable in assessing the potential impacts of proposed projects, spills, and other landscape events within the limited range of the northern cavefish in Indiana.
	I would definetly 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

	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.	
12.	IDEM has collected hornyhead chubs from the Elkhart River (Elkhart & Noble counties), St. Joseph River (Dekalb County), Cedar Creek (Allen Co.), Yellow Creek (Elkhart Co.), and Pigeon River (Lagrange Co.). If you would like the data, we can provide water chemistry, biological, and habitat data assessments.	
13.	IDEM has captured least darters at the following locations: Ringeisen Ditch, Trib of Carpenter Cr, Keefe Ditch, Claude May Ditch, and Howe Ditch in Jasper County, Singleton Ditch in Lake Co., Weiss Ditch in Newton Co., and Minier Lateral in Benton Co.	
14.	IDEM has collected tadpole madtoms on the following streams: West Creek and Singleton Ditch in Lake County, Dausman Ditch in Kosciusko Co., Bogus Run in Starke Co., and Slough Creek in Jasper Co.	
15.	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 fish species; some may not even do it al all.	
16.	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.	
17.	IDEM has captured many southern redbelly dace in their random fish sampling program. Most of these specimens came from the Whitewater Basin in headwater streams <20 sq. miles with high gradient and high biological integrity.	
18.	IDEM has collected spottail darters in Posey Co. on a trib of Black River and Hawthorne Creek.	
	Total Respondents	**18**
	(skipped this question)	25

6. Please rank the following threats to ALL Mammals in ALL habitats in Indiana.

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total
Invasive/non-native species	3% (1)	5% (2)	13% (5)	16% (6)	63% (24)	0% (0)	**38**
High sensitivity to pollution	0% (0)	8% (3)	5% (2)	24% (9)	34% (13)	29% (11)	**38**
Bioaccumulation of contaminants	0% (0)	11% (4)	13% (5)	16% (6)	32% (12)	29% (11)	**38**
Predators (native or domesticated)	0% (0)	3% (1)	13% (5)	39% (15)	45% (17)	0% (0)	**38**
Dependence on other species (mutualism, pollinators)	0% (0)	0% (0)	3% (1)	3% (1)	89% (33)	5% (2)	**37**
Diseases/parasites (of the species itself)	3% (1)	8% (3)	13% (5)	24% (9)	39% (15)	13% (5)	**38**
Regulated hunting/fishing pressure (too much)	0% (0)	0% (0)	3% (1)	13% (5)	84% (32)	0% (0)	**38**
Species over population	0% (0)	5% (2)	8% (3)	8% (3)	76% (29)	3% (1)	**38**
Unintentional take/ direct mortality (e.g., vehicle collisions, power line collisions, by-catch, harvesting equipment, land preparation machinery)	0% (0)	11% (4)	13% (5)	24% (9)	50% (19)	3% (1)	**38**
Unregulated collection pressure	0% (0)	0% (0)	0% (0)	21% (8)	76% (29)	3% (1)	**38**
Dependence on irregular resources (cyclical annual variations) (e.g., food, water, habitat limited due to annual variations in availability)	0% (0)	3% (1)	18% (7)	26% (10)	47% (18)	5% (2)	**38**
					Total Respondents		**417**

7. Please also rank these threats to ALL Mammals in ALL habitats in Indiana.

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total
Habitat loss (breeding range)	13% (5)	18% (7)	26% (10)	24% (9)	18% (7)	0% (0)	**38**
Habitat loss (feeding/foraging areas)	11% (4)	24% (9)	29% (11)	18% (7)	18% (7)	0% (0)	**38**
Small native range (high endemism)	3% (1)	8% (3)	8% (3)	16% (6)	65% (24)	0% (0)	**37**
Near limits of natural geographic	0% (0)	5% (2)	8% (3)	11% (4)	74% (28)	3% (1)	**38**

range							
Large home range requirements	0% (0)	0% (0)	11% (4)	16% (6)	74% (28)	0% (0)	**38**
Viable reproductive population size or availability	0% (0)	5% (2)	3% (1)	24% (9)	66% (25)	3% (1)	**38**
Specialized reproductive behavior or low reproductive rates	0% (0)	5% (2)	16% (6)	8% (3)	71% (27)	0% (0)	**38**
Degradation of movement/migration routes (overwintering habitats, nesting and staging sites)	5% (2)	13% (5)	8% (3)	24% (9)	50% (19)	0% (0)	**38**
Genetic pollution (hybridization)	0% (0)	3% (1)	0% (0)	13% (5)	74% (28)	11% (4)	**38**
Unknown	0% (0)	5% (1)	0% (0)	0% (0)	18% (4)	77% (17)	**22**
Other (please specify below)	5% (1)	11% (2)	16% (3)	5% (1)	5% (1)	58% (11)	**19**
					Total Respondents		**382**

8. Other threats to ALL Mammals in ALL habitats in Indiana.

1. Captive cervids
2. Urban sprawl, the attendant loss of habitat and added roads, traffic and human interference.
3. Genetic contamination from farmed white-tails
4. Loss of small farms, urban sprawl
5. Cold wet weather when first litters appear (Late March and early April)
6. Fragmentation of forest habitat and loss of farmland habitat to housing.
7. The spread of BushHoneySuckles, construction, tree diseases, tree insects, snd the removal of fence rows.
8. Loss of forest habitat surrounding winter hibernacula/caves.
9. Cottontail numbers are proportional to available habitats. To increase or decrease in number, depends on available habitats. Agriculral policy i.e. production without supply side considerations influence the availability of the habitats. Cottontails are a game species and utilized heavily as a recreational resource and is therefore a luxury. The tradeoff concerning the cottontail is that we the American public, want beef,corn and related foodstuffs at a low cost. The cottontail will not prevail here as being necessary under those societal needs!
10. With reference to "unregulated collection pressure," I included disturbance related to research/monitoring.
11. Habitat loss to natural succession is a critical threat to cottontail populations in Indiana.

12.	It might be possible to overharvest fox squirrels in small forest fragments in the northern part of the state but I believe that this too is unlikely.
13.	Although not habitat specific, the inability to responsibly and proactively manage coyotes according to the wildlife conservation model, as opposed to reactive measures through nuisance practices, is a concern regarding the conservation of coyotes. This concern applies across the landscape, not just in urban and suburban environments.
14.	Although not habitat specific, the inability to responsibly and proactively manage raccoons according to the wildlife conservation model, as opposed to reactive measures through nuisance practices, is a major concern regarding the conservation of raccoons. This concern applies across the landscape, not just in urban and suburban environments.
15.	Although not habitat specific, the inability to responsibly and proactively manage opossums according to the wildlife conservation model, as opposed to reactive measures through nuisance practices, is a concern regarding the conservation of opossums. This concern applies across the landscape, not just in urban and suburban environments.
16.	There are competition and disease concerns about red fox populations but they are not limited to grasslands. Although not habitat specific, the inability to responsibly and proactively manage red fox according to the wildlife conservation model, as opposed to reactive measures through nuisance practices, is a concern regarding the conservation of red fox. This concern applies across the landscape, not just in urban and suburban environments.
17.	Although not habitat specific, the inability to responsibly and proactively manage muskrats according to the wildlife conservation model, as opposed to reactive measures through nuisance practices, is a concern regarding the conservation of muskrats. This concern applies across the landscape, not just in urban and suburban environments.
18.	sporadic occurrence of early and mid successional fields is the greatest deterrent to higher abundance
19.	Unregulated Human Activity in Hibernacula
20.	None that I can think of. As adjacent states initiate harvest seasons for otters, there might be added pressure to take otters accidentally trapped in Indiana across state lines to market fur. However, I wouldn't expect this to have a significant impact at a statewide or even regional scale.
21.	Loss of wetlands (muckland) would be the threat to some mammals
22.	needs caves or mines for hibernation within probably 60 miles of its summering ground

Total Respondents	**22**
(skipped this question)	17

9. Please briefly describe the top two threats to ALL Mammals in ALL habitats in Indiana identified above.

1.	Overpopulation will lead to an unmanageable resource and severe habitat degredation. Captive cervids contaminate genetic integrity and increase chance of infection for wild deer

2. Coyotes are highly adaptable and are seemingly expanding their numbers across the state. People are generally "anti-coyote" fearing predation on pets, livestock and wildlife.

3. CWD will come to IN
Trophy mgt & associated leasing will lead to overpopulation & fewer active hunters

4. The mammals in Generalist habitats faces few if any threats.

5. Habitat loss
Mammal competion

6. Habitat loss mostly related to urban sprawl. Degradation of migration routes, also often related to urban sprawl and other development.

7. Invasive/non-native vegetative species such as fescue do not provide cover, nutrition and are thought to be toxic.
Habitat loss to uncontrolled vegetative succession is a serious threat.

8. CWD, EHD & tuburculosis could be devestating to a deer herd of our density.

Loss of habitat to rural developement.

9. Loss of Grassland Habitat
Competetion with Coyotes

10. Habitat fragmentation & habitat destruction.

11. Habitat loss- Land development
Invasive species and its relation to habitat loss

12. Human disturbance of hibernating bats (e.g., Ray's Cave in Greene Co.)
Alterations to microclimate within hibernacula

13. 1)Agricultural policy
2)Domestic predators

14. -Some traditional hibernacula have been rendered unsuitable or degraded due to cave development/commercialization (including disturbance of hibernating bats by human visitation), modication of the cave environment, or alternation of surface features.
-Threats also occur on summer habitat (not addressed here because it is not captured within the "cave habitat" category).

15. Habitat loss to agriculture and natural succession

16. The 2 greatest threats to the fox squirrel are overall loss of habitat and fragmentation of the remaining forest tracts.

17. As above

18. As 8 above

19. As 8 above

20.	As above
21.	Although not habitat specific, the inability to responsibly and proactively manage beaver according to the wildlife conservation model, as opposed to reactive measures through nuisance practices, is a concern regarding the conservation of beaver. This concern applies across the landscape, not just in urban and suburban environments.
22.	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.
23.	lack and distance apart of available patches of habitat these habitats are ephemeral
24.	Human disturbance of active hibernacula Loss of typical maternal roosting structures (large snags with sloughing bark) Exclusion of maternity colonies from buildings
25.	Build-up of dense urban development around roost location without adequate greenspace for foraging.
26.	Pollution/degredation of aquatic systems: reproductive performance of otters can be compromised by high levels of PCBs, heavy metals, etc. that bioaccumulate 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.
27.	1. Loss of grasslands, and grassland groundsquirrel populations. 2. Fragmentation of habitat
28.	The major two threats are loss of summer and winter (caves) habitat. In addition, education of cavers and continued improvments to cave gates are important to the Indiana bat survival.
29.	Habitat Loss in this relatively specialized habitat is the primary threat to the short-tailed shrew. Early successional grassland habitats provides marginal habitat requirements for this specialized species. The short-tailed shrew is an insectivore/vermivore. Early successional grassland habitat occurs in abandoned land associated with either agricultural, industrial or urban land uses. Only is isolated situations do grasslands develop as a dominate habitat type in Indiana. Most grasslands will eventually be dominated by shrub or tree cover. By definition early successional grassland habitat is a temporary habitat type.
30.	probably draining of wetlands for farming or development
31.	I seek to qaulify my answer about loss of migration habitat. The large-scale mortality being reported from wind turbines and other sources is the most threatening issue for this species. We also need information about how this species migrates to begin thinking about where not to place such structures. Loss of winter range is a slight concern since we really don't know where they are going.
32.	Threats to bobcat populations in Indiana are human-related factors such as direct mortality (incidental take, road-kills, persecution) and habitat loss. Conversion of native communities and

	(incidental take, road-kills, persecution) and habitat loss. Conversion of native communities and habitats for human use cause direct loss of habitats for bobcats and their prey items.
33.	Indiana is at the easternmost periphery of the historic range FGS in North America. Their range in NW Indiana coincides with some of the most productive agricultual lands in the state (i.e., Benton County) or some of the most densely populated areas (i.e., Lake, Porter counties). Prinicipal threats are primarily habitat related .... either direct loss of grassy/herbaceous cover, conversion of smaller farms (that used to maintain fencerows, etc.) to agri-business entities, and to lesser extent, invasion of extensive woody components into existing grassland communities. Being at the edge of their range, we probably didn't have alot of animals to start with either ... In summary: small, nomadic populations in restricted portion of state (maybe only 3-6 counties) that is subjected to developmental and agricultural pressures.
34.	The Allegheny woodrat occupies cliffs, caves, and other rocky habitats in decidous forests. When forests become fragmented, for whatever reasons, several negative impacts to woodrat populations can result. First, loss of mature mast-producing trees can occur; changes in forest composition can also result. Woodrats may have to cross non-forested areas to reach preferred feeding areas (i.e., hard mast crops or soft mass .... berries, etc.). While doing so, they may become exposed to ubiquitous predators (great-horned owls, raccoons). Raccoon densities may be higher in non-forested settings (such as farmed areas on top of cliffs), which could expose woodrats to higher levels of raccoon roundworm.
35.	This is probably the least-threatened bat in the US. Major threats are closure of roosts (both hibernacula and maternal) and incidental take from collisions
36.	loss of habitat is probably the only threat to some mammals, plus people trying to remove them from their lawns and gardens.
	Total Respondents **36**
	(skipped this question) 3

10. Please rank the following threats to the HABITAT of ALL Mammals in ALL habitats in Indiana.

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total
Commercial or residential development (sprawl)	13% (5)	42% (16)	21% (8)	11% (4)	13% (5)	0% (0)	**38**
Counterproductive financial incentives or regulations	0% (0)	5% (2)	14% (5)	16% (6)	27% (10)	38% (14)	**37**
Invasive/non-native species	3% (1)	11% (4)	11% (4)	18% (7)	47% (18)	11% (4)	**38**
Nonpoint source pollution (sedimentation and nutrients)	0% (0)	0% (0)	11% (4)	29% (10)	37% (13)	23% (8)	**35**
Habitat fragmentation	13% (5)	24% (9)	18% (7)	18% (7)	26% (10)	0% (0)	**38**
Successional change	3% (1)	12% (4)	6% (2)	30% (10)	48% (16)	0% (0)	**33**

Diseases (of plants that create habitat)	0% (0)	0% (0)	5% (2)	16% (6)	63% (24)	16% (6)	**38**
Habitat degradation	8% (3)	19% (7)	32% (12)	24% (9)	16% (6)	0% (0)	**37**
Climate change	3% (1)	3% (1)	9% (3)	0% (0)	59% (19)	25% (8)	**32**
Stream channelization	0% (0)	3% (1)	11% (4)	11% (4)	68% (26)	8% (3)	**38**
Impoundment of water/flow regulation	0% (0)	3% (1)	5% (2)	13% (5)	71% (27)	8% (3)	**38**
Agricultural/forestry practices	3% (1)	19% (6)	12% (4)	44% (14)	22% (7)	0% (0)	**32**
Residual contamination (persistent toxins)	0% (0)	5% (2)	11% (4)	16% (6)	34% (13)	34% (13)	**38**
Point source pollution (continuing)	0% (0)	6% (2)	8% (3)	19% (7)	39% (14)	28% (10)	**36**
Mining/acidification	0% (0)	3% (1)	11% (4)	18% (7)	55% (21)	13% (5)	**38**
Drainage practices (stormwater runoff)	0% (0)	0% (0)	5% (2)	16% (6)	66% (25)	13% (5)	**38**
Unknown	0% (0)	0% (0)	5% (1)	5% (1)	11% (2)	79% (15)	**19**
Other (please specify below)	0% (0)	0% (0)	13% (2)	0% (0)	0% (0)	87% (13)	**15**
					Total Respondents		**618**

11. Other HABITAT threats to ALL Mammals in ALL habitats in Indiana.

1. Urban spread, construction, clearing for agriculture crops and fence row removal.
2. Modern farm practices-the creation of large open, clean farm fields leaves no habitat for deer or many other mammels for that manner
3. No financial incentive to develop/maintain/manage these habitats.
4. In question #10, the participant has to speculate about the meaning of successional change. Is a "change" an increase or decrease in early or late successional habitats? Climate change also is speculative. Agriculture/Forestry practices have different effects. Grouping these practices into one category does not appropriately represent the individual practice.
5. In question #10, the participant has to speculate about the meaning of successional change. Is a "change" an increase or decrease in early successional habitats? Climate change also is speculative. Agriculture/Forestry practices have different effects. Grouping these practices into a single category does not appropriately represent each individual practice.
6. In question #10, the participant has to speculate about the meaning of successional change. Is a "change" an increase or decrease in early successional habitats? Climate change also is speculative. Agriculture/Forestry practices may have different effects. Grouping these practices into a single category does not appropriately represent each individual practice.

7.	The participant has to speculate about the meaning of climate change. Is a "change" an increase or decrease in temperature? Agriculture/Forestry practices may have different effects. Grouping these as a single practice does not appropriately represent each individual practice. Point and non-point pollution may be positive or negative to the habitat as related to beaver.
8.	Mowing or burning for aresthetic purposes such that badger prey population or badger cover are diminished.
9.	needs cavaes or mines as indicated above; Pesticides could be a major threat, for this onther bats, but unknown for sure,

Total Respondents **9**

(skipped this question) 30

12. Please briefly describe the top two HABITAT threats to ALL Mammals in ALL habitats in Indiana identified above.

1.	Degredation by overpopulation Fragmentation in farmed/heavily populated regions prevents historical movements from summer to winter ranges
2.	1) Urban sprawl 2) Ag/Forestry (mostly ag)
3.	Urban sprawl is consuming significant amounts of our forest habitat
4.	Commercial and residential development. Agricultural and forestry practices
5.	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.
6.	successional change results in habitat degredation as grasslands are invaded by woody vegetation.
7.	Urban sprawl has started to interupt movements and increased accidental mortality. Fragmentation of habitat forces unnatural movement and increases accidental mortality as well as the opportunity to spread disease.
8.	Habitat fragmentation restrict movement and hence constrict genetic mixing. Habitat degradation reduces food sources as well as reproductive potential.
9.	Forest habitat fragmentation and loss of habitat.
10.	Development- this completely removes the habitat Habitat fragmentation- this also removes habitat
11.	Adverse modifications to cave entrances (e.g., poorly designed bat gates), which cause a change in interior microclimates/temperatures. Loss/degradation/fragmentation of forested areas surrounding caves used by bats during the fall swarming period

	swarming period.
12.	1)Agricultural policy 2)Competing products (food)
13.	Loss/degradation of traditional hibernacula.
	loss, fragmentation and degradation of breeding habitat (note that breeding habitat also occurs in areas of the state not associated with caves)
14.	I believe invasion of early successional grasslands by tall fescue is probably the top threat followed closely by successional change.
15.	The 2 greatest threats to fox squirrel habitat in Indiana are overall loss of habitat and fragmentation, both due primarily to agricultural practices of urban sprawl.
16.	the participant has to speculate about the meaning of successional change. Is a "change" an increase or decrease in early successional habitats? Climate change also is speculative. Agriculture/Forestry practices have different effects. Grouping these practices into a single category does not appropriately represent each individual practice. Point and non point pollution may have a positive or negative effect.
17.	The participant is foced 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 nonpoint pollution may have a positive or negative impact.
18.	farming practices and succession suitable habitat is ephemeral and spread out
19.	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.
20.	1. Loss of grasslands, and grassland groundsquirrel populations. 2. Fragmentation of habitat
21.	The top two threats are habitat degradation of caves by potential migration of chemicals which alter the cave ecosystem, and the loss of roost trees via a number of man-related activities (commercial, agricultural, etc.)
22.	loss of habitat due to farming or development
23.	habitat disappearing to development needs caves and mines for hibernation,
24.	Our unpublished work on eastern red bats suggest the critical habitat is a combination of forests for roosting and edge habitat for roosting. As such the main threats are 1) loss of forest habitat 2) loss of suitable foraging habitat to development
25.	Top threats to bobcat habitat are loss of forested habitats (or any native or non-developed habitats) to residential, commercial, industrial, etc. uses. Conversion of habitats to types dominated for human activity, on a cumulative scale, are problematic. Fragmentation, to a lesser extent, also

	human activity, on a cumulative scale, are problematic. Fragmentation, to a lesser extent, also negatively impacts bobcat habitats, but is probably less of a factor because the species is somewhat adaptable and highly mobile.
26.	Loss of existing grassland/herbaceous cover to a number of factors (development, sprawl, agriculture) and fragmentation of remaining suitable habitats .... potential isolating small, remnant FGS populations.
27.	Cliff habitat, in general, appears somewhat secure except for quarrying operations along the Ohio River. Forested communities in association with cliffs, however, are vulnerable to development, fragmentation, loss of hard mast producing species, etc.
	The only real threat to the habitat of this bat is destruction of roosts.
28.	Exteme urbanization may become a problem, but these bats are able to fly long distances to reach feeding grounds.

Total Respondents	**28**
(skipped this question)	11

13. What current monitoring efforts by state agencies are you aware of for ALL Mammals in ALL habitats in Indiana?

	Yes, these efforts occur	Not aware of these efforts occuring	Response Total
Statewide year-round monitoring conducted by state agencies	16% (6)	84% (32)	**38**
Statewide once a year monitoring conducted by state agencies	24% (9)	76% (28)	**37**
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	30% (11)	70% (26)	**37**
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	14% (5)	86% (32)	**37**
Regional or local year-round monitoring conducted by state agencies	8% (3)	92% (34)	**37**
Regional or local once a year monitoring conducted by state agencies	24% (9)	76% (28)	**37**
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	16% (6)	84% (31)	**37**
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	16% (6)	84% (31)	**37**
		Total Respondents	**297**

14. What current monitoring efforts by other organizations are you aware of for ALL Mammals in ALL habitats in Indiana?

	Yes, these efforts occur	Not aware of these efforts occuring	Response Total
Statewide year-round monitoring conducted by other organizations	0% (0)	100% (37)	**37**
Statewide once a year monitoring conducted by other organizations	5% (2)	95% (35)	**37**
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	5% (2)	95% (35)	**37**
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	8% (3)	92% (34)	**37**
Regional or local year-round monitoring conducted by other organizations	3% (1)	97% (36)	**37**
Regional or local once a year monitoring conducted by other organizations	6% (2)	94% (34)	**36**
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	11% (4)	89% (33)	**37**
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	22% (8)	78% (29)	**37**
		Total Respondents	**295**

15. How crucial are these monitoring efforts by state agencies for the conservation of ALL Mammals in ALL habitats in Indiana?

	Very crucial	Somewhat crucial	Slightly crucial	Not crucial	Unknown	Response Total
Statewide year-round monitoring conducted by state agencies	8% (3)	3% (1)	0% (0)	72% (26)	17% (6)	**36**
Statewide once a year monitoring conducted by state agencies	6% (2)	14% (5)	9% (3)	57% (20)	14% (5)	**35**
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	11% (4)	8% (3)	8% (3)	58% (21)	14% (5)	**36**
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	3% (1)	11% (4)	0% (0)	63% (22)	23% (8)	**35**

Regional or local year-round monitoring conducted by state agencies	3% (1)	0% (0)	3% (1)	74% (26)	20% (7)	**35**
Regional or local once a year monitoring conducted by state agencies	3% (1)	6% (2)	6% (2)	66% (23)	20% (7)	**35**
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	6% (2)	0% (0)	6% (2)	68% (23)	21% (7)	**34**
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	9% (3)	9% (3)	3% (1)	63% (22)	17% (6)	**35**
					Total Respondents	**281**

16. How crucial are these monitoring efforts by other organizations for ALL Mammals in ALL habitats conservation of the in Indiana?

	Very crucial	**Somewhat crucial**	**Slightly crucial**	**Not crucial**	**Unknown**	**Response Total**
Statewide year-round monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	56% (20)	44% (16)	**36**
Statewide once a year monitoring conducted by other organizations	0% (0)	6% (2)	3% (1)	51% (18)	40% (14)	**35**
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	5% (2)	5% (2)	3% (1)	46% (17)	41% (15)	**37**
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	8% (3)	0% (0)	51% (19)	41% (15)	**37**
Regional or local year-round monitoring conducted by other organizations	0% (0)	0% (0)	3% (1)	56% (20)	42% (15)	**36**
Regional or local once a year monitoring conducted by other organizations	0% (0)	0% (0)	6% (2)	53% (19)	42% (15)	**36**
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	6% (2)	0% (0)	6% (2)	46% (16)	43% (15)	**35**
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	8% (3)	11% (4)	39% (14)	42% (15)	**36**
					Total Respondents	**288**

17. Regional or local state agency monitoring for ALL Mammals in ALL habitats in Indiana.

1. On a statewide basis in the bloomington DNR office
2. The only monitoring I know of for coyotes is the furharvest report and they might be included on small game harvest questionaires.
3. St Parks, Nature Preserves
4. statewide
5. Statewide, furbuyer survey
6. 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.
7. In the past,I believe the DFW logged rabbit sightings during quail whistle counts.
8. State Parks and selected urban areas.
9. Annual Bowhunter Survey
10. Hunter harvest data on State Fish and Wildlife Properties.
11. State deer check stations
12. All known I-bat hibernacula
13. DNR property harvest data
Annual small game survey of licensed hunters!
14. -The IDNR conducts biennial hibernacula surveys in all known Indiana bat hibernacula in the state (except Batwing and Twin Domes Caves, which are surveyed under a separate Federal contract).
-Occassional monitoring/research is conducted in cave habitats on a localized basis by State agencies for specific purposes (such as the swarming habitat study at Wyandotte cave).
-Monitoring is also occasionally conducted in summer habitat (not included in this survey).
15. The small game harvest questionnaire is the only survey the agency conducts to monitor the Indiana fox squirrel population. The survey is only conducted in odd years.
16. Indiana Division of Fish and Wildlife. Population monitoring efforts at the state, regional and local scales are occurring to obtain annual population trends but they are not habitat specific nor do they encompass all habitat types associated with generalist mammals.
17. State Rabies Lab
DNR monitoring records for bat mistnet captures
18. 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.

19.	The Indiana Division of Fish and Wildlife and the Divsion of Nature Preserves maintain data on the occurrence location of road-kill, accidently trapped or other verified human encounters with badgers.
20.	Caves in southern Indiana are monitored. Currently there are 33 hibernacula reported for the Indiana bat in southern Indiana. This confidential information is available upon request.
21.	Red bats are monitored as part of the regular bat sampling that occurs at Indianapolis Airport, Camp Atterbury, Newport Chemical Depot. Also the population trends may be assess via animals submitted to the state rabies lab.
22.	Ongoing ecological studies of bobcats in southwestern section of Indiana - primarily Greene, Lawrence, and Martin counties.
23.	When monitoring is done, it has been limited to the species historic range in the state. This is the 16-17 contiguous counties in the NW section of Indiana.
24.	Harrison and Crawford counties.
25.	Indiana State Unversity (aka John Whitaker) and the State Board of health keep detailed records of bats submitted for rabies testing Wildlife Biologists at various military bases conduct regular mist-net and hibernacula surveys as do some state parks and Scott Johnson and USFWS Indiana bat surveys collect some of ths data

Total Respondents	**25**
(skipped this question)	14

18. Regional or local monitoring by other organizations for ALL Mammals in ALL habitats in Indiana.

1.	Some municipalites; University properties
2.	Purdue U Beverly Shores US Nat'l Lkshore Wesselman woods (Evansville)
3.	None that I am aware of
4.	Private groups have helped with counts in some State Parks.
5.	Not aware of any.
6.	Unknown
7.	Unknown
8.	Rick Clawson, Missouri DOC, conducts the bienniel winter surveys at Twin Domes and Batwing caves. The Indiana Karst Conservancy (Keith Dunlap) also assists with monitoring efforts, especially at hibernacula that they own or oversee. I have monitored the Lbat population in Reeves Cave in

	at hibernacula that they own or oversee. I have monitored the I-bat population in Reeves Cave in Monroe County.
9.	Not aware of any!
10.	There are surveys conducted at localized locations throughout the State of Indiana, primarily in summer habitat but also some cave habitat work, to address specific management or research needs. For example, surveys are conducted at all Department of Defense properties in the State.
11.	I am not aware of any other monitoring.
12.	monitored twice, 1975 by Ford, and 1998 by Leibacher and Whitaker
13.	Indiana State University- most recently by John O. Whitaker, Jr. (Public survey soliciting for information on known bat locations)
14.	None that I am aware of.
15.	None known
16.	See #17.
17.	Biyearly monitoring for cave bats in about 18 caves in which Indiana myotis is known to hibernate.
18.	I don't know of any official monitoring that is occuring.
19.	None that I am aware of.
20.	This is not being done in Indiana.
21.	None that I am aware of.
22.	Indianapolis Airport Authority

Total Respondents	**22**
(skipped this question)	17

19. Please list organizations that are monitoring ALL Mammals in ALL habitats in Indiana.

1.	state Universities
2.	There may be some informal monitoring by Farm Bureau or other agricultural groups but if so, it would probably be to prove there are too many.
3.	see # 18
4.	IDNR
5.	None that I am aware of

6. unknown

7. Not aware of any.

8. Unknown

9. Unknown

10. Indiana DNR(Dr. Virgil Brack/ESI, Keith Dunlap, Scott Johnson), Indiana Karst Conservancy, local NSS Grotto members, and U.S. Fish and Wildlife Service

11. Not aware of any!

12. Federal agencies (e.g., Forest Service, DoD, COE)
Educational institutions (e.g., Purdue, ISU)
Local/County agencies
Private Conservation Organizations (e.g., Indiana Karst Conservancy)

13. The biennial small game harvest survey is the only method currently being used by the division of fish and wildlife to monitor the statewide rabbit population. I am not aware of any other monitoring occuring in the state.

14. Indiana Division of Fish and Wildlife

15. Indiana Division of Fish and Wildlife. IDF&W uses a road-kill survey to monitor annual trends in raccoon populations at the state, regional and local scales. However, monitoring is not a means to associate raccoon activity with particular habitats, as inferred on the questionnaire.

16. Indiana Division of Fish and Wildlife. IDF&W uses professional surveys to monitor annual population trends at the state, regional and local scales. However, monitoring is not a means to associate opossum activity with particular habitats, as inferred in the questionnaire.

17. Indiana Division of Fish and Wildlife. Monitoring programs used by IDF&W are not habitat specific to grasslands for red foxes.

18. Indiana Division of Fish and Wildlife. Population monitoring efforts at state, regional and local scales are to monitor annual trends. Monitoring programs used by IDF&W are not habitat specific for beaver. The response to question 13 assumes aquatic systems encompass all wetland habitat types that beaver occupy.

19. Indiana Division of Fish and Wildlife. Population monitoring efforts at state, regional and local scales are to monitor annual trends. Monitoring programs used by IDF&W are not habitat specific for muskrat.

20. Indiana Division of Fish and Wildlife. Population monitoring efforts at the state, regional and local scales are to monitor annual trends. Monitoring programs are not limited to river and stream habitats for mink.

21. ISU

22. IDNR

23. None known

24.	IDNR, USFWS, Indiana Karst Conservancy, Indiana Cave Survey, various ecological consultants and universities (federal permit holders)
25.	Ball State University; Tom Morrell.
26.	Virgil Brack and company.
27.	Indiana State University Wildlie Biologists at Military bases
28.	I hesitate to use the term "monitoring" to describe this .... but IDNR does maintain records, databases, etc. regarding reports of bobcats throughout the state. These reports are, for the most part, unsolicited and obtained as they become available. It is not a regular, routine survey ... but more of a clearinghouse for information regarding bobcat sightings, road-kills, incidental captures, etc, which is one of the few means of "monitoring" low-density and wide-ranging species such as the bobcat.
29.	No private organizations. Only IDNR, Division of Fish and Wildlife has been pursuing FGS monitoring in the last 15-20 years.
30.	Indiana DNR.
31.	Indianapolis Airport Authority, Indiana State University, Purdue University, Crane Naval Base, Newport Chemical Depot, USFWS, IDNR
32.	no monitoring done or needed for some mammals

Total Respondents	**32**
(skipped this question)	7

20. What are the current monitoring techniques for ALL Mammals in ALL habitats 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
Radio telemetry and tracking	11% (3)	19% (5)	48% (13)	7% (2)	4% (1)	11% (3)	**27**
Modeling	0% (0)	25% (6)	54% (13)	0% (0)	4% (1)	17% (4)	**24**
Coverboard routes	0% (0)	6% (1)	28% (5)	33% (6)	0% (0)	33% (6)	**18**
Spot mapping	6% (1)	6% (1)	35% (6)	24% (4)	0% (0)	29% (5)	**17**
Driving a survey route	5% (1)	14% (3)	24% (5)	29% (6)	14% (3)	14% (3)	**21**

Reporting from harvest, depredation, or unintentional take (road kill, bycatch)	68% (17)	20% (5)	4% (1)	8% (2)	0% (0)	0% (0)	**25**
Mark and recapture	8% (2)	15% (4)	46% (12)	19% (5)	4% (1)	8% (2)	**26**
Professional survey/census	38% (9)	12% (3)	29% (7)	0% (0)	8% (2)	12% (3)	**24**
Volunteer survey/census	9% (2)	30% (7)	35% (8)	0% (0)	9% (2)	17% (4)	**23**
Trapping (by any technique)	50% (14)	14% (4)	25% (7)	4% (1)	0% (0)	7% (2)	**28**
Representative sites	14% (3)	24% (5)	24% (5)	5% (1)	5% (1)	29% (6)	**21**
Probabilistic sites	12% (2)	29% (5)	24% (4)	6% (1)	0% (0)	29% (5)	**17**
Other (please specify below)	0% (0)	11% (1)	22% (2)	0% (0)	0% (0)	67% (6)	**9**
						Total Respondents	**280**

21. Other monitoring techniques for ALL Mammals in ALL habitats in Indiana.

1. coyote "howling" counts

   Reports of coyote depredation on pets or livestock
2. None that I am aware of
3. unknown
4. Unknown
5. AnaBat/acoustic and/or video monitoring of cave entrances to assess bat presence/use.
6. Not aware of any!
7. Stable isotope analysis, genetic genotyping of individuals (through guano analysis), thermal imagery surveys, contaminant analysis/monitoring through guano and/or whole body analysis
8. I am not aware of any other monitoring programs for fox squirrels in Indiana.
9. IDF&W uses professional survey/census to monitor annual population trends but, here again, it is not means to associate raccoon activity within all generalist habitat types.

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

11. The use of Anabat as appropriate. Anabat is a bat detector that uses vocalizations to identify species.

12. Look for burrows in muck

13. mist-netting stream
cave counts
rabies lab bats
trapping cave and mine entrances

14. Track plates have been used in other Midwestern states (Missouri, Wisconsin), but not in Indiana.

15. Presence/absence can generally be determined by searching cliff lines for fresh sign (latrines, food caches, maintained nests) usually in fall. Research underway in other areas to determine if woodrats can be genotyped through scats.

Total Respondents	**15**
(skipped this question)	24

22. What one or two monitoring techniques would you recommend for effective conservation of ALL Mammals in ALL habitats in Indiana?

1. Reporting from harvest, depredation, or unintentional take.
Modeling

2. Harvest information
Depredation information

3. Harvest monitor

4. Harvest surveys

5. Regulated trapping.

6. Trapping and visual surveys.
Trapping is expensive and visual surveys are less expensive nd can be combined with other surveys.
McWheter, Gary Randolph, 1991, Estimating Abudnace of Cottontail Rabbits using live trapping and visual surveys, Master's thesis, University of Tennessee

7. Collection of harvest data from manditory checkstations.

8. Continue Bowhunter Survey and Trapper Survey.

9. This is a research question to be answered by research personnel.

10. Harvest reports, unintentional kill
Modeling
White-tailed Deer Ecology and Management, Lowell K. Halls

11. Continue ongoing bienniel winter surveys at all known hibernacula.

12. Specifically being done for the cottontail is not warranted. However,an analysis of vegetative structure by specie or species group in early successional habitats and then correllated with selected early successional species would be relevant!

13. -Biennial hibernacula surveys (which I would classify as "professional survey/census"), are the only means currently available to track Indiana bat population trends on a statewide or rangewide basis. These surveys are conducted rangewide.
-Survey and monitoring activities conducted in summer habitat are used to: 1) evaluate summer distribution in the state, and 2) evaluate roosting and foraging habitat use/needs. These surveys are conducted in Indiana as well as other states throughout the range of the species.

14. I would like to see a rural mail carrier survey initiated that would be useful for monitoring rabbits and several other wildlife species. Another method to monitor rabbit populations would be to include rabbit observations on the division's annual bobwhite whistle counts.

15. A hunter report card sent out to dedicated squirrel hunters would be a useful tool to provide an index to the fox squirrel population. I would also like to see a radio-telemetry project in northern Indiana to document fox squirrel dispersal between forest tracts. Another objective of this proposed radio-telemetry project would be to evaluate the possibility of overharvesting fox squirrel metapopulations.

16. IDF&W uses Harvest Reports and Professional Surveys. However, these techniques are not habitat specific nor do they cover the full spectrum of habitats associated with generalist species.

17. IDF&W uses Harvest Reports and Professional Surveys. However, these techniques are not habitat specific nor do they cover the full spectrum of habitats associated with generalist species.

18. IDF&W uses Harvest Reports and Professional Surveys. However, these techniques are not targeted towards grassland habitats.

19. IDF&W uses Harvest Reports and Professional Surveys. Here again, the assumption is that aquatic systems include all habitat types occupied by beaver.

20. IDF&W uses Harvest Reports and Professional Surveys. Here again, the assumption is that aquatic systems include all habitat types occupied by muskrat.

21. See #19

22. trap periphery of known range in Indiana

23. 1) Hibernacula counts to track population levels (Already being done)
2) Intensive radiotelemetry that tracks roost and foraging movements of specific colonies in representative areas across the state.

24. Mark-Recapture monitoring of representative colonies across the state.

Survey a sample of Indiana residents every 10 years as to whether they have bats in their home. (Follow-up affirmative responses with a visit to confirm species)

1. Stream surveys for otter sign.
2. Reporting (number, location, etc.) of unintentional take and biological data obtained from recovered specimens (reproductive parameters).

REFERENCE: Melquist, W.E., P.J. Polechla, Jr., and D. Toweill. 2003. River Otter. Pages 708-734 in Wild Mammals of North America: biology, management, and conservation. 2nd edition. G.A. Feldhamer, B.C. Thompson, and J.A. Chapman (eds.), John Hopkins University Press, Baltimore, MD, 1216 pages.

26. Continue to monitor road-kills, accidental captures and other verified sightings. Review this data and if warrented (a number of verified sightings near grassland habitat)attempt a telemetry and tracking study.

27. Trapping for Indiana bat includes mist netting and harp trapping. Internal cave surveys are important and more emphasis should be placed on the use of Anabat.

28. look for burrows in muck connected with trapping

29. the first 3 of the above.

We need make sure someone continues to examine all animals submitted for rabies testing.

30. A regular monitoring program (using traps, echolocation calls, and mistnets) for bats should be initiated on a state-wide basis. This should be a combined effort by IDNR, Universities, and private organizations.

1. Continued documentation of sightings, road-kills, and accidental captures. Obtain pertinent biological data from recovered specimens such as age and reproductive parameters (pregnancy rate, litter size). These data could be used to model populations or build life tables in future years.

31. 2. Some form of questionnaire or survey that is sent to trappers, hunters, professional resource managers could also be useful. The Indiana Bowhunter Survey is a good example although reporting rates for bobcats are so low they may not be effective to detect changes and monitor trends.

I do not have a good, single reference that describes these techniques although they are commonly used by many state wildlife agencies.

32. 1. Live-trapping and mark/recapture.
2. Radiotelemetry.

Standardized, live-trapping for 2 nights is effective for determining distribution and relative abundance.

33.

Searches for woodrat sign --- at new sites or previously-occupied sites to assess recolonization potential.

34. This bat should simply be monitored by keeping track of capture rates from permit reports and the state board of health.

A statewide bat monitoring effort should also be developed.

35. If we wanted to survey some mammal species, I would develop a system counting hills.

Total Respondents	**35**
(skipped this question)	4

23. What current HABITAT inventory and assessment efforts or activities by state agencies are you aware of for ALL Mammals in ALL habitats in Indiana?

	Yes, these efforts occur	No effort that I'm aware of	Response Total
Statewide annual inventory and assessment conducted by state agencies	0% (0)	100% (36)	**36**
Statewide once a year inventory and assessment conducted by state agencies	6% (2)	94% (34)	**36**
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	19% (7)	81% (29)	**36**
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	22% (8)	78% (28)	**36**
Regional or local year-round inventory and assessment conducted by state agencies	3% (1)	97% (35)	**36**
Regional or local once a year inventory and assessment conducted by state agencies	3% (1)	97% (35)	**36**
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	14% (5)	86% (31)	**36**
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	22% (8)	78% (28)	**36**
		Total Respondents	**288**

24. What current HABITAT inventory and assessment efforts or activities by other organizations are you aware of for ALL Mammals in ALL habitats 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% (36)	**36**
Statewide once a year inventory and assessment conducted by other organizations	3% (1)	97% (35)	**36**
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	17% (6)	83% (30)	**36**
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	11% (4)	89% (32)	**36**
Regional or local year-round inventory and assessment	3% (1)	97% (35)	**36**

conducted by other organizations			
Regional or local once a year inventory and assessment conducted by other organizations	6% (2)	94% (34)	**36**
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	11% (4)	89% (32)	**36**
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	19% (7)	81% (29)	**36**
		Total Respondents	**288**

25. How crucial are these HABITAT efforts by state agencies for the conservation of ALL Mammals in ALL habitats 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)	6% (2)	3% (1)	61% (20)	30% (10)	**33**
Statewide once a year inventory and assessment conducted by state agencies	3% (1)	18% (6)	0% (0)	55% (18)	24% (8)	**33**
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	14% (5)	14% (5)	6% (2)	42% (15)	25% (9)	**36**
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	8% (3)	19% (7)	6% (2)	39% (14)	28% (10)	**36**
Regional or local year-round inventory and assessment conducted by state agencies	0% (0)	12% (4)	3% (1)	50% (16)	34% (11)	**32**
Regional or local once a year inventory and assessment conducted by state agencies	0% (0)	9% (3)	0% (0)	53% (17)	38% (12)	**32**
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	3% (1)	15% (5)	9% (3)	39% (13)	33% (11)	**33**

Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	21% (7)	12% (4)	33% (11)	33% (11)	**33**
					Total Respondents	**268**

26. How crucial are these HABITAT efforts by other organizations for the conservation of ALL Mammals in ALL habitats 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 year-round inventory and assessment conducted by other organizations	0% (0)	3% (1)	3% (1)	45% (15)	48% (16)	**33**
Statewide once a year inventory and assessment conducted by other organizations	0% (0)	6% (2)	6% (2)	39% (13)	48% (16)	**33**
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	9% (3)	9% (3)	3% (1)	37% (13)	43% (15)	**35**
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	11% (4)	6% (2)	6% (2)	37% (13)	40% (14)	**35**
Regional or local year-round inventory and assessment conducted by other organizations	0% (0)	6% (2)	3% (1)	39% (13)	52% (17)	**33**
Regional or local once a year inventory and assessment conducted by other organizations	0% (0)	6% (2)	0% (0)	42% (14)	52% (17)	**33**
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	3% (1)	9% (3)	3% (1)	35% (12)	50% (17)	**34**
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	3% (1)	11% (4)	9% (3)	29% (10)	49% (17)	**35**
					Total Respondents	**271**

27. Regional or local state agency HABITAT inventory and assessment for ALL Mammals in ALL habitats in Indiana.

1. State Forests
   Nature Preserves
2. None that I am aware of
3. Unknown, possibly Division of Forestery.
4. Unknown
5. IDNR
6. cave habitat is assessed when the winter surveys of hibernacula are conducted state-wide.
7. DNR property evaluations, but I know of nothing organized!
8. -State conducted annual monitoring of the cave environment in most major hibernacula. Human disturbance in key hibernacula is also monitored.
   -The contractor who conducts the biennial hibernacula surveys also documents information on cave "condition" (e.g., breakdown) and makes management recommendations.
9. I am not aware of any habitat assessment being done by a state agency.
10. I suspect some state agencies monitor and assess aquatic habitats at a statewide level ... maybe not on an annual basis, but perhaps every few years. No agency comes to mind though that does it. Nonetheless, this is an important component of inventorying otter habitat in Indiana.
11. I believe that Purdue University and the NRCS and perhaps others keep track of grasslands created as part of the Farm Bill Programs. There are also occassional statewide assessments of grassland as part of remote-sensing, GIS based studies such as the GAP Analysis. The Division of Nature Preserves also keeps track of good examples of remnant native grassland. I am not sure any of these agencies collect the grassland habitat data specifically for badgers but other agencies applied the information to badgers.
12. Karst regions and summer habitat in Indiana
13. Northeast Indiana
    Northwest Indiana
14. south central part of state
15. I know the forestry division keeps track of changes in forest cover.
16. I suspect that most, if not all, public properties in the state (Hoosier National Forest, Crane NSWC, State Forests, State Reservoirs, etc.) periodically inventory and assess forested habitats under their jurisidiction. Commercial timbered lands are probably also inventoried on a regular basis. The Nature Conservancy may also have access to data.
17. I do not know if this type of inventory is being done by any state agency in the range of FGS. I would suspect that some agencies (perhaps SWCD, SCS - on a county level) have data on distribution and abundance of grassland habitats.

18.	The closest thing I can think of is the Division of Nature Preserves may have a decent inventory of cliff habitat in the state. As far as inventory of cliff habitat that is occupied by woodrats, Division of Fish and Wildlife has these data.
19.	Given that these bats will use almost any class of habitat, any effort aimed at doccumenting landscape cover would count including tax records assessment
20.	none

Total Respondents	**20**
(skipped this question)	19

28. Regional or local HABITAT inventory and assessment by other organizations for ALL Mammals in ALL habitats in Indiana.

1.	Bev Shores Nat'l Lkshore Nat'l Forest Wesselman Woods
2.	None that I am aware of
3.	Unknown
4.	Unknown
5.	Unknown
6.	completed by Rick Clawson, Missouri DOC, for Twin Domes and Batwing caves. USFWS- Reeves Cave and others
7.	There are Farm Bill/CRP type inventories but none done specifically for the Cottontail!
8.	Several organizations coollect information on the location and condition of caves, as well as the presence of bats in caves, which provides useful information.
9.	The Indiana GAP project categorizes land use cover types from landsat imagery. I assume that the change in cover types is being calculated over a specified period of time.
10.	twice assessed
11.	None known
12.	Karst regions and summer habitat in Indiana
13.	south central part of state
14.	Local planning boards monitor land use in most localities
15.	Not aware of other organizations doing this either.

16. None that I am aware of.

17. see above

18. none

Total Respondents	**18**
(skipped this question)	21

29. Please list organizations that are monitoring this HABITAT for ALL Mammals in ALL habitats in Indiana.

1. state Universities

2. PU
Gov't careing for #28

3. None that I am aware of

4. Unknown

5. Unknown

6. Unknown

7. Indiana Karst Conservancy, NSS Grottos, USFWS, I-69 bat consultants

8. None specifically for the Cottontail!

9. IKC, TNC, USGS, Indiana Cave Survey, USFS

10. I am not aware of any scheduled monitoring of early successional habitat in Indiana. I would suspect that one of the universities has remotely sensed data but their objective probably isn't specifically to monitor early successional habitat.

11. Indiana GAP Project

12. I have already done this page twice, and had to do one other page twice when it jumped back when I hit "next"

ISU twice- 1995 by Ford. 1998 by Leibacher and Whitaker; ISU; 1975 by Ford, 1998 by Leibacher and Whitaker

13. See #27.

14. None known

15. IDNR, USFWS, Indiana Karst Conservancy, Indiana Cave Survey, ecological consultants and universities (federal permit holders)

16. Ball State University NE Ind.
Indiana State University NW

17. Virgil Brack and his company

18. See Above

19. In addition to state and federal agencies, I suspect Indiana Hardwoods Lumberman Association or other private groups may monitor forested lands, particularly those in private ownership.

20. Maybe TNC???

21. I don't believe any organizations are truly monitoring cliff habitat in Indiana.

22. IDNR--I know the forestry section keeps % forest data, all local communities are constantly reassessing zoning and tax roles

23. none

Total Respondents	**24**
(skipped this question)	15

30. What are the current HABITAT inventory and/or assessment techniques for ALL Mammals in ALL habitats 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
GIS mapping	6% (2)	35% (12)	15% (5)	3% (1)	0% (0)	41% (14)	**34**
Aerial photography and analysis	9% (3)	30% (10)	12% (4)	6% (2)	0% (0)	42% (14)	**33**
Systematic sampling	6% (2)	15% (5)	12% (4)	6% (2)	6% (2)	56% (19)	**34**
Property tax estimates	3% (1)	3% (1)	3% (1)	7% (2)	7% (2)	77% (23)	**30**
State revenue data	0% (0)	3% (1)	3% (1)	6% (2)	6% (2)	81% (25)	**31**
Regulatory information	6% (2)	6% (2)	3% (1)	6% (2)	3% (1)	75% (24)	**32**
Participation in landuse programs	6% (2)	15% (5)	18% (6)	6% (2)	3% (1)	52% (17)	**33**

Modeling	0% (0)	9% (3)	24% (8)	9% (3)	3% (1)	56% (19)	**34**
Voluntary landowner reporting	3% (1)	9% (3)	6% (2)	6% (2)	6% (2)	69% (22)	**32**
Other (please specify below)	5% (1)	0% (0)	0% (0)	5% (1)	0% (0)	90% (19)	**21**
						Total Respondents	**314**

31. Other HABITAT inventory and assessment techniques for ALL Mammals in ALL habitats in Indiana.

1. None that I am aware of
2. unknown
3. Unknown
4. Unknown
5. Temperature and Relative Humidity monitoring with remote dataloggers.
6. look for runways in muck and trap for them
7. cave survey
8. none in place, and none needed

Total Respondents	**8**
(skipped this question)	31

32. What one or two HABITAT inventory and assessment techniques would you recommend for effective conservation of ALL Mammals in ALL habitats in Indiana?

1. GIS Habitat Modeling
2. GIS mapping or examination of aerial photos
3. Not sure
4. GIS mapping and aerial photo analysis
5. GIS mapping and Aerial photos
6. Collect hunter data from DNR Properties & Private Land hunters.
   Universities keep record of habitat loss and habitat fragmentation.

7. GIS
Aerial Photography

8. Cave microclimate monitoring with dataloggers should continue. A range-wide protocol for monitoring cave temperature and humidity has been developed by Bat Conservation International and is being widely used (contact Jim Kennedy or Merlin Tuttle at BCI). I believe Scott Johnson has been following this protocol in Indiana.

9. Cottontails are a mid to late early successional habitat resident. We do not know the amount of structure required to maintain optimum populations. We don't know what an optimum population is! We do know that it cycles but we don't know why! That isn't a good answer, I don't know a good answer for that!

10. -Cave microclimate data used in conjunction with results of hibernacula surveys.
-Techniques to link summer/winter populations (new genetic techniques such as stable isotope analysis; pit tagging).
-Information on habitat use/needs in the vicinity of caves during swarming is a critical need. At present, radio telemetry represents the best potential to collect this information.

11. The best habitat inventory technique would be creating a GIS with Landsat data from different time periods.

12. I would recommend a GIS analysis that examines changes in land use over the last 30+ year period.

13. same as used

14. GIS technology appears to be the most feasible means for inventory and assessment of otter habitat at a statewide scale. I suspect analyis of aerial photos could be useful also, perhaps at a local scale. Unfortunately, I do not have any references.

15. Monitoring of the larger grasslands in Indiana both native and man-made such as the grassland created by stip-minning. Especially monitor the quality and quantity of these areas.

16. cave survey in winter, and net survey in summer

17. Statewide habitat mapping is needed (and mostly available if you know who to ask)

Property tax assessments can be used as a proxy as well

18. GIS is a logical tool to inventory and assess all aspects of forested habitats in Indiana (species composition, age & size class, ownership, management regime, etc.). It would be nice to have a GIS coverage of rock outcrops in the state to supplement forest data.

To a lesser extent, interpretation of aerial photographs would also be useful.

19. GIS is logical tool to use to depict grassland/herbaceous communities.

20. GIS is the best tool available to depict (inventory) cliff, outcrops, talus slopes, caves, or other rocky habitats within the range of the Allegheny woodrat.

21. Habitat for this bat should simply be assessed by examining large-scale changes in landuse patterns

Total Respondents	**21**
(skipped this question)	18

33. What is the current body of science for ALL Mammals in ALL habitats in Indiana?

	Response Total	Response Percent
Complete, up to date and extensive	**2**	**5%**
Adequate	**14**	**37%**
Inadequate	**12**	**32%**
Nonexistent	**1**	**3%**
Other (please explain below)		
1. There is lots of research, but also great need due to endangered status.		
2. There is very little habitat specific research on coyotes in IN. Particularly when generalizing across generalist habitat types.		
3. Literature focuses on rural, as opposed to urban, areas and therefore does not encompass all the habitats used by generalist.		
4. I am not aware of any opossum literature as it pertains to generalist habitats in Indiana.	**9**	**24%**
5. I am not aware of any literature devoted strictly to red fox use of grassland habitat		
6. I am not familiar with any literature related to beaver habitat use in IN.		
7. Literature is not habitat specific for muskrats in Indiana		
8. I'm am not aware of any literature on mink focused strictly to rivers and streams.		
9. Somewhere between Adequate & Inadequate		

Total Respondents	**38**
(skipped this question)	1

34. Please provide a citation (title, author, date, publisher) that would give the best overview of ALL Mammals in ALL habitats in Indiana, if available. This resource may be used if further detail is needed.

Title = White-tailed Deer Ecology and Management;
Author = Halls, L. K. (editor);
Date = 1984;
Publisher = Stackpole Books

Title = Mammals of Indiana;
Author = Russell E. Mumford/ John Whitaker, Jr.;
Date = 1982;
Publisher = Bloomington Indiana University Press

Title = Population Ecology and Harvest of the Cottontail Rabbit;
Author = Heraold A.Demaree, Jr;
Date = 1978;
Publisher = Indiana DFW

Title = White-tailed Deer Ecology & Management;
Author = Wildlife Management Institute Book;
Date = 1984;
Publisher = Stackpole Books

Title = None known

Title = White-tailed Deer Ecology and Management;
Author = Lowell K. Halls;
Date = 1984;
Publisher = Stackpole Books

Title = Wintering populations of bats in Indiana, with emphasis on the endangered Indiana Myotis, Myotis sodalis;
Author = Virgil Brack, Jr., Scott A. Johnson, and R. Keith Dunlap;
Date = 2003;
Publisher = Proceedings of the IN Academy of Science

Title = I can't

Title = Management of hibernacula in the state of Indiana;
Author = Johnson, Brack, Dunlap;
Date = 2002;
Publisher = Bat Conservation International

Title = Population ecology and harvest of the cottontail rabbit on the Pigeon River fish and wildlife area, 1962-1970;
Author = Harold Demaree Jr.;
Date = 1978;
Publisher = Indiana Division of Fish and Wildlife

Title = Gray and Fox Squirrel Management in Indiana;
Author = John M. Allen;
Date = 1964;

Publisher = Indiana Department of Conservation

Title = Ecology of coyotes as influenced by landscape fragmentation;
Author = Todd Attwood;
Date = May 2002;
Publisher = Purdue University

Title = Raccoon density, home range, and habitat use on south-central Indiana farmland.;
Author = Larry Lehman;
Date = 1984;
Publisher = IDF&W

Title = Fur animals of Indiana;
Author = David Brooks;
Date = 1959;
Publisher = IDF&W

Title = Distribution of the western harvest mouse in Indiana;
Author = Leibacher and Whitaker;
Date = 1998;
Publisher = Ind, Acad. Sci. 107:167-170

Title = Indiana River Otter Reintroduction Program, 2000-2001;
Author = Scott A. Johnson;
Date = November 2001;
Publisher = Internal report, Indiana Department of Natural Resources, Bloomington, IN

Title = Mammals of the Eastern United States;
Author = J.O. Whitaker, Jr. and W. J. Hamilton, Jr.;
Date = 1998;
Publisher = Cornell University Press

Title = Home range near hibernacula in spring and autumn;
Author = Russell C. Romme, Amy B. Henry, R. Andrew King, T. Glueck, and K. Tyrell;
Date = 2002;
Publisher = The Indiana Bat: Biology and Management of an Endangered Species. Bat Conservation International

Title = A 14-year study of BLARINA BREVICAUDA in east-central Illinois.;
Author = Getz, L. L.;
Date = 1989;
Publisher = J. Mammalogy 70:58-66.

Author = Mumford and Whitaker 1982

Title = Brack, Johnson and Dunlap, 2003.;
Publisher = Proc. Ind. Acad, Sci. 112:-61-74.

Title = Mammals of Indiana;
Author = John Whitaker;
Date = IN Press;
Publisher = IU Press

Title = The bobcat in Illinois;
Author = Alan Woolf and Clayton Nielsen;
Date = 2002;

Publisher = Southern Illinois University Carbondale

Title = Reduction in the Eastern Limit of the Range of the Franklin's Ground Squirrel;
Author = Scott Johnson and Jane Choromanski-Norris;
Date = 1992;
Publisher = American Midland Naturalist 128:325-331.

Title = Reassessment of the Allegheny woodrat in Indiana;
Author = Scott Johnson;
Date = 2002;
Publisher = Proceedings of the Indiana Academy of Science 111:56-66.

Title = Mammals of Indiana;
Author = John Whitaker;
Date = 2005 (currently in press);
Publisher = IU Press

Title = Mamm. IN;
Author = M & W 1982

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

Title = Mammals of the Great Lake States;
Author = ?;
Date = ?;
Publisher = ?

Title = None known

Title = Mammals of Indiana;
Author = Russell E. Mumford and John O. Whitaker, Jr.;
Date = 1982;
Publisher = Indiana University Press

Title = I can't

Title = Biennial hibernacula survey reports;
Publisher = reports submitted to IDNR

Title = see above for more

Title = Restoring river otters in Indiana;
Author = Scott A. Johnson and Kim A. Berkley;
Date = 1999;
Publisher = Wildlife Society Bulletin 27:419-427.

Author = www. natureserve.org/explorer

Title = The nonhibernating ecology of bats in Indiana with emphasis on the endangered Indiana bat, Myotis sodalis;
Author = Virgil Brack, Jr.;
Date = 1983;

Publisher = Purdue University

Title = Blarina bravicauda;
Author = George,S. B., J. R. Choate, and H. H. Genoways;
Date = 1986;
Publisher = Mammalian Species 261:1-9

Title = Mumford and Whitaker 1982

Title = Nocturnal Behavior of Eastern Red Bats;
Author = Brianne Everson;
Date = 2005?;
Publisher = MS Thesis, Indiana State University (not yet complete)

Title = Status and management of bobcas in the United States over three decades;
Author = Woolf, A. and G.F. Hubert, Jr.;
Date = 1998;
Publisher = Wildlife Society Bulletin 26:287-293.

Title = Franklin's Ground Squirrel in Illinois: A Declining Prairie Mammal?;
Author = Jason Martin, Edward Heske, Joyce Hofman;
Date = 2003;
Publisher = American Midland Naturalist 150:130-138.

Title = 2002 Allegheny woodrat monitoring program;
Author = Scott Johnson, Heather Walker, Cassie Conrad, Aaron Holbrook;
Date = 2003;
Publisher = Indiana Department of Natural Resources (internal report)

Title = Foraging-habitat selection by bats at an urban-rural interface: comparison between a successful and a less successful species.;
Author = Duchamp, Sparks, Whitaker;
Date = 2004;
Publisher = Canadian Journal of Zoology

36. What is the current HABITAT body of science for ALL Mammals in ALL habitats in Indiana?

	Response Total	Response Percent
Complete, up to date and extensive	2	6%
Adequate	12	34%
Inadequate	13	37%
Nonexistent	1	3%

Other (please explain below)
1. unknown

2. unknown

3. unknown

4. unknown

5. unknown

6. unknown

7. unknown

8. unknown

9. Unknown - I suspect it exists, just not of aware of who or where!!

10. Somewhere between Adequate and Inadequate

Total Respondents	**35**
(skipped this question)	4

37. Please provide a citation (title, author, date, publisher) that would give the best HABITAT overview of ALL Mammals in ALL habitats in Indiana, if available. This resource may be used if further detail is needed.

Title = White-tailed Deer Ecology and Management;
Author = Halls, L. K. (editor);
Date = 1984;
Publisher = Stackpole Books

Title = Not aware of any

Title = Mammals of Indiana;
Author = Russell E. Mumford;
Date = 1982;
Publisher = Bloomington Indiana University Press

Title = Mammals of Indiana;
Author = Mumford/Whitaker;
Date = 1982;
Publisher = IU Press

Title = Unknown

Title = White-tailed Deer Ecology and Management;
Author = Lowell K. Halls;
Date = 1984;
Publisher = Stackpole Books

Title = see previous reference

Title = I can't

Title = same as Q34

Title = Habitat-relative abundance relationship for bobcats in southern Illinois;

Title = Habitat-relative abundance relationship for bobcats in southern Illinois.;

Title = The bobcat in Illinois;
Author = C.K. Nielsen and A. Woolf;
Date = 2002;
Publisher = Wildlife Society Bulletin 30:222-230.;

Title = Hibernacula of the endangered Indiana bat in Indiana;
Author = Brack, Virgil Jr., A.M. Wilkenson, R.E. Mumford;
Date = 1984;
Publisher = Proceedings of the Indiana Academy of Science, vol. 93:463-468

Title = A4-year study study of BLARINA BREVICAUDA un east-central Illinois;
Author = Getz, L. L.;
Date = 1989;
Publisher = J. Mammalogy 70:58-66.

Title = Mumford and Whitaker 1982

Title = Natural Heritage of Indiana;
Author = Marion Jackson;
Date = 1999;
Publisher = IU Press

Title = The bobcat in Illinois;
Author = Alan Woolf and Clayton Nielsen;
Date = 2002;
Publisher = Southern Illinois University Carbondale

Title = not aware of any!!

Title = Natural Features of Indiana?;
Author = Alton Lindsey (editor);
Date = 1966;
Publisher = Indiana Academy of Science

Title = Natural Heritage of Indiana;
Author = MT Jackson;
Publisher = IU Press

38. If possible, please provide a second citation (title, author, date, publisher) that would give another good HABITAT overview of ALL Mammals in ALL habitats in Indiana. This resource may also be used if further detail is needed.

Title = Unknown

Title = I can't

Title = same as Q35

Title = Habitat-relative abudance relationship for bobcats in southern Illinois;
Author = Nielsen, C.K, and A. Woolf;
Date = 2002;
Publisher = Wildlife Society Bulletin 30:222-230

Title = Distribution and ecology in Indiana. Pp 48-54 in Indiana Bat: Biology and Management of an Endangered Species (A. Kurta and J. Kennedy, Eds.);
Author = John Whitaker Jr. & Virgil Brack Jr.;
Date = 2002;
Publisher = Bat Conservation International

Title = Veilleux et al. 2003.;
Publisher = J. Mamm, 841068-1075.

Title = Nocturnal Behavior of Eastern Red Bats;
Author = Brianne Everson;
Date = 2005?;
Publisher = Unpublished MS Thesis (should be complete by may 2005)

Title = not aware of any!!

Title = Indiana GAP data;

Date = Unpublished available form ISU dept of Geography

39. What are the research needs for ALL Mammals in ALL habitats in Indiana?

	Urgently needed	Greatly needed	Needed	Slightly needed	Not needed	Unknown	Response Total
Life cycle	0% (0)	12% (5)	28% (11)	22% (9)	38% (15)	0% (0)	**40**
Distribution and abundance	8% (3)	15% (6)	22% (9)	20% (8)	35% (14)	0% (0)	**40**
Limiting factors (food, shelter, water, breeding sites)	12% (5)	8% (3)	25% (10)	20% (8)	35% (14)	0% (0)	**40**
Threats (predators/competition, contamination)	10% (4)	18% (7)	25% (10)	22% (9)	25% (10)	0% (0)	**40**
Relationship/dependence on specific habitats	10% (4)	18% (7)	20% (8)	25% (10)	28% (11)	0% (0)	**40**
Population health (genetic and physical)	5% (2)	23% (9)	26% (10)	23% (9)	23% (9)	0% (0)	**39**
Other (please specify below)	19% (4)	19% (4)	5% (1)	0% (0)	10% (2)	48% (10)	**21**
					Total Respondents		**260**

40. Other research needs for ALL Mammals in ALL habitats in Indiana.

1. A deer harvest analysis and modeling program
Baseline life history data.
2. CWD all aspects
3. None that I am aware of.
4. The aging techniques (tooth wear) biologists use were developed in New York and may not be accurate for deer of the midwest. My personal experience with deer of known ages indicates that wear is less than the aging charts we currently use. Additional local research needs to be done if we are interested in accurately aging deer over 2 1/2 years.
5. Unknown
6. Research needs explore the role of age and social structure in deer herd health.
7. We need urgently need to determine the effects of the loss/fragmentation/timber management of summer habitat/forest on maternity colonies/reproductive success not just caves/winter habitat.
8. Determine what affect feral cats have on a local cottontail population!
9. Due to the high fragmentation of forest tracts in Indiana (especially northern Indiana) I believe that dispersal distance is a critical area of research. I also would like to see a research project that evaluates the amount of harvest pressure can be sustained by isolated metapopulations of squirrels.
10. The above research needs are at the landscape level not strictly habitat specific.
11. The above research needs are needed on a landscape scale, not habitat specific.
12. The above research needs are not limited to grassland habitats.
13. As above assuming aquatic systems include all habitats occupied by beaver.
14. Research needs as related to muskrats are not habitat specific.
15. Research needs are not limited to river and stream habitats
16. Relationship(s) between population levels and population indices.
17. The relationship between badgers and land use and soil type, especially soil types that support borrows both for the badger and its prey.
18. More information is needed on autumn swarming and spring staging. Similarly new hibernacula need to be recorded.
19. need to know more about rabies in some mammals
20. We desperately need to know how bats interact with each other in terms of competition.

21. We desperately need to know how this omnipresent bat influences other species.

22. We need more information on the reproduction of some mammals in various habitats.

Total Respondents	**22**
(skipped this question)	14

41. What are the HABITAT research needs for ALL Mammals in ALL habitats in Indiana?

	Urgently needed	Greatly needed	Needed	Slightly needed	Not needed	Unknown	Response Total
Successional changes	0% (0)	13% (5)	26% (10)	24% (9)	34% (13)	3% (1)	**38**
Distribution and abundance (fragmentation)	13% (5)	21% (8)	26% (10)	16% (6)	21% (8)	3% (1)	**38**
Threats (land use change/competition, contamination/global warming)	5% (2)	27% (10)	30% (11)	11% (4)	22% (8)	5% (2)	**37**
Relationship/dependence on specific site conditions	8% (3)	16% (6)	24% (9)	16% (6)	27% (10)	8% (3)	**37**
Growth and development of individual components of the habitat	0% (0)	12% (4)	21% (7)	15% (5)	41% (14)	12% (4)	**34**
Other (please specify below)	0% (0)	18% (3)	12% (2)	0% (0)	0% (0)	71% (12)	**17**
					Total Respondents		**201**

42. Other HABITAT research needs for ALL Mammals in ALL habitats in Indiana.

1. None that I am aware of
2. unknown
3. Unknown
4. Research needs explore the effects of land development.
5. How much forest habitat needs to remain arround a hibernaculum to sustain a population of size x during the fall swarming period?
6. -How does cave environment, especially temperature and temperature stability, affect suitability and use of cave by Indiana bats
-What components of the habitat immediately surrounding the cave are most important to Indiana bats during fall swarming and spring staging. How is this habitat used.

7.	distribution and dispersal factors with regard to habitat factors including streams ti largr rivers
8.	The difference between native, warm-season-grass/native forb grasslands; planted, non-native, cool-season grasslands; and CRP grasslands relative to suitability for badgers.
9.	Recommend a detailed analysis of forest canopy to openness ratio and habitat intricacies that provide preferred home range requirements, e.g. primary roosts, secondary roosts, water, night roosts, food.
10.	need to know more of the relationship between winter and summer habitat, and also of migration.
11.	Obtaining data on habitat for this bat would provide a nearly complete picture of the status of various habitat types in Indiana.
12.	Additional information on all phases of the biology of some mammals would be helpful. However, other mammals are in no current danger.

Total Respondents	**12**
(skipped this question)	26

43. How well do the following conservation efforts address the threats to ALL Mammals in ALL habitats in Indiana?

	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
Habitat protection (use below for details)	18% (7)	47% (18)	26% (10)	8% (3)	0% (0)	**38**
Population management (hunting, trapping)	26% (10)	34% (13)	3% (1)	34% (13)	3% (1)	**38**
Population enhancement (captive breeding and release)	0% (0)	0% (0)	13% (5)	87% (33)	0% (0)	**38**
Reintroduction (restoration)	3% (1)	0% (0)	11% (4)	84% (32)	3% (1)	**38**
Food plots	5% (2)	13% (5)	11% (4)	68% (26)	3% (1)	**38**
Threats reduction	5% (2)	11% (4)	8% (3)	50% (19)	26% (10)	**38**
Native predator control	0% (0)	5% (2)	26% (10)	66% (25)	3% (1)	**38**
Exotic/invasive species control	3% (1)	11% (4)	16% (6)	68% (26)	3% (1)	**38**
Regulation of collecting	16% (6)	29% (11)	13% (5)	39% (15)	3% (1)	**38**
Disease/parasite management	0% (0)	5% (2)	5% (2)	84% (32)	5% (2)	**38**
Translocation to new geographic range	0% (0)	0% (0)	14% (5)	86% (32)	0% (0)	**37**
Protection of migration routes	3% (1)	3% (1)	18% (7)	68% (26)	8% (3)	**38**

Limiting contact with pollutants/contaminants	0% (0)	11% (4)	16% (6)	55% (21)	18% (7)	**38**
Public education to reduce human disturbance	5% (2)	26% (10)	26% (10)	37% (14)	5% (2)	**38**
Culling/selective removal	5% (2)	3% (1)	13% (5)	76% (29)	3% (1)	**38**
Stocking	0% (0)	0% (0)	11% (4)	89% (34)	0% (0)	**38**
Other (please specify below)	0% (0)	0% (0)	6% (1)	19% (3)	75% (12)	**16**
					Total Respondents	**623**

44. Other current conservation practices for ALL Mammals in ALL habitats in Indiana.

1. Contraceptives; currently not used due to efficacy and economical reasons
2. None that I am aware of
3. vegetative succession control
4. unknown
5. Unknown
6. posting signs at caves, installing-bat friendly gates, land acquisition, installing fake video cameras to deter cave visits,using light-sensitve "speloggers" to monitor levels of human visitation
7. Provide additional habitats through programs, agricultural and other. Rabbits are a by product of an economy. The more human needs placed on the landscape the less amount of by products will be produced. As I mentioned above: If we select for beef and corn there will be less rabbits. By selecting for you simultaneously select against something else. Maybe we need to find out how many steaks we need will determine how many rabbits we have!
8. Note, I included regulation of research and research related disturbance under "regulation of collecting"
9. Preserve wetlands
10. Protect some caves and mines in which some mammals occur.
11. There are no current conservation practices for woodrats in place in Indiana at this time. Monitoring population levels and trying to determine factors limiting woodrats have been focus of work in state.
12. Saving grassland (and woodland) will help this animal.

Total Respondents	**12**
(skipped this question)	26

45. What one or two specific practices would you recommend for more effective conservation of ALL Mammals in ALL habitats in Indiana?

1. Population management via hunting
2. Ban cervid farming & canned hunting
3. Habitat protection and habitat creation
4. Regulated trapping and nuisance animal control policies.
5. Woodland habitat protection
   Control of forest habitat fragmentation
6. Population management
   Regulation of collecting
7. Unknown
8. Habitat Protection
   Invasive species control
9. Negotiate with the owner of Ray's Cave and other hibernacula to allow them to be gated or employ one or more of the other techniques above.
10. Promote early succession associated with structure similar to L. japonica.
11. -Gating, securing conservation easements, or purchasing unprotected hibernacula (prioritizing based on current numbers or potential of hibernacula to harbor large numbers if disturbance is presently limiting numbers).
    -Protecting surface features and forest cover surrounding hibernacula and manageing for high quality swarming habitat.
12. The best strategy would be to protect as much early successional habitat as possible but that habitat must be manipulated periodically to set back natural succession.
13. Protecting existing forest tracts and maintaining or creating corridors between fragments would, in my opinion, be the 2 most effective conservation practices for fox squirrels in Indiana.
14. See #43. In addition, although not habitat specific, outreach programs are needed to effectively and accurately educate citizens about wildlife (game and non-game), the wildlife conservation model (for game and non-game) and the need for effective coyote management programs.
15. See #43. In addition, although not habitat specific, outreach programs are needed to effectively and accurately educate citizens about wildlife (game and non-game), the wildlife conservation model (for game and non-game) and effective raccoon management programs.
16. See #43. In addition, although not habitat specific, outreach programs are needed to effectively and accurately educate citizens about wildlife (game and non-game), the wildlife conservation model (for game and non-game) and effective opossum management and it's alternatives.
17. See #43. In addition, although not habitat specific, outreach programs are needed to effectively and accurately educate citizens about wildlife (game and non-game), the wildlife conservation model

	accurately educate citizens about wildlife (game and non-game), the wildlife conservation model (for game and non-game) and the need for effective red fox management programs.
18.	See #43. In addition, although not habitat specific, outreach programs are needed to effectively and accurately educate citizens about wildlife (game and non-game), the wildlife conservation model (for game and non-game), and the need for effective beaver management programs.
19.	See #43. In addition, although not habitat specific, outreach programs are needed to effectively and accurately educate citizens about wildlife (game and non-game), the wildlife conservation model (for game and non-game), and the need for effective muskrat management programs.
20.	See #43. In addition, although not habitat specific, outreach programs are needed to effectively and accurately educate citizens about wildlife (game and non-game), the wildlife conservation model (for game and non-game), and the need for effective mink management programs.
21.	about the only one that would be effective would be to manage succession such that proper habitat was more abundant and closer together
22.	Protect bats as part of historic home preservation. Further research into how to allow peaceful and safe coexistence between bats and homeowners.
23.	Protection of aquatic and riverine habitats is essential. More programs or efforts to restore lost or degraded systems would be beneficial. Educational programs aimed to reduce incidental take would also benefit otters especially where population densities are lower.; Protect natural communities and habitats. Management of forested lands to provide early/mid successional stage habitats.;
24.	Conservation and restoration of ground squirrel and pocket gopher populations. Limit human access to all parts of large grasslands.
25.	The purchasing and protection of recorded Indiana bat hibernacula and summer habitat. Similarly, public education is needed on the importance of caves, snags, and the importance of this species to man.
26.	Manage lands for early successional grassland habitat - would require land use change every 3 to 5 years.
27.	protect caves a and mines continued education of people about bats.
28.	Studies of migration routes are needed so these areas can be protected. Care should be taken in approving wind turban power stations because of the large direct take associated with these structures. We also need some studies of these power stations in this section of the Midwest (Indiana, Ill, OH).
29.	In my opinion, there are not any truly active, ongoing conservation efforts for FGS in Indiana. Most of the work has been focused on documenting distribution and relative abundance. Periodic burning of railroad ROWs (an important land use type for FGS in IN) to maintain a strong grassy component has been beneficial in the past. Before effective conservation strategies can be implemented, one must know the limiting factors for the species. FGS will probably always have a tenuous status in Indiana. They were never common and suitable habitats are now limited to railroad ROWs and widely scattered tracts of natural grasslands. Additionally, populations are reported to be cyclic, have

	widely scattered tracts of natural grasslands. Additionally, populations are repored to be cyclic, have a discontinous or patchy distribution, and appear to be somewhat nomadic or transitory in nature.
30.	1. Research aimed to identify factors that limit woodrat populations is a high priority. 2. Periodic monitoring of extant populations. 3. Revisit previously-occuped sites to assess recolonization potential.
31.	General conservation measures for this and other bats are described in Mammals of Indiana, America's Backyard Bats (MD Tuttle, Bat Conservation International), and Sparks, D. W., and J. R. Choate. 2000. Distribution, natural history, conservation status, and biogeography of bats in Kansas. Pp: 173-228 In Reflections of a naturalist: papers honoring professor Eugene D. Fleharty (J. R. Choate, ed.), Fort Hays Studies, Special Issue 1: 1-241. (which I can provide)
32.	Save natural habitats. n

Total Respondents	**33**
(skipped this question)	6

46. How well do the following conservation efforts address the HABITAT threats to ALL Mammals in ALL habitats in Indiana?

	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
Habitat protection through regulation	6% (2)	51% (18)	31% (11)	6% (2)	6% (2)	**35**
Habitat protection on public lands	26% (9)	54% (19)	20% (7)	0% (0)	0% (0)	**35**
Habitat protection incentives (financial)	6% (2)	50% (17)	24% (8)	9% (3)	12% (4)	**34**
Habitat restoration through regulation	0% (0)	40% (14)	29% (10)	26% (9)	6% (2)	**35**
Habitat restoration on public lands	11% (4)	57% (20)	14% (5)	9% (3)	9% (3)	**35**
Habitat restoration incentives (financial)	3% (1)	56% (19)	18% (6)	15% (5)	9% (3)	**34**
Artificial habitat creation (artificial reefs, nesting platforms)	0% (0)	9% (3)	17% (6)	74% (26)	0% (0)	**35**
Selective use of functionally equivalent exotic species in place of extirpated natives	3% (1)	0% (0)	23% (8)	71% (25)	3% (1)	**35**
Succession control (fire, mowing)	11% (4)	31% (11)	11% (4)	40% (14)	6% (2)	**35**
Corridor development/protection	6% (2)	34% (12)	17% (6)	40% (14)	3% (1)	**35**
Managing water regimes	0% (0)	14% (5)	17% (6)	57% (20)	11% (4)	**35**
Pollution reduction	0% (0)	17% (6)	20% (7)	43% (15)	20% (7)	**35**
Protection of adjacent buffer zone	6% (2)	31% (11)	17% (6)	37% (13)	9% (3)	**35**
Restrict public access and disturbance	9% (3)	23% (8)	31% (11)	29% (10)	9% (3)	**35**

Land use planning	9% (3)	26% (9)	18% (6)	41% (14)	6% (2)	**34**
Technical assistance	12% (4)	32% (11)	12% (4)	29% (10)	15% (5)	**34**
Cooperative land management agreements (conservation easements)	9% (3)	54% (19)	11% (4)	11% (4)	14% (5)	**35**
Other (please specify below)	7% (1)	0% (0)	0% (0)	7% (1)	86% (12)	**14**
					Total Respondents	**605**

47. Other current HABITAT conservation practices for ALL Mammals in ALL habitats in Indiana.

1. None that I am aware of
2. unknown
3. Unknown
4. Restriction of motorized access into habitat
5. Strip spraying/interseeding
6. Fire and mowing could be beneficial to grassland habitats even though there were no threats (question 10) to grassland habitats as it pertains to red fox. Maybe Not Applicable is more appropriate than Unknown.
7. none for some mammals
8. Generally educate the public on retaining old, dead or dying trees that provide habitat for wildlife, including the Indiana bat.

Total Respondents	**8**
(skipped this question)	31

48. What one or two specific HABITAT practices would you recommend for more effective conservation of ALL Mammals in ALL habitats in Indiana?

1. Habitat protection through incentives
   Habitat protection through purchasing
2. Prescribed burning, becuase it is useful in controlling vegetative succession. Uncontrolled vegetative succession eventually excludes rabbits and makes future management difficult due to concerns for the Indiana Bat.
   Stribling, H.L. and Speake, D. W. 1991. Responses of Bobwhie WQuail and EAstern Cottontail Rabbit Populations to Prescribed Burning, Cover Enhancement and Food Plots. Alabama Game & Fish Divison/Auburn University
3. Restricting housing developement in forested areas.

Incentives for establishing new forested areas and protection of existing ones.

4. Habitat restoration on public lands
Habitat restoration incentives (financial)

5. Legislation to protect habitat.

6. Habitat Protection
Habitat Restoration

7. Conservation easements on private property containing important swarming habitat and connected karst features around key hibernacula.

8. Maintenance of early sucessional components!

9. same as Q45

10. Successional control is the best method to maintail useable rabbit habitat.

11. The 2 specific habitat practices that I would recommend would be to creat corridors between forest tracts and provide financial incentives to protect or create forest habitat.

12. see above

13. 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.

14. Grassland often have to be maintained by fire. Control-burns are becoming more difficult to conduct due to lack of trained personnel, restricted burn windows, and encroaching development. Grassland management difficulties need to be addressed.

15. See #45.

16. Early successional grassland habitat maintenance would require "restart succession is areas. Disturbance of a magnitude to create bare ground, such as a complete burn, plowing, etc. would be required to accomplish this goal.

17. anything that helps to preserve wetlands could help this animal.

18. Preservation of both forest and agricultural landscapes will protect some mammals habitat.

Most forest conservation practices (including corridors and greenways) are likely success stories for some mammals

19. Protection of large blocks of natural communities and habitats. Management of forested lands to provide early/mid successional stage habitats.

20. Considering current land use practices in NW Indiana, railroad ROWs may provide the most abundant source of grassland communities. Prescribed burning to maintain grass/forb and prairie communities along ROWs is important. Larger blocks of grassland habitats in the range are often found in state nature preserves. These are often isolated from one another ..... reducing fragmentation to the extent possible would be another beneficial habitat tool

	fragmentation to the extent possible would be another beneficial habitat tool.
21.	Encourage retention and development of hard mast trees (oaks, hickories) in close proximity to woodrat cliffs.
	As noted the biggest issue would be to further reduce disturbance by the lay public--particulalry in terms of avoiding removal of hibernacula and maternal sites.
22.	We should also remind those interested in preserving historical buildings and sites, that the bat colonies may also be part of that history.
	References available in Mammals of Indiana and Bats of Kansas (Cited Earlier)

Total Respondents	**22**
(skipped this question)	17

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

1.	Historical records show that coyotes were present in Indiana in settlement times. Ever since, one of the goals of the residents of the state seemed to be to eliminate them. Poisoning, unregulated hunting, virtually no closed season on hunting/trapping, paying bounties have done little to reduce the population. In fact, some evidence points to an increasing population in spite of all these attempts. About the only real threat to coyotes would be urban sprawl cutting into their numbers or over-population creating an outbreak of mange or disease. Coyotes will be a part of Indiana's wildlife for a long time.
2.	No
3.	Evaluate current harvest and hunting stategies to determine if we need to better balance opportunity with harvest. Continue to monitor QDM practices (quality deer management) in other areas. I believe we already have quality deer in Indiana without getting involved in QDM restrictions or regulations.
4.	None
5.	Research into the how the elimination of the older age classes of deer effects the health of the deer herd.
6.	I am consulting with FHWA and INDOT on their proposed I-69 extention which is traversing karst terrain in Monroe and Greene counties. INDOT consultants are surveying many previously unsurveyed caves (n = 60 in 2004-05) that are potential Indiana bat hibernacula. New data will be available by March 2005. The FWS is also currently revising the Indiana Bat Recovery Plan, which once completed will be an excellent source of information for this effort. Lori Pruitt is the best contact to keep up with the plan's status.
7.	No! Western Harvest Mouse entered Indiana by range expansion from Illinois about 1969 in or near Newton County (Willow Slough) and has continued to spread since then until it occurred in at least

Newton County (Willow Slough) and has continued to spread since then until it occurred in at least 18 counties. We can always learn more about it, but and we could attempt to learn more about how it spreads and what deters it from spreading (the latter seems to be larger rivers).

9. Maintain bat friendly human barriers at hibernacula
Research needs:
1) determine adequate levels of snag retention in managed forests
2) Include snag retention and snag decay rate in models of forest composition
3) estimate reproductive success or survival

10. The IDNR reintroduction program appears to have successfully restored otters in select watersheds throughout the state. Populations are established near release sites, have expanded to adjacent habitats, and colonized areas not originally targeted for restoration. Public interest in this species remains high and the otter can serve as a profile species for wetland and riverine protection.

11. Work closely with all appropriate federal and state environmental agencies in coordinating efforts on the Indiana bat.

This is still a common bat, but threats to its migration routes are a critical isssue.

12. Little is known about population dynamics for any bat--this one in particular.

A state-wide monitoring effort should be undertaken.

13. In summary, FGS is extremely rare in Indiana - probably always was and probably always will be. Current occupied range is greatly reduced from historical occurrence ... maybe only 3 of 16 previously-occupied counties. Suitable habitats are limited to isolated tracts of grassland and narrow stretches of railroad ROWs, the latter of which may function as ecological traps. Management options and recovery strategies are limited .... and evaluating their effectiveness can be confounded by the species' population dynamics and habitat preferences. The species presents a very challenging conservation opportunity.

14. Factors responsible for the decline and local extirpation of woodrats, rangewide and in Indiana, remain unclear. Suspected causes include habitat fragmentation, increased predation from ubiquitous predators (owls, raccoons), changes in forest composition, severe winters, fatal exposure to raccoon roundworm, and decreased production of hard mast. Remnant populations in Indiana are exceedingly small and probably vulnerable to extirpation from any number of stochastic events. Such small colonies may also suffer inbreeding and loss of genetic variation as seen in Illinois. Invasion by exotic plant species, such as garlic mustard, was evident at several Indiana sites ... which may affect availability of green vegetation, soft mass, fungi, or other food items. Hard mast is an important, high energy food resource for woodrats, and low acorn crops may impact local populations. Raccoon roundworm is present at woodrat localities in Indiana, but contamination levels and impacts to the species are unknown.

15. This is a common animal in grassy fields and also in woods. It is doing fine at present, so nothing is needed.

Off the subject I wondered why you left off such species as the shrews Sorex hoyi and S. fumeus.

Total Respondents	**15**
(skipped this question)	24