

# WADEABLE/LARGE RIVERS IN THE EASTERN CORNBELT/INTERIOR PLATEAU ECOREGIONS OF THE OHIO RIVER DRAINAGE HABITAT NARRATIVE

## Habitat description

Streams of the Ohio River drainage, Eastern Corn Belt ecoregion are found in central and east-central Indiana; Interior Plateau ecoregion streams are found in south-central and southeastern Indiana. Wadeable/large rivers are those having a drainage area of  $> 19 < 2,000 \text{ mi}^2$ . The streams of the Eastern Corn Belt ecoregion are highly influenced by the extensive agriculture that dominates the ecoregion. The Interior Plateau ecoregion includes Indiana's karst region and the most rugged terrain of Indiana.

## Problems affecting species and habitats

### Species threats

Respondents ranked the following threats to wildlife in wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat in Indiana:

Rank	Threats to wildlife in wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat
1	High sensitivity to pollution
2	Habitat loss (breeding range)
3	Habitat loss (feeding/foraging areas)
4	Dependence on irregular resources (cyclical annual variations) (e.g., food, water, habitat limited due to annual variations in availability)
5	Invasive/non-native species
6	Specialized reproductive behavior or low reproductive rates
7	Viable reproductive population size or availability
8 (tie)	Predators (native or domesticated)
8 (tie)	Degradation of movement/migration routes (overwintering habitats, nesting and staging sites)
9	Bioaccumulation of contaminants
9	Diseases/parasites (of the species itself)
10	Small native range (high endemism)
11	Unintentional take/ direct mortality (e.g., vehicle collisions, power line collisions, by-catch, harvesting equipment, land preparation machinery)

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- 12 Regulated hunting/fishing pressure (too much)
- 13 Dependence on other species (mutualism, pollinators)
- 14 Near limits of natural geographic range
- 15 Genetic pollution (hybridization)
- 16 Large home range requirements
- 17 (tie) Species overpopulation
- 17 (tie) Unregulated collection pressure

A respondent offered additional threats to wildlife in wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat in Indiana (not ranked):

- High stream flow for a few months following spawning can reduce class year strength seriously. Reducing ditching in headwaters, installing grass waterways and WASCOS and maintaining riparian corridors, can reduce the threat. All of these measures will slow stream flows and reduce siltation

Respondents listed top threats to wildlife in wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat in Indiana (not ranked):

- Hellbenders
  - Small geographic range
  - Small population sizes
- Habitat modification, fragmentation, degradation or loss
  - In-stream modifications
  - Loss of instream cover
  - Riparian destruction
  - Channelization
  - Rock bass: Habitat loss and degradation are serious threats. They prefer silt free streams to reproduce and thrive. They also relate closely to structure/cover therefore any habitat loss is a threat
  - 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. Habitat loss is biggest threat
  - Breeding and feeding/foraging habitat loss due to sedimentation from farm fields and stream banks as well as the removal of natural riparian vegetation
  - Runoff and pollution
    - Introduction of sediments, if only temporary
    - Pollution within the Tippecanoe River system in Indiana
    - Point source pollution that triggers fish kills or repels rock bass from the area
    - Pollution which triggers fish kills or repels smallmouth from the area
    - Siltation of spawning areas and pools
- Loss of reproductive ability
  - Any factor which reduces the reproductive population size
  - Eastern sand darter: Low reproductive rates/small populations - reach maturity at age one, but only lives a few years
  - Hellbenders: In many locations there is concern about low reproductive rates, but this is unknown in Indiana populations

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Technical experts and conservation organizations reviewed the above results and were asked if these were a reasonable representation of the threats to wildlife in wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat. There were no responses.

### Habitat threats

Respondents ranked threats to wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat in Indiana:

<b>Rank</b>	<b>Threats to wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat</b>
1	Stream channelization
2	Habitat degradation
3	Point source pollution (continuing)
4	Nonpoint source pollution (sedimentation and nutrients)
5	Agricultural/forestry practices
6	Drainage practices (stormwater runoff)
7	Habitat fragmentation
8	Commercial or residential development (sprawl)
9 (tie)	Counterproductive financial incentives or regulations
9 (tie)	Impoundment of water/flow regulation
10	Residual contamination (persistent toxins)
11	Mining/acidification
12	Invasive/non-native species
13	Successional change
14	Climate change
15	Diseases (of plants that create habitat)

Respondents noted no other threats to wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat in Indiana.

Respondents listed top threats to wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat in Indiana (not ranked):

- Habitat degradation, alteration, loss, fragmentation
  - Instream modifications
  - Runoff
    - Agricultural
    - Residential
  - Impoundment

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- Sedimentation
- Removal of natural riparian vegetation, especially through drainage and maintenance activities
- Toxins and pollutants
  - Point source pollution: These ecoregions have major threats from large cities causing fish kills from wastewater treatment plants. Also, confined feeding operations in rural areas are a major threat to stream fish communities
- Channelization
  - Which reduces the shallow (less than 1.5 feet) sand/gravel substrate can critically reduce or fragment habitat

Technical experts and conservation organizations reviewed the above results and were asked if these were a reasonable representation of the threats to wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat. There were no responses.

## Additional research and survey efforts

### Current body of research

#### Species research

Fifty percent of respondents stated that the current body of science is adequate for wildlife in wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat in Indiana; fifty percent stated that it is inadequate.

Respondents identified the following citations (title, author, date, publisher) that would give the best overview of wildlife in wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitats in Indiana.

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 = Naiades of Pennsylvania;  
Author = Ortman;  
Date = 1919;  
Publisher = Carnegie Museum

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

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

Title = Field guide to freshwater mussels of Midwest;  
Author = Cummings & Mayer;  
Date = 1992;  
Publisher = INHS

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Title = 'Clubshell';  
Author = USFW, Division of Endangered Species;  
Publisher = Online

Title = A survey of fish communities and aquatic habitats at Indiana's major streams with emphasis on smallmouth bass distribution and abundance;  
Author = Stuart T. Shipman;  
Date = 12/1997;  
Publisher = DNR fisheries section

Title = A survey of fish communities and aquatic habitats at Indiana's major streams with emphasis on smallmouth bass distribution and abundance.;  
Author = Stuart T. Shipman;  
Date = December 1997;  
Publisher = IDNR

Title = 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 = The Fishes of Missouri;  
Author = William L. Plieger;  
Date = 1997;  
Publisher = Missouri Conservation Commission

Title = Handbook of freshwater fishery biology;  
Author = Kenneth D. Carlander;  
Date = 1997;  
Publisher = Iowa University Press

Title = fishes of Tennessee;  
Author = Etnire and Starnes

Title = Fishes of Ohio;  
Author = Milt Troutman;  
Publisher = OSU Press

Title = FW fishes of Canada;  
Author = Scott & Crossman

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 = 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

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Technical experts and conservation organizations reviewed the above results and were asked if these were a reasonable representation of the current body of science for wildlife in wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat. There were no responses.

### Habitat research

Fifty percent of respondents stated that the current body of science is adequate for wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat in Indiana; forty-two percent stated that it is inadequate or nonexistent.

Respondents identified the following citations (title, author, date, publisher) that would give the best overview of wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat in Indiana.

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

Title = Freshwater Mollusca of WI;  
Author = Baker;  
Date = 1929;  
Publisher = WI Geol. Nat. Sci. Surv.

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

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

Title = A survey of fish communities and aquatic habitats at Indiana's major streams with emphasis on smallmouth bass distribution and abundance.;  
Author = Stuart T. Shipman;  
Date = December 1997;  
Publisher = IDNR

Title = 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 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;

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Publisher = DNR/Fisheries section

Technical experts and conservation organizations reviewed the above results and were asked if these were a reasonable representation of the current body of science for wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat. There were no responses.

### Research needs

#### Species research

Respondents ranked research needs for wildlife in wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat in Indiana:

Rank	Research needs for wildlife in wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat
1	Limiting factors (food, shelter, water, breeding sites)
2	Relationship/dependence on specific habitats
3 (tie)	Distribution and abundance
3 (tie)	Threats (predators/competition, contamination)
4 (tie)	Life cycle
4 (tie)	Population health (genetic and physical)

A respondent noted an additional research need for wildlife in wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat in Indiana:

- To find out why the clubshell has depopulated most of its former distribution in Indiana. Developing some sort of timeline (late Pleistocene, Holocene), usually archeological or historic, for relic valve distribution might narrow possibilities of critical limiting factors (post-settlement siltation, etc.)

Technical experts and conservation organizations reviewed the above results and were asked if these were a reasonable representation of the research needs for wildlife in wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat. There were no responses.

#### Habitat research

Respondents ranked research needs for wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat in Indiana:

Rank	Research needs for wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat
1	Threats (land use change/competition,

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- contamination/global warming)
- 2 Relationship/dependence on specific site conditions
- 3 Distribution and abundance (fragmentation)
- 4 Growth and development of individual components of the habitat
- 5 Successional changes

Respondents noted no additional research needs for wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat in Indiana.

Technical experts and conservation organizations reviewed the above results and were asked if these were a reasonable representation of the research needs for wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat. There were no responses.

### Conservation actions necessary

#### Species actions

Respondents ranked conservation efforts by how well they address threats to wildlife in wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat in Indiana:

Rank	Conservation efforts for wildlife in wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat
1	Stocking
2	Reintroduction (restoration)
3 (tie)	Habitat protection
3 (tie)	Limiting contact with pollutants/contaminants
4	Translocation to new geographic range
5	Population management (hunting, trapping)
6 (tie)	Population enhancement (captive breeding and release)
6 (tie)	Threats reduction
6 (tie)	Exotic/invasive species control
6 (tie)	Regulation of collecting
6 (tie)	Disease/parasite management
6 (tie)	Public education to reduce human disturbance
6 (tie)	Culling/selective removal

Respondents noted no other current conservation practices for wildlife in wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat in Indiana.

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Respondents recommended these practices for more effective conservation of wildlife in wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat in Indiana (not ranked):

- Habitat protection, restoration and enhancement
  - Restore riparian corridors
  - Eliminate instream modifications, including impoundment
  - Pollution control
    - From wastewater treatment plants and confined feeding operations
  - Protect shallow sand/gravel habitat from siltation and channelization
  - Eastern sand darter: Reduce sedimentation covering sand substrate that darter needs to survive and reproduce. Current efforts to reduce sedimentation in streams is somewhat effective, but I'm not sure it is enough to keep the eastern sand darter from disappearing
  
- Regulation
  - Strict enforcement of laws regulating instream modification
  - Declare moratorium on channel/drainage improvement projects that do not mitigate losses
  
- Incentives
  - For farmers
  
- Propagation

Technical experts and conservation organizations reviewed the above results and were asked if these were a reasonable representation of the conservation efforts for wildlife in wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat. There were no responses.

Habitat actions

Respondents ranked conservation efforts by how well they address threats to wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat in Indiana:

Rank	Conservation efforts for wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat
1	Protection of adjacent buffer zone
2	Pollution reduction
3	Corridor development/protection
4	Habitat restoration incentives (financial)
5	Habitat protection incentives (financial)
6	Habitat protection through regulation
6	Habitat restoration through regulation
7	Habitat restoration on public lands
8	Habitat protection on public lands

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- 9 Land use planning
- 10 (tie) Artificial habitat creation (artificial reefs, nesting platforms)
- 10 (tie) Managing water regimes
- 10 (tie) Restrict public access and disturbance
- 10 (tie) Technical assistance
- 10 (tie) Cooperative land management agreements (conservation easements)

A respondent listed another current conservation practice for wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat in Indiana:

- Eastern sand darter: The best way to conserve critical habitat for the eastern sand darter would be:
  - Habitat protection on all lands
  - Habitat restoration of floodplains would be critical to the amount of sedimentation reaching the stream bed
  - Managing water regimes may 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 runoff to a minimum

Respondents recommended the following practices for more effective conservation of wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat in Indiana (not ranked):

- Habitat protection and restoration
  - No instream modifications
  - Limit runoff through incentives or other means
  - Manage pollutants and toxins for improved water quality and fewer fish kills
  - Protect buffer/riparian zones: Leads to improved water quality and more instream cover
- Incentives
  - CREP and other incentives for BMPs
  - Increase habitat using incentives
  - To protect adjacent buffer zones
- Regulation
  - To maintain available habitat
- Technical assistance
- Land use planning

Technical experts and conservation organizations reviewed the above results and were asked if these were a reasonable representation of the conservation efforts for wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat. There were no responses.

## Proposed plans for monitoring

### Current monitoring

#### Species monitoring

Respondents were aware of the following monitoring efforts by state agencies for wildlife in wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat in Indiana (not ranked):

- Statewide year-round monitoring
- Statewide once-a-year monitoring
- Periodic statewide (less than once a year but still regularly scheduled) monitoring
- Occasional statewide (less than once a year and not regularly scheduled) monitoring
- Regional or local year-round monitoring
- Regional or local once-a-year monitoring
- Periodic regional or local (less than once a year but still regularly scheduled) monitoring
- Occasional regional or local (less than once a year and not regularly scheduled) monitoring

Respondents were aware of the following monitoring efforts by other organizations for wildlife in wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat in Indiana (not ranked):

- Regional or local once-a-year monitoring
- Periodic regional or local (less than once a year but still regularly scheduled) monitoring
- Occasional regional or local (less than once a year and not regularly scheduled) monitoring

Respondents ranked monitoring efforts by state agencies based on their importance for conservation of wildlife in wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat in Indiana:

Rank	Monitoring efforts by state agencies for conservation of wildlife in wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat
1	Occasional regional or local (less than once a year and not regularly scheduled) monitoring
2	Periodic regional or local (less than once a year but still regularly scheduled) monitoring
3	Periodic statewide (less than once a year but still regularly scheduled) monitoring
4 (tie)	Regional or local once-a-year monitoring
4 (tie)	Occasional statewide (less than once a year and not regularly scheduled) monitoring
5	Regional or local year-round monitoring
6	Statewide year-round monitoring

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7 Statewide once-a-year monitoring

Respondents ranked monitoring efforts by other organizations based on their importance for conservation of wildlife in wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat in Indiana:

Rank	Monitoring efforts by other organizations for conservation of wildlife in wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat
1 (tie)	Periodic statewide (less than once a year but still regularly scheduled) monitoring
1 (tie)	Regional or local once-a-year monitoring
1 (tie)	Periodic regional or local (less than once a year but still regularly scheduled) monitoring
2	Occasional regional or local (less than once a year and not regularly scheduled) monitoring
3	Regional or local year-round monitoring
4	Occasional statewide (less than once a year and not regularly scheduled) monitoring
5 (tie)	Statewide year-round monitoring
5 (tie)	Statewide once-a-year monitoring

Respondents listed regional or local monitoring by state agencies for wildlife in wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat in Indiana (not ranked):

- IDNR Division of Fish and Wildlife
- Wabash system
- Tippecanoe River, Maumee system
- Periodic (usually annual) monitoring in the Tippecanoe River by IDNR
- Blue River (Harrison County), Sugar Creek (Shelby County), Indian Creek (Greene County)
- In early to mid 1990s, Division of Fish and Wildlife conducted fish community inventories on the major streams throughout the state
- IDEM Probabilistic sampling
- Eastern sand darters
  - 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
  - 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 five years
  - See IDEM OWQ's Surface Water Quality Monitoring Strategy and project work plans and IDNR Fisheries Section work plans

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- In early to mid 1990's the Division of Fish and Wildlife conducted a smallmouth bass inventory
- Smallmouth bass
  - Five streams 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
  - Game fish population estimates (including rock bass) have been conducted on five streams every other year from 1998 through 2004

Respondents listed regional or local monitoring by other organizations for wildlife in wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat in Indiana (not ranked):

- Wabash system
- Tippecanoe River, Maumee system
- West Fork White River & tributaries (Muncie area)
- Ball State University fish sampling
- Eastern sand darter: 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
- US Environmental Protection Agency
- USGS Water Resources Division
- Ohio River Valley Water Sanitation Commission
- Midwest Biodiversity Institute
- U.S. Army Corps of Engineers
- Muncie Bureau of Water Quality
- City of Elkhart Water Quality
- Universities
- Consulting firms

Respondents listed organizations that monitor wildlife in wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat in Indiana (not ranked):

- Consultants
- The Nature Conservancy
- U.S. Fish and Wildlife Service
- IDNR Division of Fish and Wildlife
- Muncie Bureau of Water Quality
- Soil and Water Conservation Districts
- Purdue University
- Wildcat Creek Watershed Alliance
- US Environmental Protection Agency
- USGS Water Resources Division
- Ohio River Valley Water Sanitation Commission
- Midwest Biodiversity Institute
- U.S. Army Corps of Engineers
- Muncie Bureau of Water Quality
- City of Elkhart Water Quality

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- Consulting firms

Respondents considered monitoring techniques for wildlife in wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat in Indiana:

Monitoring techniques for wildlife in this drainage habitat	Used	Not used but possible with existing technology and data	Not economically feasible
Radio telemetry and tracking	--	X	X
Modeling	X	X	--
Spot mapping	X	X	--
Driving a survey route	X	--	X
Reporting from harvest, depredation, or unintentional take (road kill, by-catch)	X	X	X
Mark and recapture	X	X	--
Professional survey/census	X	--	--
Volunteer survey/census	X	X	--
Trapping (by any technique)	--	X	X
Representative sites	X	X	--
Probabilistic sites	X	X	--

Respondents noted other monitoring techniques for wildlife in wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat in Indiana:

- Unintentional take could be monitored from fish kill cadaver counts if officers could be trained to identify northern hog suckers instead of not counting them, or just lumping them into the generic class of "round bodied suckers"

Technical experts and conservation organizations reviewed the above results and were asked if these were a reasonable representation of the monitoring techniques for wildlife in wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat. There were no responses.

### Habitat inventory and assessment

Respondents were aware of the following inventory and assessment efforts by state agencies for wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat in Indiana (not ranked):

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- Statewide annual inventory and assessment
- Statewide once-a-year inventory and assessment
- Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment
- Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment
- Regional or local year-round inventory and assessment
- Regional or local once-a-year inventory and assessment
- Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment
- Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment

Respondents were aware of the following inventory and assessment efforts by other organizations for wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat in Indiana (not ranked):

- Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment
- Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment
- Regional or local year-round inventory and assessment
- Regional or local once-a-year inventory and assessment
- Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment
- Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment

Respondents ranked inventory and assessment efforts by state agencies based on their importance for conservation of wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat in Indiana:

Rank	Inventory and assessment by state agencies for conservation of wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat
1	Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment
2 (tie)	Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment
2 (tie)	Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment
3	Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment
4	Regional or local once-a-year inventory and

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- assessment
- 5 Statewide once-a-year inventory and assessment
- 6 Statewide annual inventory and assessment
- 7 Regional or local year-round inventory and assessment

Respondents ranked inventory and assessment efforts by other organizations based on their importance for conservation of wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat in Indiana:

Rank	Inventory and assessment by other organizations for conservation of wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat
1	Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment
2	Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment
3	Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment
4	Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment
5	Statewide once-a-year inventory and assessment
6	Statewide annual inventory and assessment
7	Regional or local once-a-year inventory and assessment

Respondents listed regional or local inventory and assessment by state agencies for wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat in Indiana (not ranked):

- Wabash system
- Tippecanoe River and Maumee system (Usually species inventories are made, with relevant habitat information)
- Blue River (Harrison County), Sugar Creek (Shelby County), Indian Creek (Greene County)
- IDEM and IDNR (as well as other organizations) use the Qualitative Habitat Evaluation Index to document the habitat quality of the streams sampled for aquatic communities
- IDEM/OWQ/BSS
- IDNR/FWD/FS

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- ORSANCO;
- Blue River (Harrison County)

Respondents listed regional or local inventory and assessment by other organizations agencies for wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat in Indiana (not ranked):

- Wabash system
- Tippecanoe River and Maumee system
- Muncie BWQ – West Fork-White River and tributaries in the Muncie area

Respondents listed organizations that monitor the wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat in Indiana (not ranked):

- Consultants
- The Nature Conservancy
- U.S. Fish and Wildlife Service
- IDNR – Division of Fish and Wildlife
- Cities of Muncie
- City of Elkhart
- U.S. Geological Survey/WRD

Respondents considered inventory and assessment techniques for wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat in Indiana:

<b>Inventory and assessment techniques for wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage_habitat</b>	<b>Used</b>	<b>Not used but possible with existing technology and data</b>	<b>Not economically feasible</b>
GIS mapping	X	X	--
Aerial photography and analysis	X	X	--
Systematic sampling	X	--	--
Property tax estimates	--	--	X
State revenue data	--	--	X
Regulatory information	X	--	--
Participation in land use programs	X	X	--
Modeling	X	X	--
Voluntary landowner reporting	X	X	X

## Appendix F-17: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau Ecoregions Wadeable/Large River

Respondents listed additional inventory and assessment techniques for wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat in Indiana (not ranked):

- Water quality monitoring
- QHEI

Technical experts and conservation organizations reviewed the above results and were asked if these were a reasonable representation of the inventory and assessment techniques for wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat. There were no responses.

### **Recommended monitoring**

#### Species monitoring

Respondents recommended the following monitoring techniques for effective conservation of wildlife in wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat in Indiana (not ranked):

- Professional Survey
- Intensive quantitative sampling of known populations. Need to understand demography of the Clubshell (See Strayer & Smith, 2003. AFS Monogr. 8.)
- Less intensive qualitative sampling of new or not recently surveyed areas. Need to determine distribution and status of the Clubshell (See Strayer & Smith, 2003. AFS Monogr. 8.)
- State DNR or professional census at representative or probabilistic sites
  - Development of trained, select volunteer core to undertake surveys at probabilistic sites, particularly where some wildlife species should, or could occur and has not been documented in recent years
- Stream fish community surveys
- Rock bass population estimates
- Electrofishing surveys
  - From probabilistic and representative sites
  - Catch rate data
- Eastern sand darter: See where populations have been captured in the past and then with seines 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"
- Population estimates
- Angler creel surveys
- Smallmouth bass
  - 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
  - Smallmouth bass population estimates

Technical experts and conservation organizations reviewed the above results and were asked if these were a reasonable representation of the monitoring techniques for effective conservation of wildlife in wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat. There were no responses.

## Appendix F-17: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau Ecoregions Wadeable/Large River

### Habitat inventory and assessment

Respondents recommended the following inventory and assessment techniques for effective conservation of wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat in Indiana (not ranked):

- Systematic survey and GIS
  - More extensive use of GIS-modeled habitat probabilities
- Assess riparian corridor
- Water quality monitoring
- CREP, farmer incentives for no-till, riparian corridors, etc.
- Strictly control instream modifications: mining, snagging, etc.
- 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

Technical experts and conservation organizations reviewed the above results and were asked if these were a reasonable representation of the inventory and assessment techniques for effective conservation of wadeable large rivers of the interior plateau of the eastern corn belt Ohio River drainage habitat. There were no responses.