HEADWATERS IN EASTERN CORNBELT/INTERIOR PLATEAU ECOREGION OF 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. Headwater streams are those having a drainage area of < 20 mi^2. Many headwater streams of the Eastern Corn Belt ecoregion are constructed drainage ditches or channelized streams and are intermittent. 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 this drainage habitat in Indiana:

Rank	Threats to wildlife in this drainage habitat
1 (tie)	Habitat loss (breeding range)
1 (tie)	Habitat loss (feeding/foraging areas)
2 (tie)	Viable reproductive population size or availability
2 (tie)	Degradation of movement/migration routes (overwintering habitats, nesting and staging sites)
3	High sensitivity to pollution
4 (tie)	Dependence on irregular resources (cyclical annual variations) (e.g., food, water, habitat limited due to annual variations in availability)
4 (tie)	Bioaccumulation of contaminants
5	Specialized reproductive behavior or low reproductive rates
6	Dependence on other species (mutualism, pollinators)
7	Diseases/parasites (of the species itself)
8	Predators (native or domesticated)
9	Unintentional take/ direct mortality (e.g., vehicle collisions, power line collisions, by-catch, harvesting equipment, land preparation machinery)
10	Invasive/non-native species
11	Unregulated collection pressure
12	Genetic pollution (hybridization)
13 (tie)	Small native range (high endemism)
13 (tie)	Near limits of natural geographic range

14 Regulated hunting/fishing pressure (too much)

Respondents offered additional threats to wildlife in this drainage habitat in Indiana (not ranked):

- Orangethroat darter habitat threats
  - 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 include aquatic passage problems through culverts
  - Threats to species' watersheds include pollution, clearing of the riparian vegetation, creek gravel mining and channelization

Respondents listed top threats to wildlife in this drainage habitat in Indiana (not ranked):

- Habitat modifications
  - Dredging of headwater streams
  - Alterations of hydrology and land use changes
- Runoff
- Orangethroat darter threats
  - Migration threats: Aquatic passage problems through stream crossing structures
  - Threats to breeding habitat (high quality riffles)
    - Loss of riffle habitat results from water quality degradation and stream channel stability due to dredging, channelization, roads and clearing of riparian vegetation

Technical experts and conservation organizations reviewed the above results and were asked if these were a reasonable representation of the threats to wildlife in this drainage habitat. There were no responses.

Habitat threats

Respondents ranked threats to this drainage habitat in Indiana:

Rank	Threats to this drainage habitat
1 (tie)	Habitat degradation
1 (tie)	Stream channelization
1 (tie)	Drainage practices (stormwater runoff)
2 (tie)	Commercial or residential development (sprawl)
2 (tie)	Habitat fragmentation
3 (tie)	Nonpoint source pollution (sedimentation and nutrients)
3 (tie)	Agricultural/forestry practices
4 (tie)	Impoundment of water/flow regulation
4 (tie)	Point source pollution (continuing)
5 (tie)	Successional change

5 (tie)	Residual contamination (persistent toxins)
6 (tie)	Mining/acidification
6 (tie)	Counterproductive financial incentives or regulations
7	Diseases (of plants that create habitat)
8	Climate change

Respondents noted no additional threats to this drainage habitat in Indiana.

Respondents listed top threats to this drainage habitat in Indiana (not ranked):

- Pollution
  - Runoff
  - Nonpoint source pollution (sedimentation)
- Habitat degradation
  - Channelization
  - Destruction of clear shaded waters by forestry/agricultural practices or stream channelization

Technical experts and conservation organizations reviewed the above results and were asked if these were a reasonable representation of the threats to this drainage habitat. There were no responses.

Additional research and survey efforts

Current body of research

Species research

One third of respondents stated that the current body of science is adequate for wildlife in this drainage habitat in Indiana; two thirds said that it is inadequate.

Respondents identified the following citations (title, author, date, publisher) that would give the best overview of wildlife in these drainage habitats in Indiana.

Title = Occurrence and distribution of freshwater mussels in the small streams of Tippecanoe County, Indiana;
Author = Myers-Kinzie, M., S. Wente, & A. Spacie;
Date = 2001;
Publisher = Proc. Ind. Acad. Sci.

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

Title = Freshwater Mollusca of WI;
Author = Baker;
Date = 1919;
Publisher = WI Geol. Nat. Hist. Surv.

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 this drainage habitat. There were no responses.

Habitat research

All respondents stated that the current body of science is inadequate for this drainage habitat in Indiana.

Respondents identified the following citations (title, author, date, publisher) that would give the best overview of these drainage habitats in Indiana.

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

Title = Freshwater Molluscs of WI;
Author = Baker;
Date = 1928;
Publisher = WI Geol. Nat. Sci. Surv.

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 this drainage habitat. There were no responses.

Research needs

Species research

Respondents ranked research needs for wildlife in this drainage habitat in Indiana:

Rank	Research needs for wildlife in this drainage habitat
1 (tie)	Threats (predators/competition, contamination)
1 (tie)	Relationship/dependence on specific habitats
2	Limiting factors (food, shelter, water, breeding sites)
3	Life cycle
4	Distribution and abundance
5	Population health (genetic and physical)

A respondent noted other research needs for wildlife in this drainage habitat in Indiana:

- Habitat needs are not completely understood. I have seen fresh cylindrical papershell in channelized agricultural ditches. Other small streams with good habitat have only weathered, dead fragments

Appendix F-16: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau Ecoregions Headwater

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 this drainage habitat. There were no responses.

Habitat research

Respondents ranked research needs for this drainage habitat in Indiana:

Rank	Research needs for this drainage habitat
1 (tie)	Threats (land use change/competition, contamination/global warming)
1 (tie)	Relationship/dependence on specific site conditions
2	Growth and development of individual components of the habitat
3	Distribution and abundance (fragmentation)
4	Successional changes

A respondent noted additional research needs for this drainage habitat in Indiana:

- Effects of roads and steams crossings on some wildlife species. Is aquatic passage through culverts and other stream crossing structures adequate, or are these crossings causing aquatic habitat fragmentation?

Technical experts and conservation organizations reviewed the above results and were asked if these were a reasonable representation of the research needs for this drainage habitat. There were no responses.

Conservation actions necessary

Species actions

Respondents ranked conservation efforts by how well they address threats to wildlife in this drainage habitat in Indiana:

Rank	Conservation efforts for wildlife in this drainage habitat
1	Regulation of collecting
2 (tie)	Habitat protection
2 (tie)	Limiting contact with pollutants/contaminants
2 (tie)	Public education to reduce human disturbance
2 (tie)	Threats reduction

A respondent noted other current conservation practices for wildlife in this drainage habitat in Indiana:

- 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

Respondents recommended these practices for more effective conservation of wildlife in this drainage habitat in Indiana (not ranked):

- For all mussel species: Educate anglers that it is illegal to use mussels as fishing bait
- CREP and other incentives for BMPs
- Limit instream modifications (See Watters, 2000. Proc. 1st FMCS Symposium)
- Orange throat darter
    - Restore stream channels so that riffle habitats are enhanced or protected
    - Restore or enhance riparian vegetation to enhance or protect stream channels from runoff or impacts to the channel
    - Maintain roads and stream crossings so that stream channel function and aquatic passage are maintained
- Habitat protection

Technical experts and conservation organizations reviewed the above results and were asked if these were a reasonable representation of the effective conservation of wildlife in this drainage habitat. There were no responses.

Habitat actions

Respondents listed the following conservation efforts as “somewhat” addressing threats to this drainage habitat in Indiana:

- Habitat protection on public lands
- Habitat restoration on public lands
- Corridor development/protection
- Pollution reduction
- Protection of adjacent buffer zone
- Land use planning
- Technical assistance
- Habitat restoration incentives (financial)
- Habitat protection through regulation
- Habitat protection incentives (financial)
- Habitat restoration through regulation
- Managing water regimes
- Cooperative land management agreements (conservation easements)

Respondents listed no other conservation practices for this drainage habitat in Indiana.

Respondents recommended the following practices for more effective conservation of this drainage habitat in Indiana (not ranked):

- Treat small streams as biological resources and not just drainage ditches. At the very least, require that a mussel survey be done before dredging
- Promote riparian corridor
- Limit habitat modifications
- Streambank stabilization or stream restoration (reconstructing the channel to reconnect it to its natural floodplain elevation)
- 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

- Restore riparian vegetative communities through tree planting, etc.
- Habitat protection; protection of adjacent buffer zone

Technical experts and conservation organizations reviewed the above results and were asked if these were a reasonable representation of the practices for more effective conservation of this 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 this drainage habitat in Indiana (not ranked):

- 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 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 this 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 this drainage habitat in Indiana:

Rank	Monitoring efforts by state agencies for conservation of wildlife in this 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 (tie)	Periodic statewide (less than once a year but still regularly scheduled) monitoring
3 (tie)	Occasional statewide (less than once a year and not regularly scheduled) monitoring
4 (tie)	Statewide once-a-year monitoring
4 (tie)	Regional or local once-a-year monitoring
5	Regional or local year-round monitoring
6	Statewide year-round monitoring

Appendix F-16: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau Ecoregions Headwater

Respondents ranked monitoring efforts by other organizations based on their importance for conservation of wildlife in this drainage habitat in Indiana:

Rank	Monitoring efforts by other organizations for conservation of wildlife in this 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 (tie)	Statewide once-a-year monitoring
3 (tie)	Periodic statewide (less than once a year but still regularly scheduled) monitoring
3 (tie)	Occasional statewide (less than once a year and not regularly scheduled) monitoring
3 (tie)	Regional or local once-a-year monitoring
4 (tie)	Regional or local year-round monitoring
4 (tie)	Statewide year-round monitoring

Respondents listed regional or local monitoring by state agencies for wildlife in this drainage habitat in Indiana (not ranked):

- IDNR nongame biologist does mussel surveys. But, he is only one person and there are thousands of miles of streams in state
- Wabash system
- IDEM and the DNR Nongame program also conduct monitoring during the field season, once a year for fish. These above fish surveys are not specific to the orangethroat darter, but would include it
- IDEM monitors the health of major river basins every five years by looking at chemical, physical and biological data collected at random locations within the watershed. Southern redbelly dace have been captured in the Ohio River drainage habitat; however, specific monitoring for the species has not occurred to my knowledge by anyone state or other organization

Respondents listed regional or local monitoring by other organizations for wildlife in this drainage habitat in Indiana (not ranked):

- Commmonwealth Biomonitoring frequently does habitat evaluations in small streams as part of watershed studies. If I happen to see a shell, I make a note of it in field notes. These are not official mussel surveys
- Wabash system
- 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 cornbelt/interior plateau ecoregions. These above fish surveys are not specific to the orangethroat darter, but would include it

Respondents listed organizations that monitor wildlife in this drainage habitat in Indiana (not ranked):

- Consultants
- TNC (possibly)
- USDA Forest Service, Hoosier National Forest
- USDI Fish and Wildlife Service
- IDEM
- IDNR

A respondent noted, “Most mussel surveys are on bigger rivers. I was contacted by a college professor who was interested in taking a class to a small stream to learn about mussels. I discouraged him from doing so unless he followed DNR regulations concerning collectors' permits. I haven't heard any more from him.”

Respondents considered monitoring techniques for wildlife in this 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
Modeling	--	X	--
Spot mapping	X	--	--
Reporting from harvest, depredation, or unintentional take (road kill, by-catch)	--	--	X
Mark and recapture	X	--	--
Professional survey/census	X	--	--
Volunteer survey/census	X	--	--
Representative sites	X	--	--
Probabilistic sites	X	X	--

A respondent noted other monitoring techniques for wildlife in this drainage habitat in Indiana:

- Electrofishing and seining are appropriate methods for monitoring the orangethroat darter

Technical experts and conservation organizations reviewed the above results and were asked if these were a reasonable representation of the monitoring efforts of wildlife in this drainage habitat. There were no responses.

Habitat inventory and assessment

Respondents were aware of the following inventory and assessment efforts by state agencies for this drainage habitat in Indiana (not ranked):

- Occasional statewide (less than once a year and not regularly scheduled) 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 this drainage habitat in Indiana (not ranked):

- 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 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 this drainage habitat in Indiana:

Rank	Inventory and assessment by state agencies for conservation of this drainage habitat
1	Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment
2	Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment
3	Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment
4	Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment
5 (tie)	Statewide once-a-year inventory and assessment
5 (tie)	Regional or local once-a-year inventory and assessment
6 (tie)	Statewide annual inventory and assessment
6 (tie)	Regional or local year-round inventory and assessment

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Respondents ranked inventory and assessment efforts by other organizations based on their importance for conservation of this drainage habitat in Indiana:

Rank	Inventory and assessment by other organizations for conservation of this drainage habitat
1	Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment
2	Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment
3 (tie)	Regional or local once-a-year inventory and assessment
3 (tie)	Statewide once-a-year inventory and assessment
3 (tie)	Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment
3 (tie)	Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment
4 (tie)	Regional or local year-round inventory and assessment
4 (tie)	Statewide annual inventory and assessment

A respondent listed regional or local inventory and assessment by state agencies for this drainage habitat in Indiana:

- Wabash system

Respondents listed regional or local inventory and assessment by other organizations agencies for this drainage habitat in Indiana (not ranked):

- Commonwealth Biomonitoring does habitat evaluations on small streams as part of watershed studies. These evaluations are not specific to mussels, but are Ohio EPA QHEI methods
- Wabash system
- Two or more 5th level HUC watersheds a year that encompass the Hoosier National Forest are sampled; a random sampling of streams found within these 5th level HUCs occurs

Respondents listed organizations that monitor this drainage habitat in Indiana (not ranked):

- Consultants
- TNC (possibly)
- IDEM
    - Qualitative Habitat Evaluations completed at sites where southern redbelly dace may have been captured as part of the fish community sampling program

- IDNR
- USDA Forest Service
- USDI Fish and Wildlife Service

Respondents considered inventory and assessment techniques for this drainage habitat in Indiana:

Inventory and assessment techniques for this drainage habitat	Used	Not used but possible with existing technology and data	Not economically feasible
GIS mapping	X	X	--
Aerial photography and analysis	--	--	X
Systematic sampling	X	--	--
Participation in land use programs	X	X	--
Modeling	X	X	--
Voluntary landowner reporting	X	--	X

A respondent listed additional inventory and assessment techniques for this drainage habitat in Indiana:

- 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

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 this drainage habitat. There were no responses.

Recommended monitoring

Species monitoring

Respondents recommended the following monitoring techniques for effective conservation of wildlife in this drainage habitat in Indiana (not ranked):

- Intensive quantitative sampling of known populations (Need to understand demography of species. See Strayer & Smith, 2003. AFS Monogram 8)
- Less intensive qualitative sampling of new or not recently surveyed areas. Need to determine distribution and status of species. (See above for protocols.)
- Electrofishing 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 riffle habitats

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 this drainage habitat. There were no responses.

Habitat inventory and assessment

Respondents recommended the following inventory and assessment techniques for effective conservation of this drainage habitat in Indiana (not ranked):

- Assess riparian corridor presence
- Water quality
- Two protocols that I recommend for reference include the following:
    - 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 substrate available within riffle habitats, which are the preferred habitat of the orangethroat darter)
    - 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 useful for developing a watershed level sampling design and includes useful methods for measuring stream channel and stream habitat parameters.)
- Qualitative Habitat Evaluation Index (QHEI) developed by the Ohio EPA is a useful qualitative field method that can help prioritize sites within a watershed for stream habitat or water quality improvement

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 this drainage habitat. There were no responses.