MICHIGAN 2015 - 2025

WARMWATER STREAMS & THEIR HEADWATERS

Wildlife Action Plan

Today's Priorities, Tomorrow's Wildlife

WHAT ARE WARMWATER STREAMS & THEIR HEADWATERS?

In this plan, Warmwater Streams are small to medium-sized streams with watersheds less than 300 square miles and average July water temperatures greater than 70°F. Headwater tributaries flowing into Warmwater Streams provide critical habitat for many aquatic species and are therefore included in this plan. Headwaters in these systems generally begin in hilly, coarse-textured morainal areas, are influenced by groundwater inputs, and tend to have cool temperatures and relatively stable flows. Headwaters transition into Warmwater Streams as they move downslope across finer glacial tills and lake plains where they gain a larger proportion of water from surface runoff and become wider. Warmwater Streams and their Headwaters are found primarily in the southern portion of Michigan's Lower Peninsula with a few occurring in the western portion of the Upper Peninsula.

Southern Redbelly Dace

Redside Dace

Smallmouth Bass

North American River Otter

PLAN CONTRIBUTORS

Central Michigan University

Huron River Watershed Council

Michigan Department of Environmental Quality

Michigan Department of Natural Resources

Michigan State University

The Nature Conservancy

Beaver

Riverine Clubtail **Dragonfly**

Rayed Bean

Rock Bass

WHAT USES WARMWATER STREAMS & THEIR HEADWATERS?

WHY ARE WARMWATER STREAMS & THEIR HEADWATERS IMPORTANT?

Warmwater Streams and their Headwaters are important features on the landscape providing aquatic habitat not only for popular gamefish such as Smallmouth Bass and Channel Catfish, but also for Michigan's unique non-game fishes, amphibians, aquatic insects, mussels, snails, and crayfish. These small streams wind through public and private lands throughout the state, providing places for exploration and recreation for young and old alike. The riparian zones adjacent to Warmwater Streams and their Headwaters provide important habitats and migration corridors used by most terrestrial wildlife during some part of their life cycle. Healthy and intact Warmwater Streams and their Headwaters also provide significant ecosystem services such as sediment retention, groundwater recharge, transformation and storage of nutrients, and natural flood control. Headwaters and small streams can account for up to 80% of a river's drainage network and collectively determine the health and recreational potential of downstream rivers and lakes.

WHAT IS THE HEALTH OF WARMWATER STREAMS & THEIR HEADWATERS?

Although warmwater streams and their headwaters are relatively common landscape features, very few remain fully intact. Early in Michigan's development, many of these streams were dredged and channelized to promote drainage as lands were cleared and converted to agricultural and urban land uses. Tiling of agricultural fields for drainage and increased impervious surfaces associated with urban development have increased runoff and delivery of pollutants. Dams were constructed on many stream reaches to provide power for mills and manufacturing facilities, and today, connectivity is severely limited by high levels of fragmentation (Cooper et al. in preparation). In irrigated agricultural landscapes, streams are vulnerable to depletion from large-quantity water withdrawals. Together, these human activities have degraded warmwater streams and their headwaters by homogenizing stream channels, altering flow and temperature regimes, increasing erosion and sediment inputs, blocking migration pathways, and degrading water quality. Currently, approximately 45% of Warmwater Streams and their Headwaters suffer from moderate to severe levels of landscape disturbance from agricultural and urban land use (Cooper et al. in preparation).

GOALS

- Improve degraded Warmwater Streams and Headwater habitats to maintain current populations of focal species.

> "Siltation of gravel spawning sites and the elimination of food organisms probably have been the major reasons causing the local extinction of the Bigeye Chub, the Western Creek Chubsucker, the Ironcolor Shiner, the Weed Shiner, the Southern Redbelly Dace, the Redside Dace, the River Darter, and possibly the Channel Darter. Industrial and municipal pollution also harmed these species, as well as the River Redhorse, Northern Madtom, and Silver Shiner."
>
> (Smith 1994)

Pipes in Streams

Large quantity water withdrawals from small streams and headwaters can deplete flows, disrupt natural sediment transport, and reduce or eliminate available downstream habitats.

WHAT ARE THE WARMWATER STREAMS & THEIR HEADWATERS FOCAL SPECIES?

Where we are now and what we think we can realistically achieve over the next 10 years.

Orangethroat Darter
(Etheostoma spectabile)
Special Concern

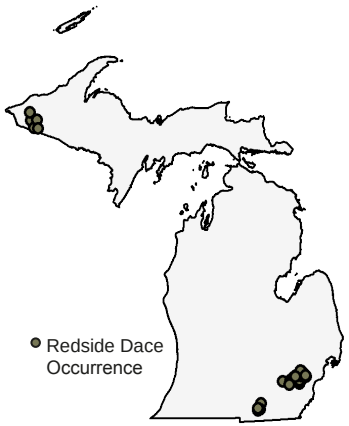
The Orangethroat Darter is a small fish in the Perch family. The brightly colored males have an orange throat and belly, orange and blue on the body and fins, and 5 to 7 dark vertical bars on their sides. This species is adapted to life on the stream bottom and relies on shallow gravel riffles in the headwaters of creeks and small rivers. The Orangethroat Darter has undergone serious declines and is limited in distribution to three watersheds in southeast Michigan.

GOALS

- Complete an inventory of known historical sites and refine species distribution.

Redside Dace
(Clinostomus elongatus)
State Endangered

The Redside Dace is an elongated minnow with a dark crimson band on its side and a prominent lower jaw that extends beyond the upper jaw. These small fish eat insects, and their large mouths enable them to catch flying and terrestrial insects by leaping out of the water (Goforth 2000). They rely on clear pool habitats in headwater streams of moderate gradient with abundant coarse woody habitat. When spawning, males establish territories in gravel riffles which they actively defend. Redside Dace are now limited to three native populations in Southeast Michigan and one introduced population in the Western Upper Peninsula (Latta 2005).



GOALS
- Maintain existing native populations.
- Determine the factors that limit Redside Dace populations.

GOALS
- Maintain existing populations.
- Determine the factors that limit Southern Redbelly Dace populations

Southern Redbelly Dace
(Chrosomus erythrogaster)
State Endangered

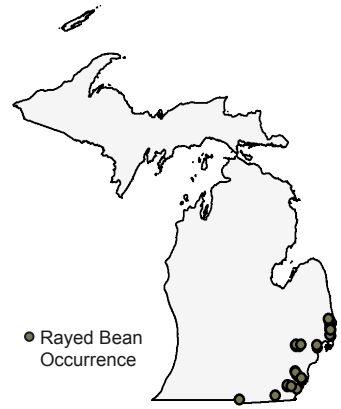
The Southern Redbelly Dace is a small-bodied minnow with red or yellow sides and two dark, lateral stripes. This species is only found in clear, cool, shaded headwater streams with overhanging vegetation and undercut banks (Trautman 1981). They feed primarily on filamentous algae and detritus. When spawning, two males and a female can often be seen using nests built by other shiners in gravel substrate (Stagliano 2001). This species was previously known from 10 locations in southeastern Michigan and has declined to three or fewer populations.

Silver Shiner
(Notropis photogenis)
State Endangered

The Silver Shiner is an elongate, mercury-colored minnow with a clearly defined dark or reddish stripe along the middle of its back. The snout is long, and two black crescents are present between the nostrils. They feed primarily on insects, and have been reported leaping out of the water to capture flying insects (Trautman 1981). This species is most abundant in streams of moderate to high gradient with abundant swift riffles and deep pools with clean gravel, cobble, and boulders. The Silver Shiner is known from only two watersheds in southeast Michigan and is critically imperiled.

GOALS

- Establish baseline status and distribution.
- Complete Rayed Bean recovery plan.
- Maintain existing populations.



Rayed Bean
(Villosa fabalis)
Federal and State Endangered

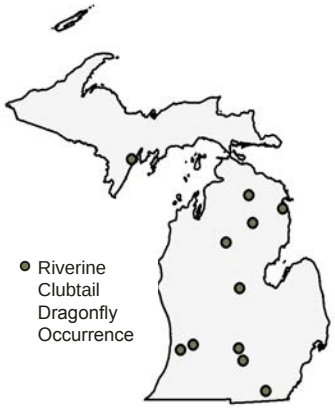
This small mussel is light to dark green with numerous wavy, dark green rays on its shell. Adult Rayed Beans are usually less than 1.5 inches in length and are somewhat elliptical in shape. The Rayed Bean is found buried in the gravel or sand substrates of small streams associated with the faster flowing riffles and runs. This species was historically more widespread but is now limited to five watersheds in southeastern Michigan. Three of these populations are small and their long-term viability is in question (USFWS 2012).

GOALS

- Maintain existing populations.
- Determine the factors that currently limit Silver Shiner populations.

Riverine Clubtail Dragonfly
(Stylurus amnicola)
Special Concern

The Riverine Clubtail is approximately two inches in length. Its midsection is marked with a yellow triangle on top between two yellow stripes, and its head is mottled with dark green eyes (Gehring 2006). The nymph of this dragonfly relies on medium-sized streams and rivers with clear water, moderate currents, and sand-gravel substrates. Members of this group of dragonflies are referred to as “hanging clubtails” for their habit of hanging vertically when perched on streamside vegetation (COSEWIC 2012). The Riverine Clubtail dragonfly has been collected from 11 locations in Michigan.



GOALS
- Establish baseline status and distribution.
- Maintain existing populations.

GOALS
- Protect and maintain existing populations. [CS]

Northern Clubshell
(Pleurobema clava)
Federal and State Endangered

The Northern Clubshell is a freshwater mussel with triangular-shaped shells that are tan to yellowish brown and covered with interrupted broad, green rays. The Northern Clubshell is found in small to medium warmwater streams with sand and gravel substrates, and in Michigan, it is only found in the St. Joseph River (Maumee drainage) in southern Hillsdale County.

HOW VULNERABLE ARE FOCAL SPECIES TO CLIMATE CHANGE?

Cooper et al. (in preparation) and Hoving et al. (2013) determined climate vulnerabilities for focal species. See threats section for more specifics about how climate change may affect species and habitats.

Climate vulnerability rankings are based on the likelihood and amount of change in species abundance or range by 2050 - stable = likely to remain unchanged.

	Climate Vulnerability
Orangethroat Darter	Stable
Redside Dace	Stable
Silver Shiner	Stable
Southern Redbelly Dace	Stable
Rayed Bean	Stable
Riverine Clubtail	Stable
Northern Clubshell	Stable

WHAT ARE THE CONSERVATION THREATS & ACTIONS?

Major threats that need to be addressed and key actions that need to be implemented over the next 10 years.

THREATS to Habitat

Natural Systems Modifications

- Increases in stream temperatures, nutrient loadings, and sediment inputs from removal of riparian vegetation (Sweeney et al. 2004).
- Altered hydrology and increases in sediment and nutrient loading due to increases in impervious surfaces (Stanfield and Kilgour 2006).
- Significant reductions of the amount of water in outlet channels when lake levels are mandated, especially during droughts (O'Neal and Soulliere 2006).
- Reductions in stream flow due to surface water and groundwater extraction (Hamilton and Seelbach 2011).

Agriculture & Aquaculture

- Increases in high flows and decreases in low flows, altering the natural hydrologic processes, when agricultural lands are drained through stream channelization and field tiling (Infante et al. 2006).
- Altered hydrology and reductions in habitat complexity after dredging for drain maintenance (Infante et al. 2006).

Transportation & Service Corridors

- Altered water flows, sediment transport changes, and fragmentation caused by road and pipeline crossings (Francis and Haas 2006).

Pollution

- Increases in nutrient loadings from manure runoff from feedlots (COSEWIC 2011).
- Increases in sediment loading and substrate embeddedness from farm field runoff (Waters 1995; Talmage et al. 2002).
- Increased inputs of salt and other pollutants from road crossings (Hanshue and Harrington 2016).
- Changes in thermal regimes from runoff and loss of riparian vegetation (Wehrly et al. 2006).

Climate Change

- Precipitation is very likely to become more extreme and less consistent due to climate change, which could lead to increases in peak flows and lower base flows (Pryor et al. 2014).

Conservation ACTIONS for Habitat

Land & Water Management

H1. Implement key management options identified in Michigan Department of Natural Resources river assessment plans (e.g., Black, Clinton, Grand, Huron, Kalamazoo, Raisin, and Rouge Rivers).
[BRA; CRA; GRA; HRA; KRA; RRA; RgRA]

H2. Assist landowners with obtaining alternative water supplies through Natural Resources Conservation Service (NRCS) and Farm Bill programs to limit large-quantity, direct water withdrawals from streams supporting focal species.

H3. Protect and manage habitat at existing sites supporting focal species. [CS]

H4. Implement the Michigan Aquatic Invasive Species State Management Plan. [AIS]

Raising Awareness

H5. Promote enrollment and certification of farms in the Michigan Agriculture Environmental Assurance Program (MAEAP).

H6. Work with Natural Resources Conservation Service, conservation districts, drain commissioners, private landowner programs, and crop consultants to increase awareness of the Wildlife Action Plan and the conservation benefits of implementing best management practices. [HUR 2.3, 4.1; CRA; RRA]

H7. Provide recreational users, researchers and industry with best management practices for stopping the introduction and spread of invasive species. [AIS]

Conservation Designation & Planning

H8. Work with the Michigan Department of Environmental Quality to develop storm water management plans in priority watersheds. [CRA; RRA; RgRA]

H9. Work with Natural Resources Conservation Service and conservation districts to target Farm Bill programs toward conserving focal species habitats, and to focus conservation efforts on infiltration and groundwater recharge zones.

H10. Use the results of the Western Lake Erie Basin Conservation Effects Assessment Project (CEAP) to identify and target priority agricultural lands to reduce edge-of-field waterborne losses of sediments, nutrients, and pesticides (lakeerieceap.com/).

H11. Work with the Michigan Department of Transportation, county and municipal road commissions, and Michigan Department of Environmental Quality to inventory road stream crossings to identify priority sites to reduce sediment inputs, and to ensure that best management practices are used during maintenance, repair, and installation of culverts and bridges. [CRA; RgRA]

H12. Integrate Wildlife Action Plan priorities with local watershed management plans. [CS]

Law & Policy

H13. Continue to administer an effective Michigan Department of Environmental Quality protection program for wetlands, lakes, and streams, and provide incentives for conservation practices.

H14. Take appropriate enforcement actions for violations of the Invasive Species Order, and maintain the Prohibited and Restricted Species list pursuant to the Natural Resources and Environmental Protection Act, 451 of 1994, as amended. [AIS]

Research & Monitoring

H15. Determine the feasibility of using two-stage channel design to protect focal species habitat.

H16. Refine species maps, habitat suitability models, and priority maps based on field data, updated GIS layers, and updated downscaled climate projections (Cooper et al. in preparation; Wehrly et al. in preparation; Yeh et al. in preparation).

H17. Develop and implement targeted habitat surveys.



THREATS to All Focal Species

Lack of Knowledge

- Lack of information on Silver Shiner life history, habitat preferences, and spawning behavior (Carmen 2001a).
- Lack of information on general life history needs and fish hosts for Rayed Bean (Carmen 2001b).
- Lack of information on distribution, relative abundance, and specific habitat needs for Riverine Clubtail (Gehring 2006).

Invasive & Other Problematic Species, Genes & Diseases

- Nonnative fish species prey upon or compete with focal species (Morris and Burridge 2006; COSEWIC 2007; COSEWIC 2011; COSEWIC 2012).

Natural Systems Modifications

- Focal species are naturally discontinuously distributed across the landscape, and any modifications (natural or man-made) can create isolated populations and localized extirpations (Goforth 2000; Stagliano 2001).

Transportation & Service Corridors

- Dams limit movement of species and can isolate populations (Aadland 2010).




Conservation ACTIONS for All Focal Species

Conservation Designation & Planning

S1. Develop state conservation strategies for focal species.

Law & Policy

S2. Protect focal species and their habitats through the environmental permit review process. [CS]

Research & Monitoring

S3. Determine biotic and abiotic characteristics associated with focal species to better understand habitat needs. [CS]

S4. Determine how barriers affect focal species populations, and prioritize barrier removals within key watersheds, with consideration of invasive species. [RgRA]

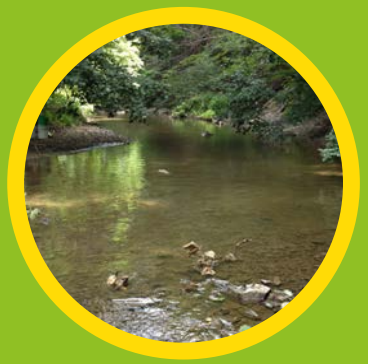
S5. Work with watershed groups and other citizen science efforts to survey for Riverine Clubtail to better assess distribution.

S6. Determine gravidity, life stage timelines, and propagation techniques for Rayed Bean. [CRA]

S7. Develop a standardized data repository for fish and mussels that is accessible to partners for conservation.

HOW WILL WE MONITOR?

Assessing status and measuring progress towards goals.



HABITAT

- Continue Michigan Department of Environmental Quality macroinvertebrate, aquatic habitat and water quality monitoring.
- Continue U.S. Geological Survey stream flow and water quality monitoring in Warmwater Streams and their Headwaters.

ORANGETHROAT DARTER

- Conduct targeted surveys at known and potential sites regularly. Use Michigan Department of Natural Resources habitat suitability models to help focus sampling.
- Continue to update element occurrences in the state's Natural Heritage Database.

REDSIDE DACE

- Conduct targeted surveys at known and potential sites regularly. Use Michigan Department of Natural Resources habitat suitability models to help focus sampling.
- Continue to update element occurrences in the state's Natural Heritage Database.

SOUTHERN REDBELLY DACE

- Conduct targeted surveys at known and potential sites regularly. Use Michigan Department of Natural Resources habitat suitability models to help focus sampling.
- Continue to update element occurrences in the state's Natural Heritage Database.

SILVER SHINER

- Conduct targeted surveys at known and potential sites regularly. Use Michigan Department of Natural Resources habitat suitability models to help focus sampling.
- Continue to update element occurrences in the state's Natural Heritage Database.

RAYED BEAN

- Conduct targeted surveys regularly using standard mussel survey protocol (Strayer and Smith 2003) to determine distribution, relative abundance, and trends.
- Continue to update element occurrences in the state's Natural Heritage Database.

RIVERINE CLUBTAIL

- Conduct targeted dragonfly surveys at known and potential sites regularly.
- Continue to update element occurrences in the state's Natural Heritage Database.

NORTHERN CLUBSHELL

- Conduct targeted surveys regularly using standard mussel survey protocol (Strayer and Smith 2003) to determine distribution, relative abundance, and trends. [CS]
- Continue to update element occurrences in the state's Natural Heritage Database.

WHERE ARE THERE PLACES FOR PARTNERSHIP?

This map was designed by partners to help them connect around important places for focal species. Working together on conservation actions on a voluntary basis provides great benefits to wildlife and people.

Conservation Priority

- High
- Moderate

This map is based on suitability for focal species, vulnerability to climate change, and amount of landscape disturbance in watersheds.

HOW DOES THIS PLAN LINK WITH OTHER CONSERVATION PLANS?

There has been a multitude of relevant planning efforts across the state and country over the past ten years. Bracketed superscripts throughout the Wildlife Action Plan indicate where the conservation action, goal, or monitoring strategy aligns with those from another plan. For conservation plans with distinct objectives, the objective or strategy number is also included. This linking of plans is meant to facilitate the expansion of partnerships.

[AIS] Michigan's aquatic invasive species state management plan 2013 Update (MDEQ et al. 2013)

[BRA] Black River assessment (Haas 2009)

[CC] National fish, wildlife and plants climate adaptation strategy (National Fish, Wildlife and Plants Climate Adaptation Partnership 2012)

[CS] Clubshell (*Pleurobema clava*) and Northern Riffleshell (*Epioblasma torulosa rangiana*) recovery plan (USFWS 1994)

[CRA] Clinton River assessment (Francis and Haas 2006)

[GRA] Grand River assessment (Hanshue and Harrington 2016)

[HRA] Huron River assessment (Hay-Chmielewski et al. 1997)

[KRA] Kalamazoo River assessment (Wesley 2005)

[RgRA] Rouge River assessment (Beam and Braunscheidel 1998)

[RRA] River Raisin assessment (Dodge 1998)

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Photo Credits

Southern Redbelly Dace & Redside Dace - Bob Muller

Riverine Clubtail Dragonfly - John C. Abbott/Abbott Nature Photography

Rayed Bean - D. Woolnough, Central Michigan University

Northern Clubshell – U.S. Fish and Wildlife Service

Smallmouth Bass - U.S. Fish and Wildlife Service

River Otter - U.S.Fish and Wildlife Service, Kenny Bahr

American Beaver - Steve Hersey

Rock Bass - Joseph Tomelleri

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ABOUT THE WILDLIFE ACTION PLAN

Today's Priorities, Tomorrow's Wildlife

Every state has a Wildlife Action Plan, which taken together create a national conservation strategy for safeguarding wildlife and their habitats for current and future generations. Each state's action plan is uniquely designed to serve the needs of that state. These plans provide a framework for proactive conservation and management of fish and wildlife before they become imperiled, which is more straightforward, cost-efficient, and effective.

Michigan's Wildlife Action Plan was developed by conservation partners across the state. It provides information about those species in greatest conservation need. The plan is organized by chapters or mini-plans. Each mini-plan outlines priorities for the next 10 years. The mini-plans detail priority habitats and focal species of greatest conservation need, status of species and habitats, critical threats, needed conservation actions, places for partnerships, monitoring needs, and goals. This is one of 15 mini-plans. For more information about how the plan was built and to read other mini-plans, please visit: www.michigan.gov/dnrwildlifeactionplan.