

DATE: November 17, 2022

TO: Sarah Luck, Limit Calculator; Caitlin O'Connell, Compliance Engineer

FROM: Camille Bruhn, Water Quality Biologist, South Central Region; Kristi Minahan, Water Quality Standards Specialist; Diane Figiel, Limits Coordinator

SUBJECT: Glass Hollow Creek (WBIC 966400) Stream Classification, Bagley WWTF Visit Summary

### **Overview of issue**

A site visit was conducted on June 20 and 21, 2022, to determine the stream classification of Glass Hollow Creek (WBIC 966400) where the Bagley Wastewater Treatment Facility (WWTF) discharges. The permit is set to expire March 31, 2023, and the stream classification needed to be assessed before the next permit issuance. Previous permit limits were based on limited aquatic life (LAL) for its receiving water, Glass Hollow Creek, and on downstream protection of the Mississippi River for phosphorus. However, Glass Hollow Creek is not in ch. NR 104 as an LAL or limited forage fish (LFF) water. We were asked to assess the fish and habitat within Glass Hollow Creek. The facility discharges through a pipe south under a field to Glass Hollow Creek, which then runs .57 miles to a backwater of the Mississippi River, known as Ferry Lake (but which is not a lake under our definitions). Bagley is a small facility and low-flow discharger. The design flow is 0.024 MGD, but the actual annual average discharge is 0.021 MGD (.04 cfs).

### **Summary of recommendations**

- Segment 1: Glass Hollow Creek, upstream of outfall (From 5m upstream of the Bagley WWTF outfall to ~340m upstream)
  - Codified designated use: Glass Hollow Creek is not in ch. NR 104 as an LAL or LFF, so it would default to a warmwater stream.
  - Classification used for previous permit issuance: LAL
  - Previous stream class recommendations: In 2003 it was proposed for listing as LAL, but we could not find documentation as to why this was recommended.
  - Modeled Natural Community: Coldwater
  - New recommended Natural Community and Designated Use (including whether LAL/LFF may be appropriate): Verified natural community is warm headwater and the current appropriate designated use is warmwater forage fish. LAL would not be an appropriate classification since there is a fish community present, along with flows sufficient to support a fish community. However, insufficient habitat may be a basis for conducting a use attainability analysis (UAA) in the future to change the codified use to LFF. See the discussion section for more information.
- Segment 2: Glass Hollow Creek, downstream of outfall (From ~300m downstream of the Bagley WWTF outfall to where the outfall enters Glass Hollow Creek)
  - All the same summary information for Segment 1 above applies to Segment 2 as well.
- Segment 3: Backwater to Mississippi River (known as Ferry Lake):
  - Glass Hollow Creek flows into Ferry Lake, which is a backwater of the Mississippi River. It is not classified as a lake based on our lake category definitions. This backwater has a warmwater sport fish designated use.

### Site observations

- Segment 1 (From 5m upstream of the Bagley WWTF outfall to ~340m upstream). A beaver dam was being formed just upstream of the WWTF outfall (photo 2). The survey segment extends from 5m upstream of the Bagley WWTF outfall (#2, green dot on map) upstream about 340m (#1, red dot on map). This section had a “U-shaped” channel, and the bottom substrate was composed of sediment and detritus. This segment was very similar to Segment 2, although this segment was shallower, with an average depth of 0.4m. Fish habitat was limited to some overhanging vegetation and a little woody debris. The whole stream surface was covered with planktonic algae, which can be seen in photos 3 and 5.
- Segment 2 (From ~300m downstream of the Bagley WWTF outfall to where the outfall enters Glass Hollow Creek). The survey segment extends from about 300m downstream of the WWTF outfall (#3, blue dot on map) upstream to where the Bagley WWTF enters Glass Hollow Creek (#2, green dot on map). This section also had a “U-shaped” channel, and the bottom substrate was sediment and detritus. This survey segment was deeper, with an average depth just over 1m. Similar to the upstream segment, habitat was rare with limited overhanging vegetation and woody debris. The stream surface was also covered with planktonic algae. A very large beaver dam was present at the start of the station (~300m downstream from the WWTF outfall). This beaver dam caused a break in the stream flow and thus the water above the beaver dam was disconnected from the downstream water (see photos 3 and 4).

### Site overview map



### **Fish survey results**

- Segment 1 (From 5m upstream of the Bagley WWTF outfall to ~340m upstream): The following fish were found upstream of the Bagley WWTF: black bullhead, fathead minnow, green sunfish, pumpkinseed (see attached data tables). The modeled natural community was coldwater, but no coldwater species were found in this survey. The natural community more closely resembles a warm headwater. The fish community was composed primarily of tolerant fish species and exceeds the tolerance test. The stream is backed up by two beaver dams (one ~300m downstream of the WWTF outfall and one just upstream of the WWTF outfall) and flows into the Mississippi River. Dissolved oxygen (DO) and temperature may be limiting factors for the fish that can inhabit this stream due to the beaver dam and the connection to the Mississippi. Therefore, a large number of tolerant species would be expected and, using best professional judgement, the fish community adequately represents the current conditions of the stream and that a warm headwater natural community is appropriate. The IBI score (warmwater IBI score central south near lake river corrected) was -5 (very poor).
- Segment 2 (From ~300m downstream of the Bagley WWTF outfall to where the outfall enters Glass Hollow Creek): The following fish were found downstream of the Bagley WWTF: black bullhead, bluegill, fathead minnow, green sunfish, Mississippi silvery minnow, pumpkinseed, pumpkinseed x bluegill, white sucker (see attached data tables). The modeled natural community was coldwater, but no coldwater species were found in this survey. The natural community more closely resembles a warm headwater. Like the upstream survey, the fish community was composed primarily of tolerant fish species and exceeds the tolerance test. The stream is backed up by another beaver dam and flows into the Mississippi River. DO and temperature may be limiting factors for the fish that can inhabit this stream due to the beaver dam and the connection to the Mississippi. Therefore, a large number of tolerant species would be expected and, using best professional judgement, the fish community adequately represents the current conditions of the stream and that a warm headwater natural community is also appropriate for this survey stretch. The IBI score (warmwater IBI score central south near lake river corrected) was 0 (very poor).

### **Habitat survey results**

- Segment 1 (From 5m upstream of the Bagley WWTF outfall to ~340m upstream): A qualitative habitat survey was performed upstream of the Bagley WWTF. The habitat score was 20, with a rating of poor (see attached data tables). The upstream section of the stream had much of the same habitat features as the downstream section: a “U-shaped” channel with lots of sediment, no pool or riffle areas, and limited fish cover. The only difference between this section and the downstream section was the average depth (0.4m in this segment compared to just over 1m in segment 2). The measured flow was 0.035cms, which is low, but is still sufficient to support fish (above 0.03cfs (~0.00085cms), which is the cutoff for a Macroinvertebrate community). The facility’s actual annual average discharge is .04 cfs, contributing flow to the stream.
- Segment 2 (From ~300m downstream of the Bagley WWTF outfall to where the outfall enters Glass Hollow Creek): Both a quantitative and qualitative habitat survey was performed downstream of the Bagley WWTF. The overall qualitative and quantitative habitat scores were 25, which is fair on the rating scale (see attached data tables). The stream was a “U-shaped” channel with lots of sediment, no pool or riffle areas, and limited fish cover. The flow in the downstream portion was 0.055cms, which is also sufficient to support fish.

## Discussion

*Note: Recommendations from this site visit are shown at the top of this memo.*

The Bagley Wastewater Treatment Facility discharges to Glass Hollow Creek. Water consistently flows in Glass Hollow Creek and the annual average Bagley WWTF discharge is .021 MGD. Fish and qualitative habitat surveys were conducted upstream of the Bagley WWTF, and fish and both quantitative and qualitative habitat surveys were conducted downstream of the Bagley WWTF (see attached data tables). The fish IBI scores for both surveys were very poor. This stream can and does support a fish community, although it is a tolerant fish community due to very turbid, slow moving water with little fish habitat available. Beaver dams present in the stream and the connection to the Mississippi River are also impacting the current conditions. The habitat score upstream of the WWTF was poor and the scores downstream of the WWTF were fair. The entire stream reach assessed was one large run with extensive sedimentation present.

The verified natural community is warm headwater, and the current appropriate designated use is warmwater forage fish, given that a warmwater community is present and the stream is not listed in ch. NR 104 as LAL or LFF. Limited aquatic life (LAL), which previous permit limits were based on, would not be an appropriate classification since there is a fish community present, along with flows sufficient to support a fish community. However, insufficient habitat may be a basis for conducting a use attainability analysis (UAA) in the future to change the codified use to limited forage fish (LFF). In the department's draft UAA guidance, a stream may be eligible for LFF if it has a tolerant community and it has insufficient habitat to support a higher-quality community, as demonstrated with a qualitative habitat score less than 30. Both the upstream and downstream segments of Glass Hollow Creek had habitat scores of <30 (20 and 25, respectively). The department does not have plans at this time to conduct waterbody UAAs, as the department may be revising its designated use structure in the future, which would require a code revision. Even if the creek were classified as LFF, LFF receives the same phosphorus criteria as warmwater, so the facility would still need to meet warmwater phosphorus criteria for the creek.

## Photos



**Photo 2: 2 on map, small  
beaver dam just upstream of  
the Bagley WWTF outfall**



**Photo 3: 3 on map- beaver dam that  
is completely blocking water from  
freely flowing downstream**



**Photo 4: 3 on map- bottom of beaver dam that is completely blocking flow downstream to the Mississippi River**



**Photo 5: Visual appearance of Glass Hollow Creek, looking upstream from 3 on map**



Data Tables, June 20 & 21, 2022

<b>FISH DATA</b>	<b>Glass Hollow Creek From 5m US of the Bagley WWTF outfall to ~340m upstream</b>	<b>Glass Hollow Creek From ~300m DS of the Bagley WWTF outfall to where the outfall enters Glass Hollow Creek</b>
	<b>06/20/2022</b>	<b>06/20/2022</b>
<i>BLACK BULLHEAD</i>	5	16
<i>BLUEGILL</i>		1 (3.3)
<i>FATHEAD MINNOW</i>	345	232
<i>GREEN SUNFISH</i>	22	6
<i>MISSISSIPPI SILVERY MINNOW</i>		1
<i>PUMPKINSEED</i>	6 (2.6, 2.6, 2.75, 2.5, 2.9, 2.9)	4 (2.9, 2.5, 2.6, 2.8)
<i>PUMPKINSEED X BLUEGILL</i>		1 (2.5)
<i>WHITE SUCKER</i>		2

<b>QUALITATIVE HABITAT EVALUATION</b>	<b>Sample Date</b>	<b>Mean Stream Width (m)</b>	<b>Mean Stream Depth (m)</b>	<b>Riparian Buffer Score</b>	<b>Bank Erosion Score</b>	<b>Pool Area Score</b>	<b>Width Depth Ratio Score</b>	<b>Riffle Riffle Ratio Score</b>	<b>Fine Sediments Score</b>	<b>Fish Cover Score</b>	<b>Habitat Score</b>	<b>Habitat Rating</b>
Glass Hollow Creek From 5m US of the Bagley WWTF outfall to ~340m upstream	06/20/2022	7	0.4	10	5	0	5	0	0	0	20	Poor
Glass Hollow Creek From ~300m DS of the Bagley WWTF outfall to where the outfall enters Glass Hollow Creek	06/20/2022	8	1.06	10	5	0	10	0	0	0	25	Fair

<b>QUANTITATIVE HABITAT EVALUATION</b>	<b>Sample Date</b>	<b>Mean Stream Width (m)</b>	<b>Mean Buffer Width</b>	<b>Mean Buffer Width Score</b>	<b>Mean Bank Erosion</b>	<b>Mean Bank Erosion Score</b>	<b>% Pool</b>	<b>% Pool Score</b>	<b>Width Depth Ratio</b>	<b>Width Depth Ratio Score</b>	<b>Riffle Riffle Ratio</b>	<b>Riffle Riffle Ratio Score</b>	<b>Bend Bend Ratio</b>	<b>Bend Bend Ratio Score</b>	<b>% Fine Sed</b>	<b>% Fine Sed Score</b>	<b>% Fish Cover</b>	<b>% Fish Cover Score</b>	<b>Habitat Score Small Streams</b>	<b>Habitat Rating Small Streams</b>
Glass Hollow Creek From ~300m DS of the Bagley WWTF outfall to where the outfall enters Glass Hollow Creek	06/21/2022	8	6.71	10	0.66	5	0	0	7.26	10	0	0	0	0	86.46	0	1.08	0	25	Fair

# Natural Community Verification Report

Waterbody Name (WBIC): GLASS HOLLOW CREEK (966400) (Upstream from WWTF)

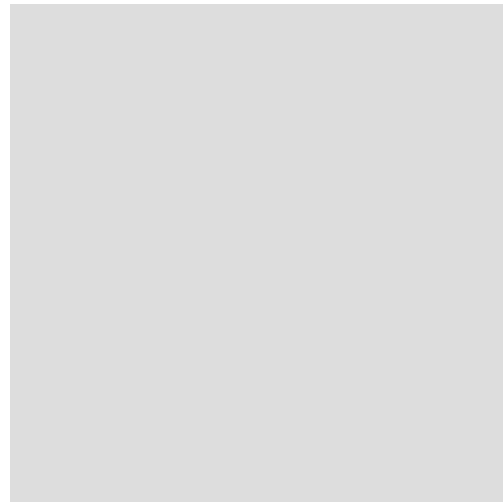
Swims Station ID: 10056731

Survey Sequence Number: 515097295

This NC Verification Report was run on Glass Hollow Creek ~240m DS of Railroad Bridge, (10056731), located in GRANT County with fish Survey Sequence Number 515097295 sampled on NA NA, NA. The Natural Community for this station was verified by Camille Bruhn on October 17, 2022.

The Natural Community was modeled *Coldwater* and is now Verified as *Warm Headwater* .

Survey location



Fish captured

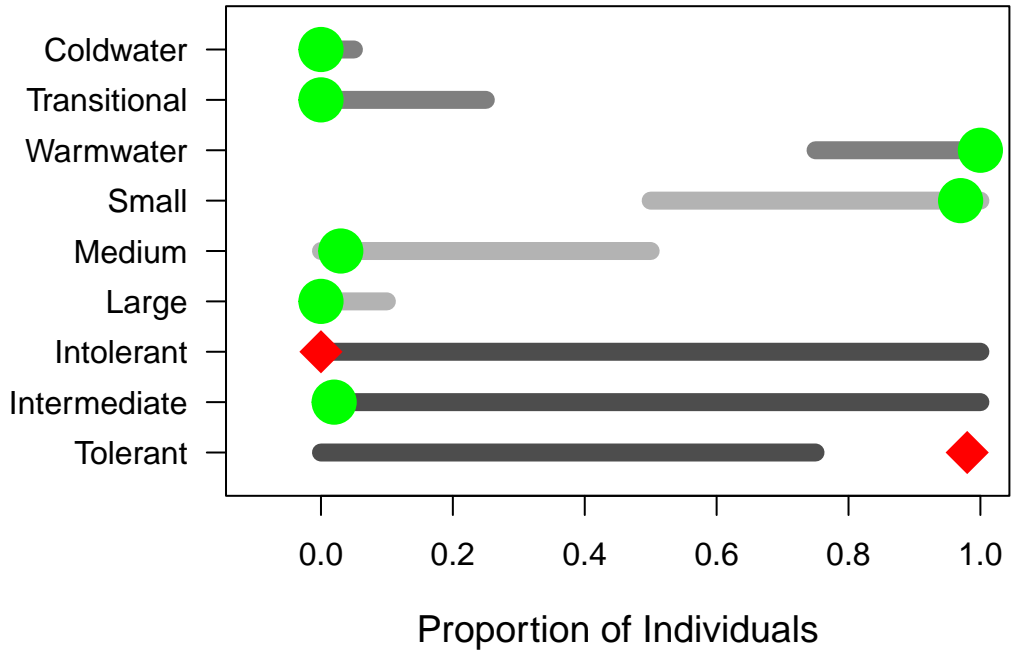
Species	Count
BLACK BULLHEAD	5
FATHEAD MINNOW	345
GREEN SUNFISH	22
PUMPKINSEED	6

Guild percentages

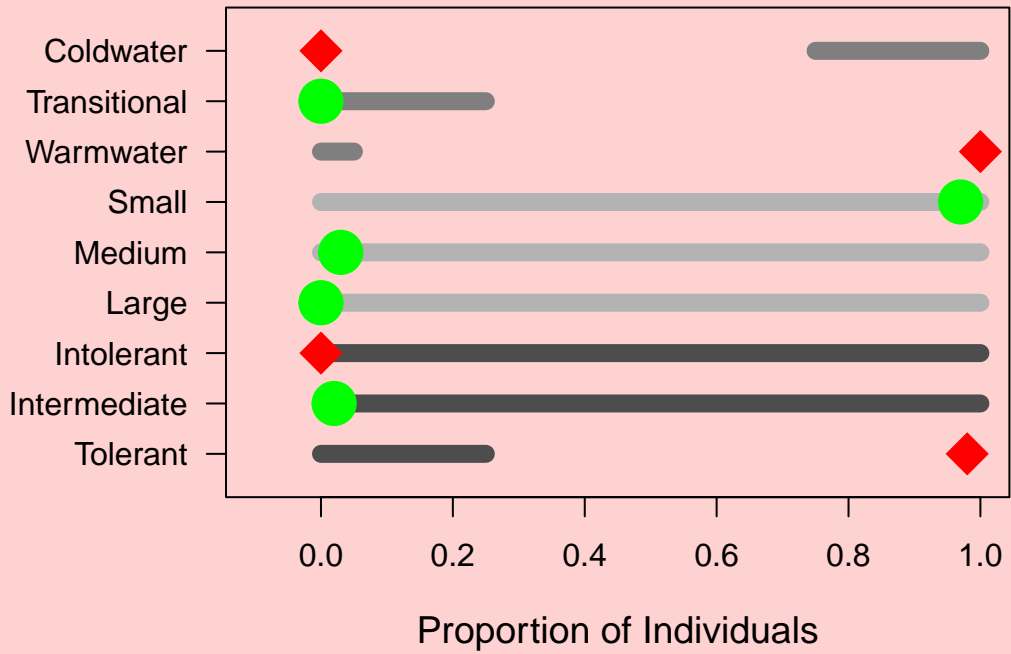
Thermal	Percent.Indiv.	Size	Percent.Indiv.	Tolerance	Percent.Indiv.
Coldwater	0	Small	97	Intolerant	0
Transitional	0	Medium	3	Intermediate	2
Warmwater	100	Large	0	Tolerant	98



### Warm Headwater Guild Test



### The NC shown below was considered but NOT selected Coldwater



**Comments from WR Biologist:**

Modeled to be coldwater, but no coldwater species were found in the stream (2 surveys). Warm headwater NC exceeds the tolerance test, but stream is backed up by a beaver dam and flows into the Mississippi River. DO and temperature may be issues due to the beaver dam and the connection to the Mississippi, therefore, would expect a large number of tolerant species. Fish assemblage indicates warm headwater. Biologist BPJ feels this adequately represents the stream at this time in the absence of coldwater species in this waterbody.

# Natural Community Verification Report

Waterbody Name (WBIC): GLASS HOLLOW CREEK (966400) (downstream from WWTF)

Swims Station ID: 10056731

Survey Sequence Number: 515097296

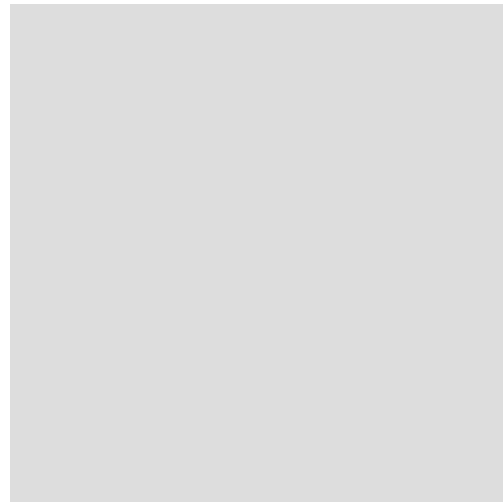
This NC Verification Report was run on Glass Hollow Creek ~240m DS of Railroad Bridge, (10056731), located in GRANT County with fish Survey Sequence Number 515097296 sampled on NA NA, NA. The Natural Community for this station was verified by Camille Bruhn on October 17, 2022.

The Natural Community was modeled *Coldwater* and is now Verified as *Warm Headwater* .

Survey location

Fish captured

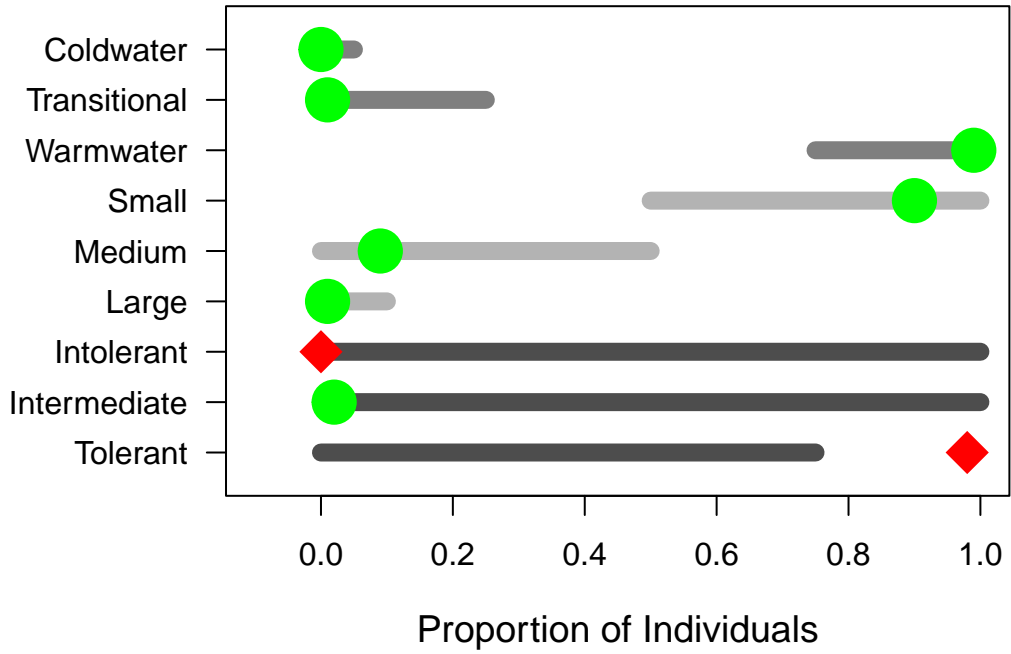
Species	Count
BLACK BULLHEAD	16
BLUEGILL	1
FATHEAD MINNOW	232
GREEN SUNFISH	6
MISSISSIPPI SILVERY MINNOW	1
PUMPKINSEED	4
PUMPKINSEED X BLUEGILL	1
WHITE SUCKER	2



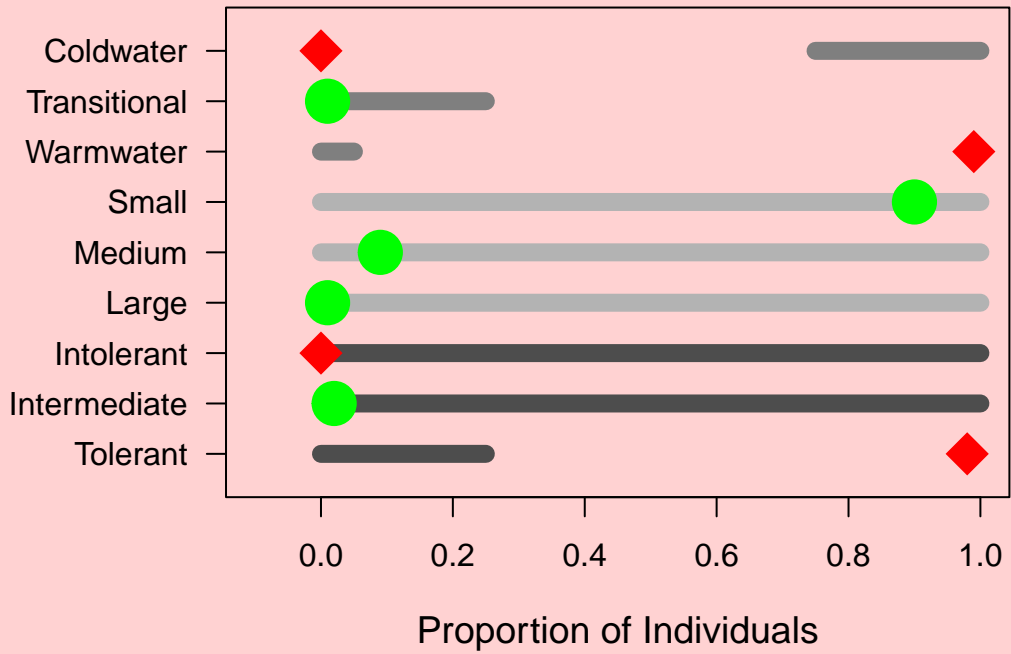
Guild percentages

Thermal	Percent.Indiv.	Size	Percent.Indiv.	Tolerance	Percent.Indiv.
Coldwater	0	Small	90	Intolerant	0
Transitional	1	Medium	9	Intermediate	2
Warmwater	99	Large	1	Tolerant	98

### Warm Headwater Guild Test



### The NC shown below was considered but NOT selected Coldwater



**Comments from WR Biologist:**

Modeled to be coldwater, but no coldwater species were found in the stream (2 surveys). Warm headwater NC exceeds the tolerance test, but stream is backed up by a beaver dam and flows into the Mississippi River. DO and temperature may be issues due to the beaver dam and the connection to the Mississippi, therefore, would expect a large number of tolerant species. Fish assemblage indicates warm headwater. Biologist BPJ feels this adequately represents the stream at this time in the absence of coldwater species in this waterbody.