An Evaluation of

Big Spring Branch

WBIC = 1212900

Iowa County, WI

Aquatic Life Use Assessment and Stream Classification Review

June 3, 2021

By James Amrhein, Kimberly Kuber, and Camille Bruhn

Water Quality Biologists

Southern District

Wisconsin Department of Natural Resources

Summary:

An assessment to determine stream classification was conducted on Big Spring Branch (WBIC =1212900) on June 3rd, 2021 from just upstream of the Highland Wastewater Treatment Plant discharge and continuing on downstream to the confluence with Unnamed Tributary (WBIC =1213000). See Figure 1.

It was determined that the portion of Big Spring Branch from its headwaters downstream to its confluence with Unnamed Tributary (WBIC = 5035733) was Limited Forage Fish (LFF). From this point downstream to the junction with Unnamed Tributary (WBIC = 1213000) was continuous fish and aquatic life (FAL). See Figure 2a.

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Background:

Big Spring Branch is a 7.3 mile long spring fed stream that begins north of the Village of Highland in Iowa County. It flows northwest into Grant County and then empties into Sixmile Creek in the northeastern part of Grant County. It gets its name from a large spring that augments flow in the SE ¼ SE ¼ Section 18 T7N R1E (Highland Township) in Iowa County, just east of Big Spring Road. Historically, the stream has contained "an excellent population of brown trout" (Smith and Ball, 1972). The Iowa County portion of the stream historically has had a forage fish population consisting of sculpins, creek chubs, brook sticklebacks, blacknose dace, and stonerollers (Piening and Threinen, 1968).

As per Table 3 in ch. NR 104 (WDNR, 2004), Big Spring Branch is currently classified as "Noncontinuous IA"- also known as a Limited Forage Fishery (LFF) - "Upstream for the North line of Section 19, T7N, R1E" (Figure 2b). From this point downstream, the classification is continuous fish and aquatic life (FAL). Additionally, the stream is designated as Class 1 Trout stream downstream from the Unnamed Tributary (WBIC =1213000), with the additional classification of Exceptional Resource Water, "from Springhead to Blue River" (WDNR, 2010a). All stream classifications were supported in a report by Schlesser (1990).

Methods:

This most current evaluation of the stream was conducted on June 3rd, 2021 by Wisconsin Department of Natural Resources (WDNR) water quality biologists Jim Amrhein, Kim Kuber, and Camille Bruhn. Also accompanying them were WDNR wastewater engineer Nathan Wells, Highland Wastewater Treatment Plant (WWTP) operator Tom Hebgen, and Highland Village President George Breiwa.

The entire length of stream was walked from the WWTP outfall to the junction with Unnamed Tributary (WBIC = 1213000). See Figure 1. Physical water quality parameters consisting of temperature, dissolved oxygen, pH and specific conductivity were recorded at various locations along the way (Table 1). Additionally, fish surveys were also conducted at various locations using a single probe "backpack" shocker to determine if fish were present or absent, to get an indication of species diversity, as well as size structure in those areas where fish were found. Notes and pictures were also taken to document the findings, and particularly at points were the stream changed characteristics (i.e. water presence/absence, flow, geomorphology, biology). Locations of sampling events and points of interest were documented using a hand-held GPS unit. Locations, notes and photos correspond to the numbering system found in Figure 1.

Observations:

Upstream of the wastewater outfall (site 1), water was found to be pooled up and fairly stagnant, with an abundance of algal growth. A small trickle of water was seen passing downstream. The wastewater

treatment plant effluent augmented the flow (site 2). Of the physical water chemistry parameters recorded, specific conductivity, because of its direct relationship between the presence of chlorides found in wastewater, was taken upstream of the outfall and in the outfall itself to use as a surrogate for determining the footprint and influence of the wastewater on points downstream.

A substantial pool forms immediately downstream of the culvert under Lagoon Road (site 3). No fish were found to be present in that pool. Other than that, from points 4 through 8, the stream had small pools of up to 10 centimeters (cm) deep. They were connected by surface water flows that were narrow (generally less than 30 cm wide) and shallow (1-2 cm deep). At site 7, the first fish was encountered in a small pool. A single creek chub, a tolerant thermally transitional species (Lyons, et. al., 1996), was found. At site 8, a pool was found to hold 14 creek chubs, all of similar size at approximately 4 inches long.

At sites 9 and 10, the stream entered a more open meadow, with long, narrow pools , 10-30 meters long, 2-3 meters wide and up to 0.5 meters deep. Hundreds of creek chubs were observed in these pools. Shocking showed multiple year classes of creek chubs ranging from 2.5 to 6 inches.

Between sites 10 and 12, the stream varies between small pools and narrow, shallow stream channels, with the flows gradually decreasing.

At site 12, stream flow and all other evidence of surface water was lost. Approximately 90 meters downgradient at site 13, there was the appearance of one small pool of water. Water chemistry was taken to determine if this pool was still showing the influence of higher conductivity noted upstream and potentially an indication of effluent signature. Specific conductance was 1225 microSiemens/cm, which is above a background concentration for this area of southern Wisconsin. It is unknown if this conductivity is the result of residual effluent making its way to this pool through seepage or if other factors (such as minerals in the soils) are contributing to the conductivity at this site.

At site 14 and continuing for 300-400 meters downgradient, there was no water. The area is bounded by steep rock walls and the bottom made up of boulders (0.3 – 2 meters in diameter). There is no evidence of bed or banks in this section. Jewel weed is the predominant plant, but the plant community is also made up of species that prefer a dryer environment (grasses, garlic mustard), indicating the area has not been inundated with water for some time.

At the confluence of Unnamed Tributary (WBIC = 5035833) (Site 15) some intermittent pools with no connecting flow appear. At site 16, fish were observed and a shocking survey revealed multiple species of fish, including brook stickleback, southern redbelly dace, creek chub, and mottled sculpin. Mottled sculpin are an intolerant, coldwater indicator species (Lyons, et. al., 1996). Water chemistry readings showed a specific conductivity of 382 uS/cm, which would indicate that the system is no longer under the influence of wastewater effluent.

The area after site 16 and downstream to site 17 contains intermittent pools which appeared devoid of fish, with the area from site 17 to 18 being a dry stretch. Site 18 is a pool upstream of the confluence with Unnamed Tributary (WBIC =5035733). Some fish and a snapping turtle were observed in this pool. From sites 19 through 20, pools become consistently larger and deeper, with some interconnecting flow in between them. Fish surveys revealed the presence of mottled sculpin, creek chub and southern redbelly dace.

At site 20, flow is observably higher and the presence of mottled sculpin more prevalent with over a dozen specimens being captured. From site 20 through site 24, pool/riffle/run complexes are common. Three brown trout, a coldwater indicator game species and ranging in size from 8.1 to 12.2 inches long, were captured at site 21. White sucker, mottled sculpin, creek chub, southern redbelly dace, and brown trout were captured at site 22. This observed geomorphology of the stream continued until its

confluence with Unnamed Tributary (WBIC =1213000). At this juncture (site 25), the Unnamed Tributary did not appear to be contributing any substantial flow to the system as the water was backed up the tributary by the volume of water in Big Spring Branch.

Conclusions:

As shown in Figure 3, following several years of higher than average precipitation, the area has experienced average to below average precipitation since December 2020 (WDNR, 2020), thus allowing the stream to return to a more "normal" condition.

Instantaneous water chemistry showed all parameters to be within a normal range relative to the site at which they were taken. Dissolved oxygen was above 3 mg/L in the portion deemed LFF and above 5 mg/L in the section deemed FAL (WDNR, 2010b). Instantaneous water temperatures in the FAL section appear cold enough to sustain a coldwater community (Lyons, et. al., 1996). Using conductivity as a surrogate to trace the impact of the wastewater discharge due to high levels of chlorides usually associated with wastewater, it was determined the effluent had a negligible impact beyond the confluence of Unnamed Tributary (WBIC = 5035833) (site 15).

From the Highland Wastewater Treatment outfall to the confluence with Unnamed Tributary (WBIC = 5035733), the stream has demonstrated it can sustain several species of fish, including the intolerant mottled sculpin. This section can also sustain a full life cycle of certain fish species – particularly creek chubs. The presence of multiple year classes indicate this species is capable of completing a life cycle within the pools.

From Unnamed Tributary (WBIC = 5035733) on down to the confluence with Unnamed Tributary (WBIC = 1213000), inter-pool connectedness and flow became consistent. Species diversity increased and 2 coldwater indicator species (mottled sculpin and brown trout) were present.

This does not mean that the length of stream either devoid or containing water may not vary from year to year as influenced by different precipitation patterns from year to year or within years. However, the compendium of evidence suggests the stream can support some form of fish life in certain stretches of the section currently classified as LFF and that fish can re-colonize other areas within that section once flow conditions allow passage.

The original stream determination was done 40 years ago (WDNR, 2004) and this current assessment supports the LFF designation, at a minimum, upstream of the north line of Section 19, T7N, R1E. However, as depicted in Figure 2a, this contemporary study suggests the stream classification be changed to FAL – coldwater, from Unnamed Tributary (WBIC = 5035733) to Unnamed Tributary (WBIC = 1213000). This area has shown the capacity to support trout and other coldwater indicator species. Additionally, this section should obtain a fisheries designation as trout water and making it consistent with the designation downstream.

References:

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Piening, Ronald and Threinen, C.W. 1968. Lake and Stream Classification Project. Surface Water Resources of Iowa County. Wisconsin Department of Natural Resources. Madison, WI.

Schlesser, Roger. 1990. Big Spring Branch at Highland, Iowa County. Triennial Standards Review, Highland WWTP. Bureau of Water Resources Management. Wisconsin Department of Natural Resources. Southern District. July, 1990.

Smith, Tom D., and Ball, Joseph R. 1972. Lake and Stream Classification Project. Surface Water Resources of Grant County. Wisconsin Department of Natural Resources. Madison, WI.

WDNR. 2004. NR 104.05, Variances and additions applicable in the southern District. Wisconsin Department of Natural Resources Administrative Code. Register, February 2004, No. 578.

WDNR. 2010a. NR 102.11, Exceptional Resource waters. Wisconsin Department of Natural Resources Administrative Code. Register, November 2010, No. 659.

WDNR. 2010b. NR102.04. Categories of surface water uses and Criteria. Wisconsin Department of Natural Resources Administrative Code. Register, November 2010, No. 659.

WDNR. 2020. Natural Community Verification App (v2.2). Antecedent Weather. Extensive Weather Analysis. Created by Matt Diebel and Alex Latzka. Wisconsin Department of Natural Resources. Bureau of Water Resources. http://34.223.230.186:3838/shuprm/NC_App/

Table 1: Instantaneous Water Chemistry Data from Big Spring Branch 06/03/2021.

Map ID	Time	Description	Latitude	Longitude	Temperature (°C)	pH	Specific Conductivity (uS/cm)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Saturation)
1	911	5m US WWTF Discharge	43.05213	-90.39323	15.45	6.87	1113	6.18	61.5
2	914	Effluent Outfall	same	same	15.47	6.84	1555	4.93	49.4
3	919	DS Lagoon Rd Xing			15.73	7.11	1495	5.22	51.9
4	933								
5	939		43.05265	-90.3952					
6	943		43.05244	-90.3958					
7	959		43.05266	-90.39773					
8	1014		43.0538	-90.39964	15.41	7.93	1543	8.45	86
9	1038		43.05738	-90.40043					
10	1048		43.05787	-90.40041					
11	1053		43.05816	-90.40079	18.48	8.17	1520	8.6	91.8
12	1104	Stream flow lost	43.05885	-90.40263					
13	1111	1st pool DS Disappearance			13.08	7.75	1206	6.03	58.5
14	1118	Photo of "the canyon"	43.05965	-90.40377					
15	1145	Confluence w/ gully	43.06204	-90.40987					
16	1152		43.06299	-90.4111	15.9	7.65	382	7.62	73
17	1201	Intermittent	43.06346	-90.41173					
18	1208	Intermittent Pool	43.06484	-90.41346					
19	1211	Large Pool	43.06518	-90.41354					
20	1222	Flow picked back up	43.06763	-90.41216	11.21	7.82	507	10.3	94.3
21	1230	Brown Trout captured	43.06889	-90.41223					
22	1238		43.07	-90.41163					
23	1251	US DNR fenceline	43.07166	-90.41166	15.97	8.52	488	14.16	143.42
24	1310	US Confluence w/ trib	43.07283	-90.41113	15.81	8.31	523	14.36	145.4
25	1312	Trib- stagnant			15.44	8.26	520	14.14	142.1

Map IDs are shown on Figure 1.

Figure 1: Big Spring Branch Surveillance Sites, June 3rd, 2021

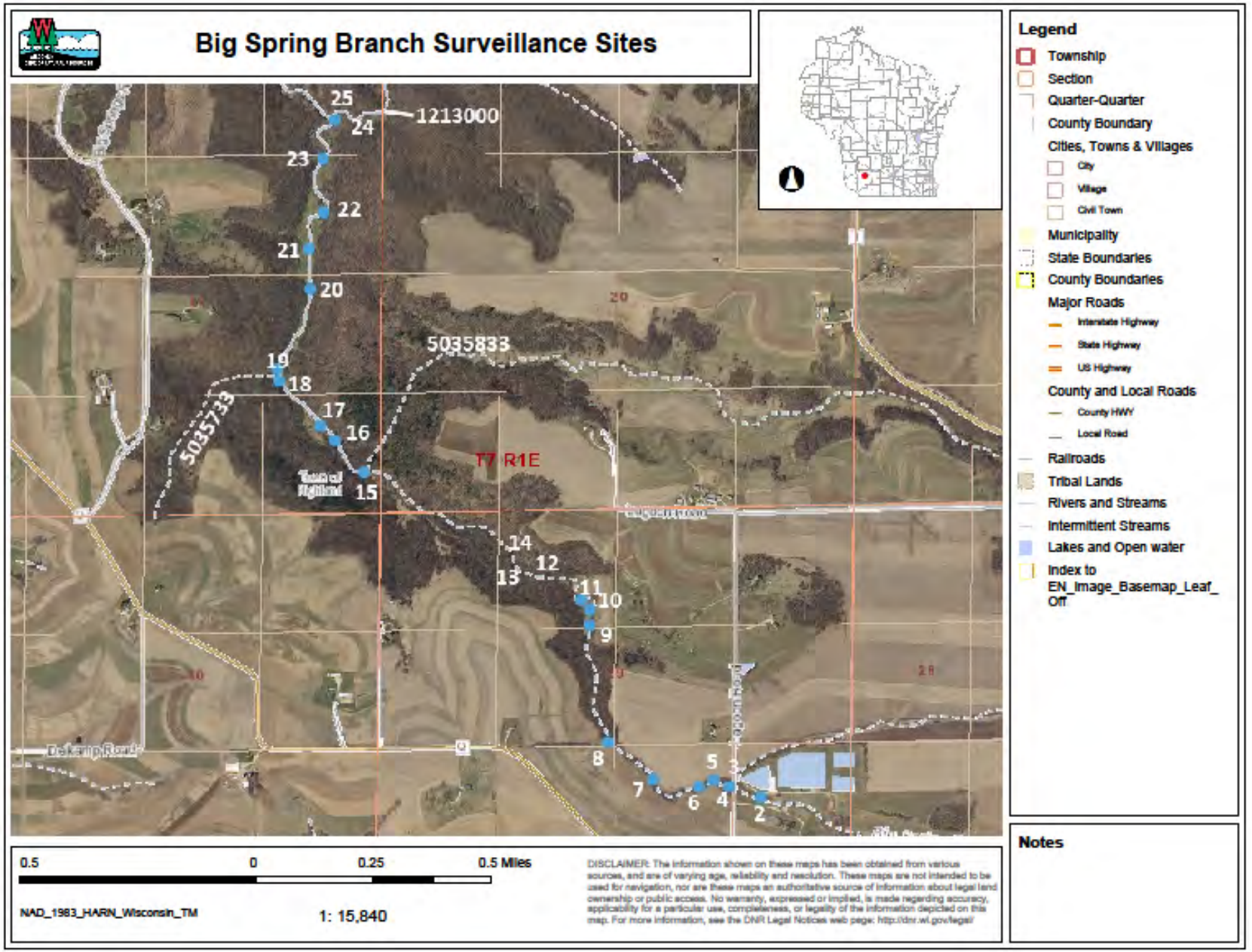
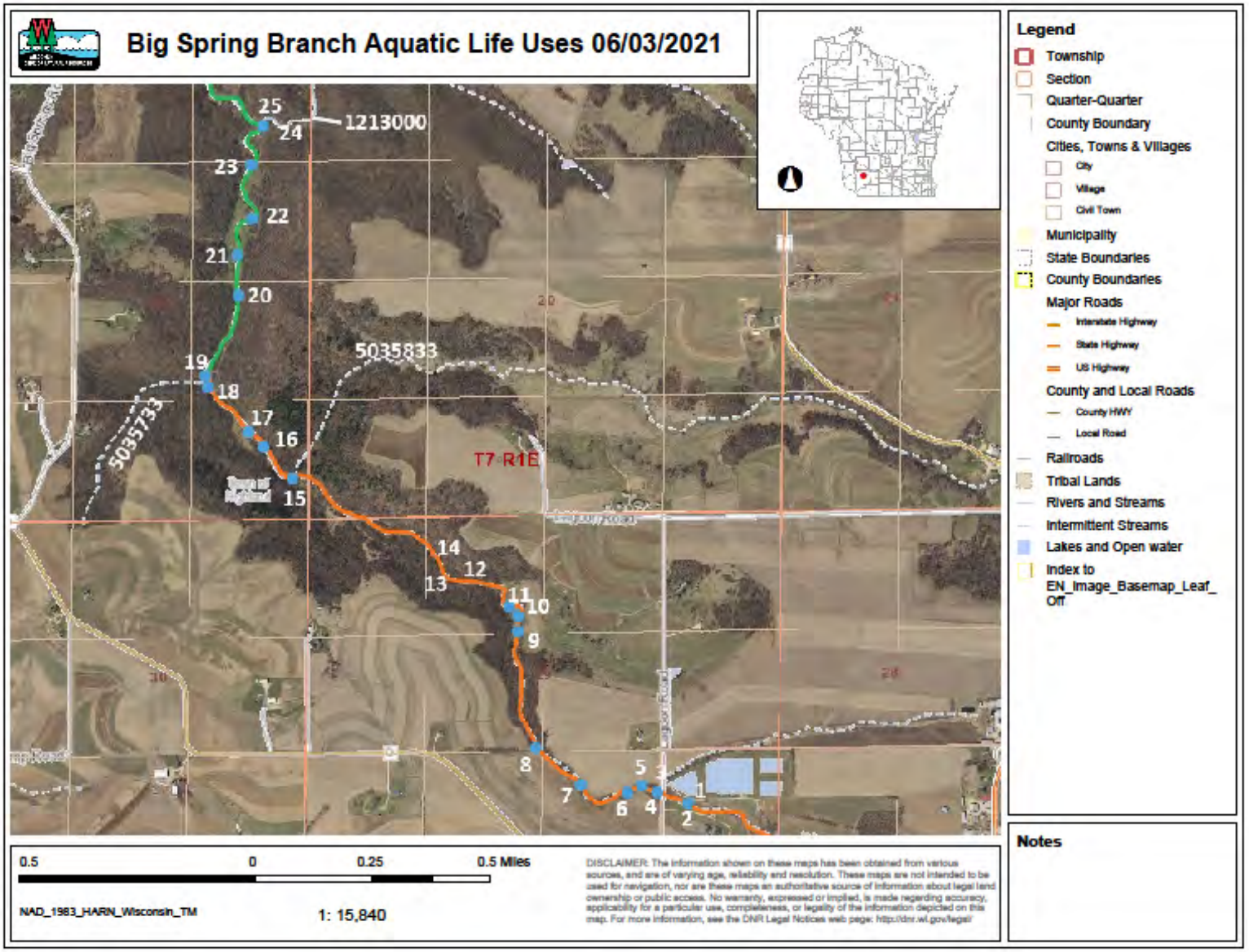


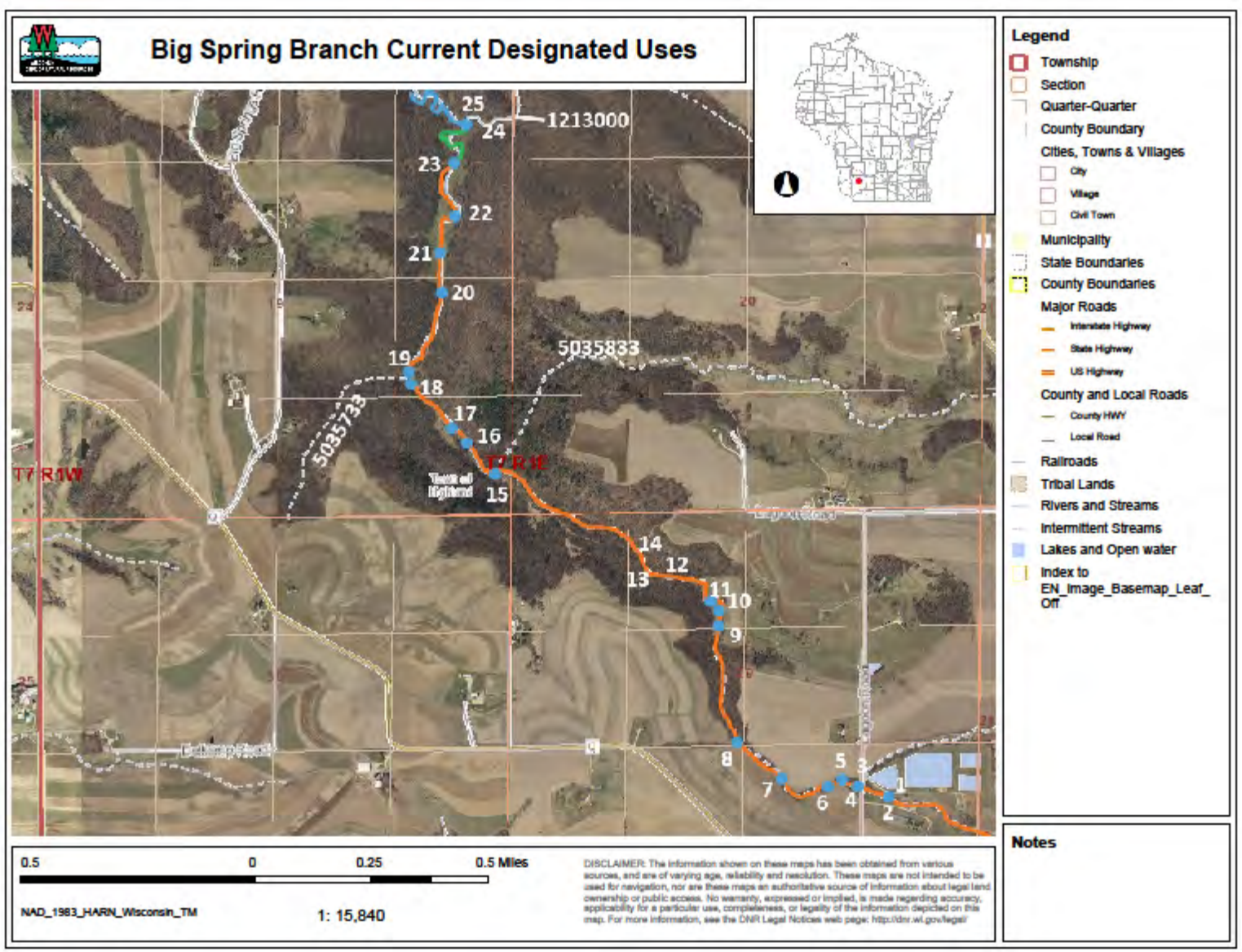
Figure 2a: Big Spring Branch Aquatic Life Uses, June 3rd, 2021



Orange indicates Limited Forage Fish (LFF)

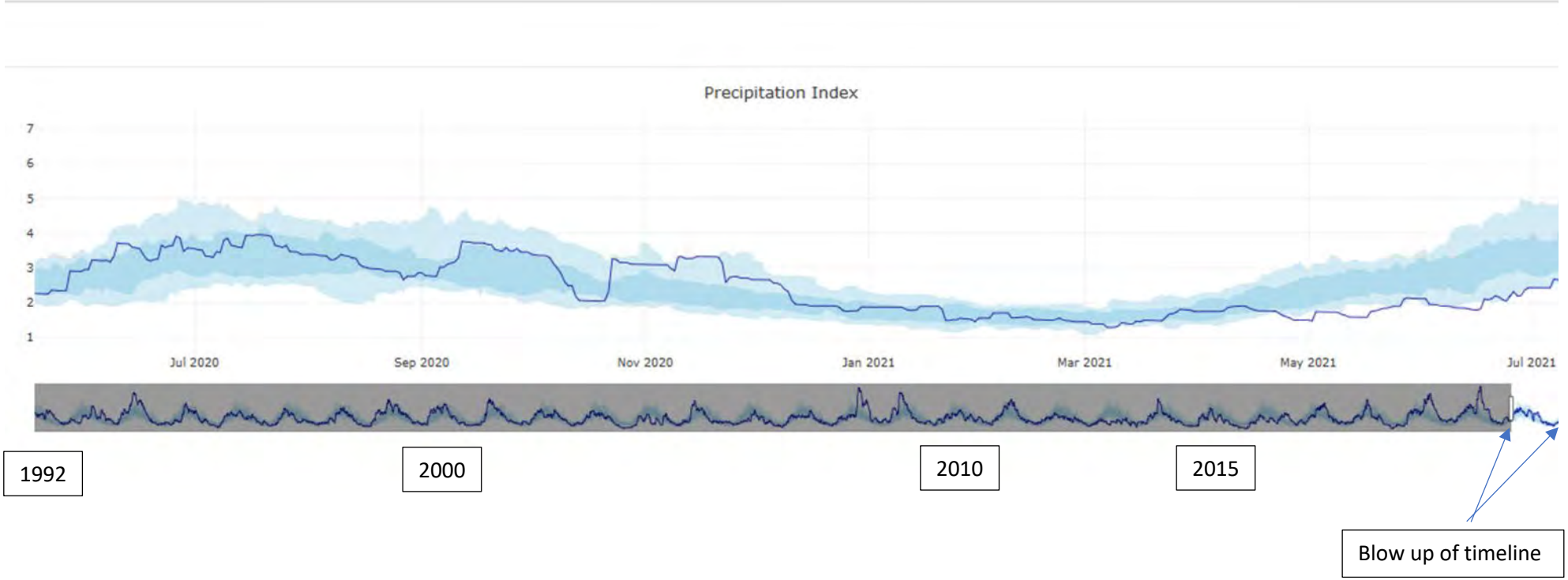
Green indicates Full Fish and Aquatic Life (FAL)

Figure 2b: Big Spring Branch Current Designated Uses



Orange indicates Noncontinuous 1A (Limited Forage Fish)
Green indicates Full Fish and Aquatic Life (FAL)
Blue indicates FAL and Class 1 trout

Figure 3: Antecedent Precipitation for Highland, WI – May 2020 to July 2021



Precipitation index (dark blue line) is the weighted average daily precipitation (mm) in the preceding four years, with more weight on recent precipitation, and is an indicator of stream baseflow. Historical range of variation (10th and 90th percentiles) and depicted in light blue is summarized by HUC10 watershed for the period 1984-2013. The darker blue indicates the lower 25th and upper 75th percentiles.

Site Photos

Site 1: Upstream of WWTP Outfall

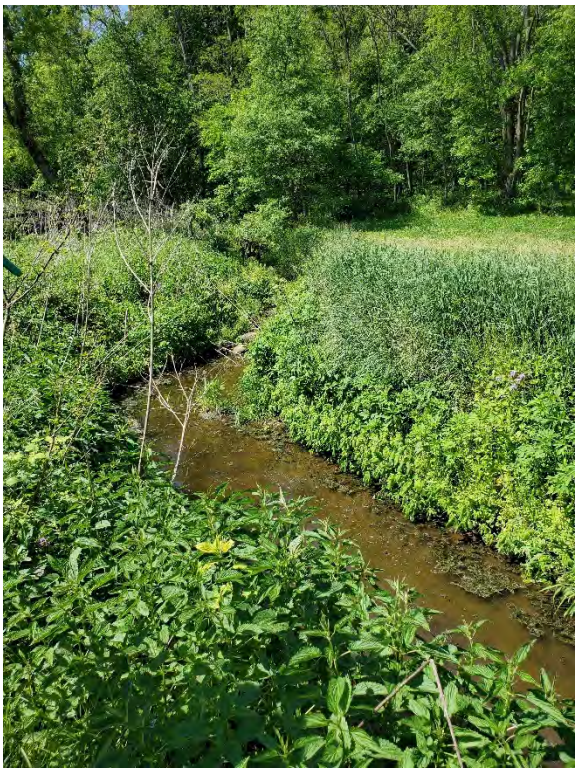
Site 2: Junction of WWTP outfall and Big Spring Branch

Site 3: Immediately below culvert west of Lagoon Road

Sites 4 through 8: showing small pools connected with small shallow stream thread

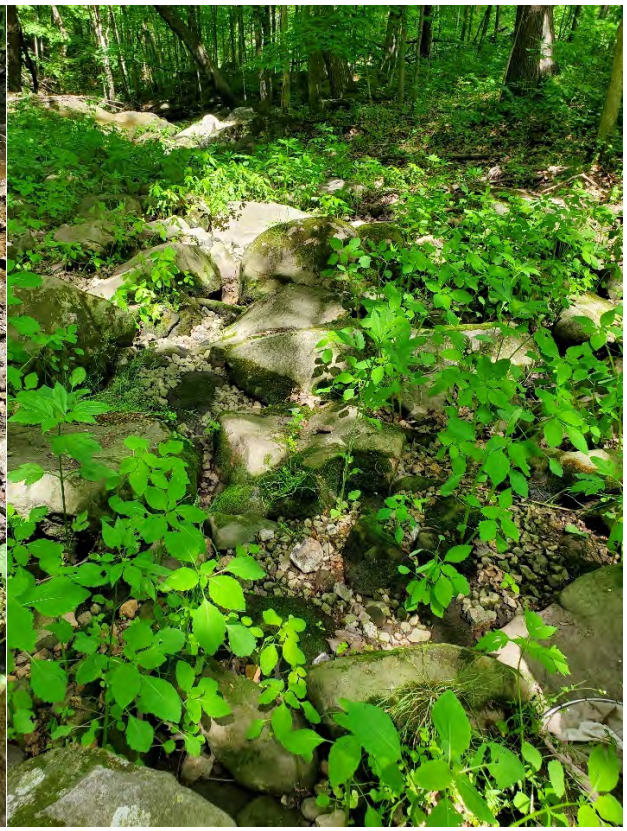
Site 7: First fish found – Creek Chub


Sites 9 and 10: Larger pools in open meadow

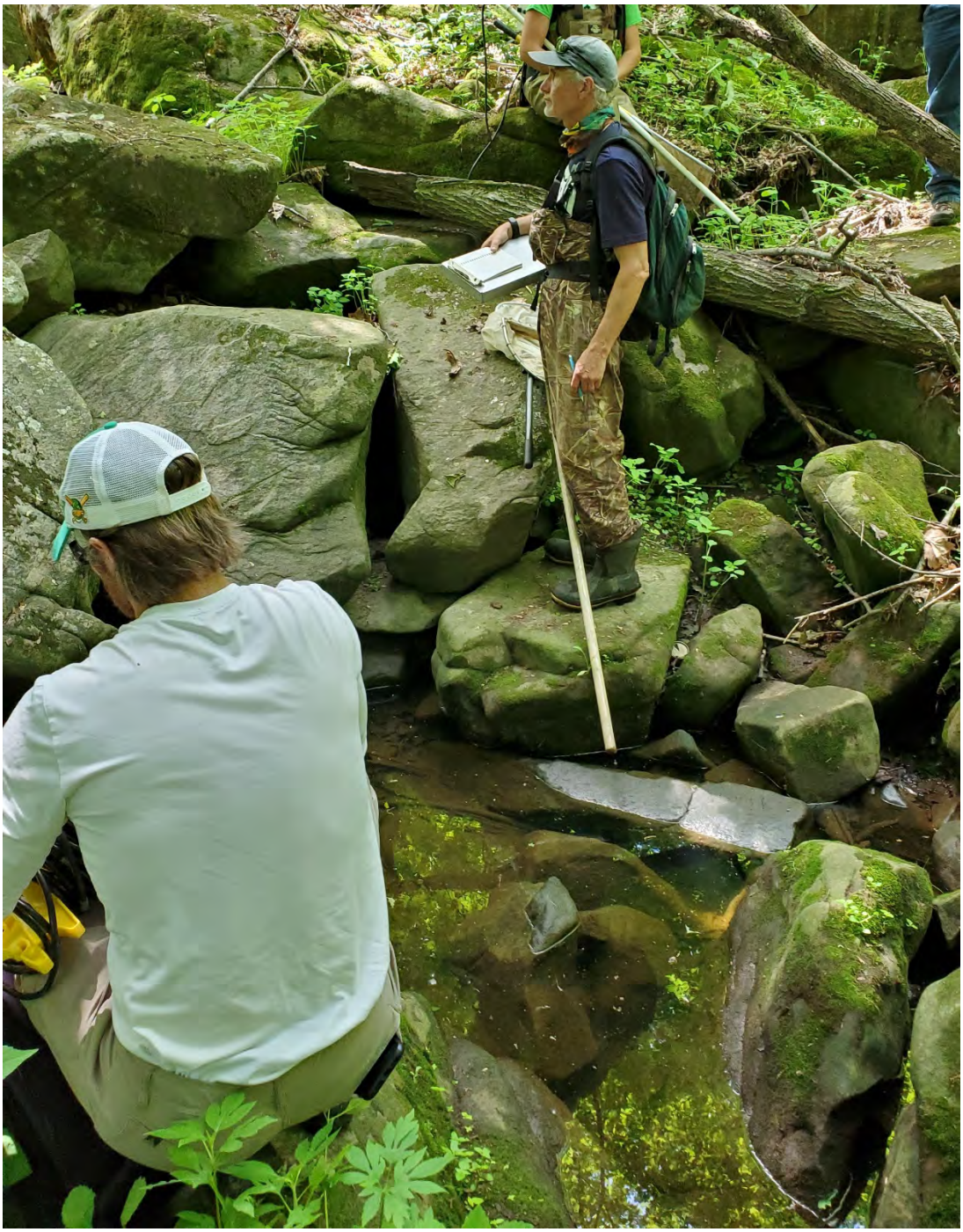



Site 10: Multiple year classes of Creek Chubs found

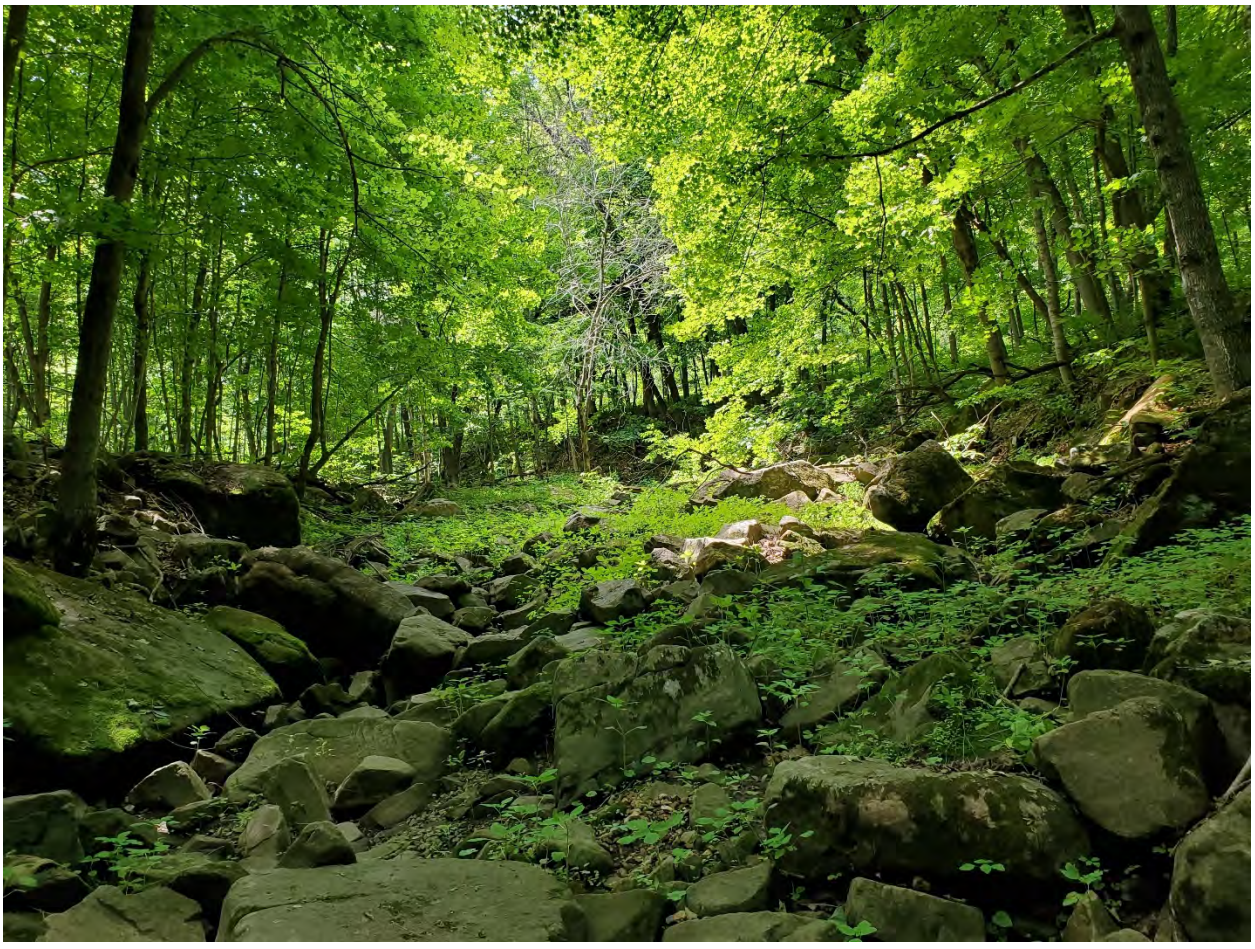
Site 12: Stream flow is lost



Site 13: Small pool of water (1st appearance of water after surface water disappearance)

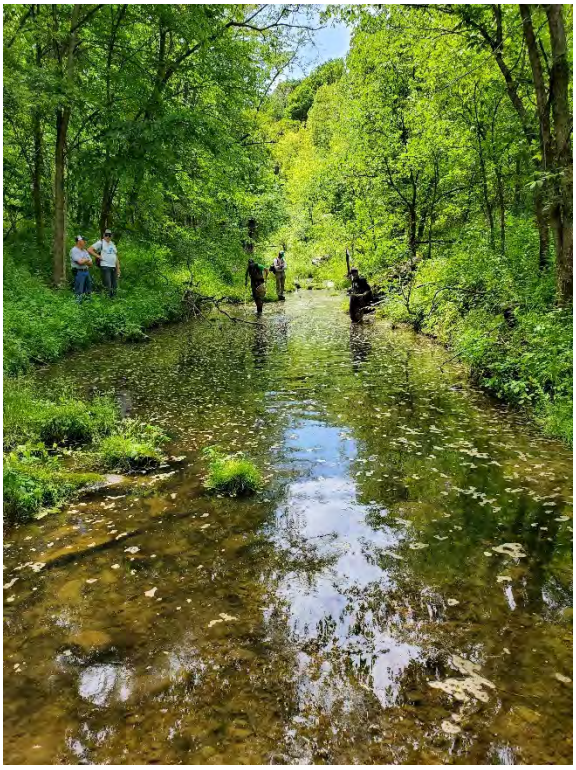


Site 14 down to Site 15: No evidence of stream flow; lack of stream characteristics



Site 15: Confluence w/Unnamed Tributary (WBIC =5035833); intermittent pools with no interconnecting flow appear

Site 16: Larger pools with multiple species of fish present: creek chub, brook stickleback, southern redbelly dace and mottled sculpin



Site 18: Intermittent pool with snapping turtle

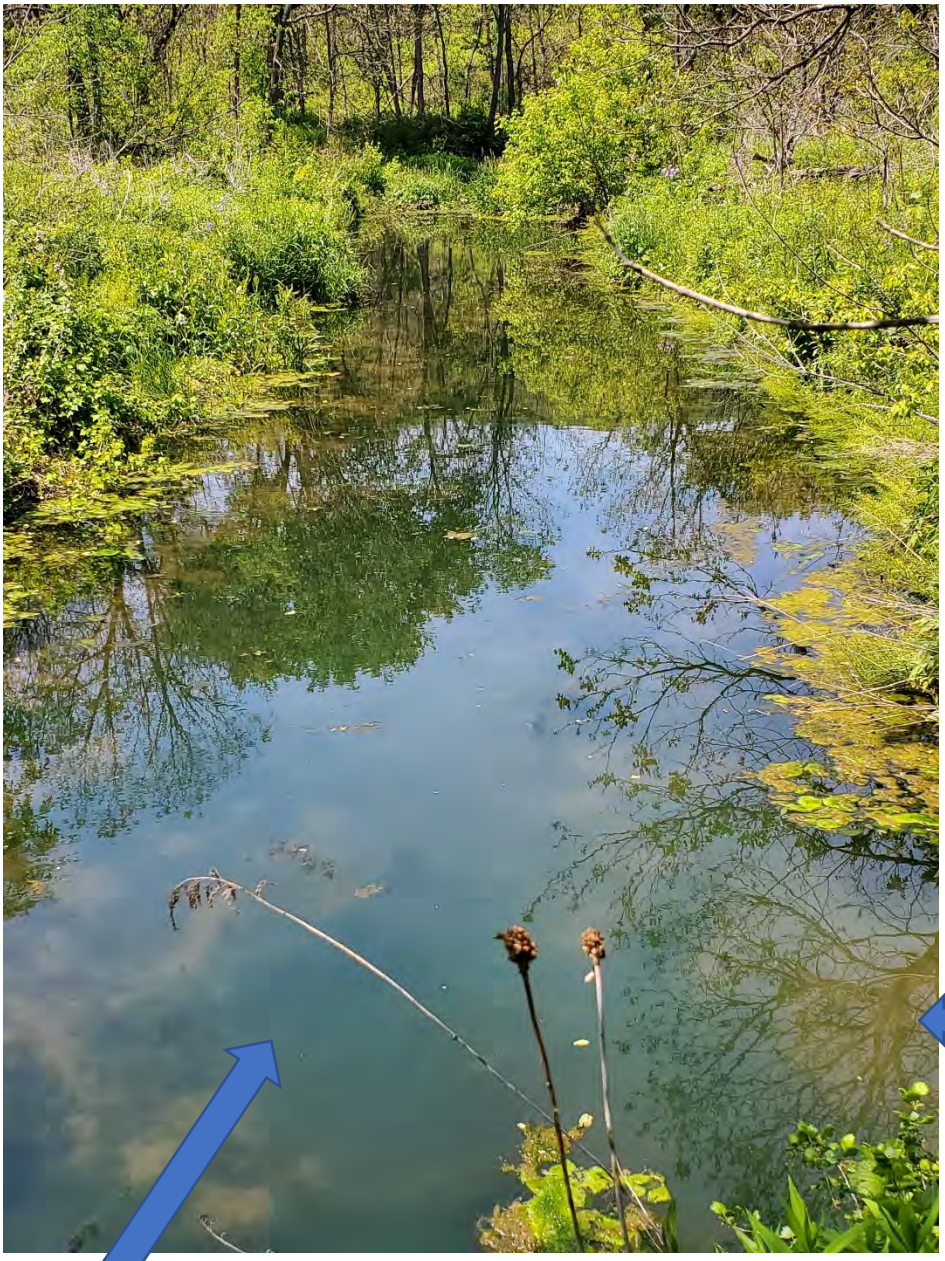
Site 19: Confluence w/ Unnamed Tributary (WBIC =5035733); large pool, fish present, flow and pools become more consistent

Site 20: Flow (stream volume and velocity) has noticeably increased

Sites 21 through 24: Riffle, run, pool complexes are common

Site 21: Brown trout are found

Site 25: Confluence with Unnamed Tributary (WBIC =1213000) and end of survey



Unnamed Tributary

WBIC =1213000

Big Spring Branch