

2018-2019 MAINSPRING STREAM BIOMONITORING PROGRAM SUMMARY REPORT

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INTRODUCTION

The purpose of this report is to provide an overview of what was accomplished by the Mainspring Stream Biomonitoring Program during the summer seasons of 2018 and 2019. The table lists the sites monitored and the results (IBI and Bioclass Rating).

For some sites I cite a saSVAP score. saSVAP, jointly developed by Mainspring and the Coweeta LTER program, is an adaptation of the USDA Stream Visual Assessment Protocol (SVAP) and is potentially an epitomal Citizen Science tool (saSVAP is not an appropriate methodology for our larger streams – indicated in the table by N/A.)

FIXED STATIONS

LTRNE-005, Little Tennessee River at Needmore.

This is both a Mainspring and a TVA fixed station, jointly sampled since 1990. Since sampling requires use of the TVA boat electrofisher, we adhere to their rotation, which initially involved annual sampling, but has been biennial since 2002-2004.

LTRSR-137, Little Tennessee River at US 246, Rabun Gap, Georgia.

This site has the intent of capturing mainstem conditions at the Georgia/North Carolina line; in 2007 it was substituted for a site precisely at the State Line which had become unsafe for backpack electrofisher work. Mainspring is involved in a process focused on this area with various actors in Rabun County; at this point in time it is safe to say that so long as bioclass rating at LTRSR-137 remains stable (or even improves!) the socio-political issues around the Dillard-Rabun Gap area are more urgent to discuss than biological details.

CULPC-075, Cullasaja River at Peaceful Cove:

This fixed station will be discussed below under “Cullasaja Initiative”.

CARRP-087, Cartoogechaye Creek at Macon County Rec Park:

Although this site generally remains on the lower margin of the Good bioclass, examination of the IBI metrics suggests the “yo-yo” effect whereby moderately stressed streams which are neither critically impacted nor near pristine fluctuate in response to short term or local impacts. At this point in time the main impacts to lower Cartoogechaye Creek seem to be related to accumulation of sediment in riffles and along shorelines, resulting in low numbers of riffle dwelling fish and exaggerated numbers of centrarchids.

RABRC-055, Rabbit Creek above second crossing on Rabbit Creek Rd.:

While modest improvement was registered in the early years of monitoring here, there does not seem to be much possibility of Rabbit Creek rising above the Poor bioclass.

WAYCR-093, Wayah Creek at Crawford Rd.

In 2018 and 2019 we continued to document what appears to be the slow improvement of lower Wayah Creek following connection of the Wayah valley (including the LBJ Job Corps center, which formerly had its own package plant) to the Franklin sewer system ca. 1995. Bioclass ratings, formerly oscillating between Fair and Good, are now consistently Good. Improvement includes the return of 3 species each of riffle dwelling darters and water column user cyprinids.

MIDHE-126, Middle Creek at West Middle Creek Rd.:

Although not related to Mainspring project activity, the ongoing gradual improvement of Middle Creek, dating from an SCS/Soil and Water Conservation District erosion control project on agricultural lands in the upper watershed (Scaly Mountain) in the 1980's, is something which should be repeatedly stressed as an example of what is possible. MIDHE-126 is now firmly in the Good bioclass category.

REFERENCE SITES:

In populated areas, Excellent IBI scores (representing essentially unaltered conditions) are unlikely to be reported from any but the smallest headwater streams. We currently consider two sites, one at each extreme of our service area, as representing the healthiest, least altered conditions available to us; both were monitored in 2019.

BRSLN-008, Brush Creek (Swain County) along Lower Needmore Road:

With a Good bioclass rating, as determined by IBI, and an Excellent saSVAP score in its lower reaches, Brush Creek represents a priceless resource within the Needmore Game Lands. Results in 2019 confirm Brush Creek's importance as an aquatic habitat, but also as an essential component for the realization of Mainspring's goal of protecting an intact biological corridor connecting the Cowee range to the Nantahalas, across the Little T in the Needmore Game Lands.

BETCO-173, Betty Creek at the Hambidge Center, below Messer Creek Rd.

Since the initial round of biomonitoring in 1990, we have identified Betty Creek as the single biologically most intact major tributary to the Little Tennessee system above Fontana. In 2010, when we entered into an agreement with the Hambidge Center for Creative Arts and Sciences to provide biomonitoring services for a restoration project on a section of Betty Creek which includes a Mainspring easement, their consultant selected BETCO-173 as the project reference site, and we concur. In both 2018 and 2019 it posted Excellent saSVAP scores, along with a Good IBI-based bioclass rating. Of particular interest here, along with what seems to be an improving trout population, is the status of

upper Betty Creek as the only area where both longnose dace and Tuckasegee darter, two riffle dwelling species experiencing decline across most of the watershed, are holding their own or even increasing in abundance. In 2019, this site also produced the first hellbender we have taken from the upper Little Tennessee watershed since 2014.

CULLASAJA INITIATIVE AND OTHER SITES WHERE AGROCHEMICAL POLLUTION MAY BE A CONCERN

In 2017, motivated by shockingly low fish abundance in the lower Cullasaja River, Mainspring entered into an informal agreement with the North Carolina Division of Water Resources and Wildlife Resources Commission (NCDWR and NCWRC, respectively) and TVA to carry out extensive monitoring of the Cullasaja below the Gorge/Falls, based on suspicions of agrochemical pollution. Initial field work was begun in 2018 and completed in August, 2019. A final report on this work, with recommendations, will be available by early next year. Until that time, conclusions reported here, including IBI scores, should be considered provisional.

CULBY-066, Cullasaja River at U.S. 441 Bypass

CULWG-067, Cullasaja River above Belleview Rd.

The 2018 trend for CULBY-066 is given as “negative” because very shortly after the last previous biomonitoring visit to this site (1994) an extensive riffle, located directly under the bypass bridge, was completely destroyed during bridge construction. 2018, with the availability of the TVA electrofisher boat, marks the first time we have availed ourselves of the opportunity to monitor this now universally deep, largely featureless reach of the extreme lower Cullasaja.

CULWG-067, only about a half mile upstream, was initially chosen in 1995 as a replacement for CULBY-066, having become the lowermost wadable section of the Cullasaja. The extreme low density of fish (all species) in 2016 and 2017 (as low as 2.1 fish/300 sq. ft, vs. a minimum of 13 to receive the high score for the catch per unit effort metric), even in a reach with moderate amounts of hard substrate and other elements of habitat, provoked our interest in evaluating the Cullasaja as a whole. In the case of the lower two sites, we would prefer to wait until all the results are in, and all parties have had a chance to meet and begin drafting a final report to say anything beyond confirming that the Poor and Very Poor bioclass ratings based on IBI seem appropriate.

CULPC-075, Cullasaja River at Peaceful Cove

This site, along with an upstream macroinvertebrate site selected by the state agencies, forms part of the “Cullasaja Initiative Package”. However, since it is a Mainspring fixed station, monitored annually since 1992, we will comment on it here. Independently of the Cullasaja Initiative, the most important point about CULPC-075, located upstream of nearly all significant agricultural impacts in a reach with abundant hard substrate and riffle-pool sequences, is as an antidote to reflexive alarmism.

LAKMO-193, Lakey Creek below Bryson City Rd. (NC Highway 28)

BRAHE-184, Bradley Creek at Henson restoration site off Bryson City Road

These two streams of very similar size both arise on the Cowee Range and reach the Little Tennessee River within a mile of each other. Both are notable for unusual abundance of darters for such small streams. And ca. 2018 we began to detect apparent low conductivity (as inferred from electrofisher behavior) and uncharacteristically low fish abundance in both streams, but particularly Lakey Creek.

CATRE-180, Cat Creek at lower end of Equinox Environmental restoration site:

Prior to about 2005 Cat Creek was arguably the most heavily impacted non-urban stream in the upper Little Tennessee watershed, with routinely Very Poor Bioclass ratings. At that time, the State of North Carolina acquired a large portion of the riparian lands and, with Equinox Environmental, initiated an ambitious program of stream restoration. CATRE-180 was established to track that restoration, beginning in 2011. Physical improvement is obvious and is reflected in rising saSVAP scores. Benthic macroinvertebrate samples (discontinued in 2014) suggested improvement and there were clear improvements in IBI through 2015.

However, in 2017 and again in 2019, while the condition of the channel and riparian buffer continued to improve, the IBI and many of its components showed a sudden and drastic decline, reflected in:

- Decline in observed value and score for 5 of 8 IBI metrics, including catch per unit effort.
- Significant increases in proportional abundance of 4 tolerant and/or omnivorous fish species.
- Parallel decreases in proportional abundance of 4 benthic and/or insectivorous species.

All indications point to toxic pollution, perhaps from agrochemicals. This site clearly merits further investigation.

OTHER RESTORATION (INCLUDING BARRIER REMOVAL) SITES

PEEPC-176, Peeks Creek along Peeks Creek Rd.

PEEPC-176 qualifies as a “restoration” site if we consider Nature to be the agent of restoration. In 2004 Peeks Creek was devastated by a debris flow which completely eliminated fish and crayfish from the stream, while grossly altering the habitat. In 2019, we verified that the fish assemblage had returned to its original equilibrium through fish and saSVAP monitoring. The results, now being prepared for publication as a scientific paper, support our 2014 conclusion and may provide a valuable lesson in restoration planning.

LICNE-511, Licklog Creek above Needmore Rd.

This site was sampled in 2018 as follow-up to a fall, 2017 sample which documented the success of culvert replacement to remove a barrier to upstream fish movement at the very lower extreme, on Needmore Road. At that time we documented the first records of spotfin chub for Licklog Creek, along with large numbers of whitetail shiner. While in the summer sample we did not expect or take spotfin chub, the results of the fall 2017 and summer 2018 document occupancy by 12 native fish species vs. 6 in two previous samples (2006 and 2008).

WALPG-199, Walnut Creek at Highlands Rd. and at Pine Grove Baptist Church

In the service of evaluating a barrier removal project, in 2019 we established this site on Walnut Creek, where we removed a barrier to upstream fish movement in 2017. Although the purpose was not to calculate an IBI, an IBI protocol was followed, and scored slightly better than the previous IBI (both Fair). The real news is documentation of 4 species new to Walnut Creek above the former barrier, including large numbers of young-of-the-year warpaint and Tennessee shiners, indicating successful reproduction. This tends to validate both investment in barrier removal and Mainspring's discovery of the importance of fall migration into tributaries by cyprinids.

WATAC-051, Watauga Creek above new bridge at John Brown farm

Replacement, in 2010 of a failing culvert on a private farm road which was acting as a partial barrier to fish movement while impeding sediment flushing and threatening catastrophic failure, has brought biological benefits while functioning as a win-win from the landowner's point of view. IBI has increased from the lower range of Fair to a low Good, while the abundance of benthic fish and the proportion of darters to sculpins among the benthics has increased, as demonstrated by the 2019 data.

CRAPA-064, Crawford Branch at Franklin Memorial Park

Especially since completion of a Mainspring-supported restoration project in 2015, this has become a quasi-fixed station. 2019 marks the highest ever IBI and saSVAP scores here (but bioclass rating remains in the Poor range). Also, for the first time, in 2019, the benthic macroinvertebrate sample produced specimens of Plecoptera. On the one hand the disastrous condition of this quintessentially urban stream above and below the park limits what can be gained, but on the other we can be proud that an eyesore has been converted to an attractive stretch of creek exemplifying Shade Your Stream principles as well as a marvelous teaching resource.

SUTMO-148, Sutton Branch at Rabun Gap-Nacoochee School

A farm road which crossed at the lower end of the site has been abandoned and its culvert is partially blocked and unattended. Coupled with periodic occupancy by beavers this has caused a massive sediment buildup. IBI has dropped from 41 (Fair) in 2004 to 33 (Poor) in 2018 owing both to sedimentation and blockage of interchange with Betty Creek a few hundred yards downstream. This experience underlines that restoration should imply maintenance.

ADDITIONAL SITES

IOTRC-565, Iotla Creek at the corner of Bennett and Rose Creek Roads

This site, on probably our worst quality major tributary, was done mainly to get supplementary data for a scientific paper we are working on, linking extent of upper watershed forest cover to IBI at downstream sites. As expected, it scored Poor on both the IBI and saSVAP indices, with a single invasive exotic species, yellowfin shiner, comprising 49% of the fish sample.

LTRIB-042, Little Tennessee River at Iotla Bridge

In 2018, this mainstem site was prioritized by TVA, on a rotation basis. As is our custom, the Mainspring team provided assistance. The site lived up to normal expectations, with an IBI of 52 in the middle of the Good bioclass range.

NPRST-196, North Prong Ellijay Creek above Ellijay Creek at Little Ellijay

This site, last monitored in 2015, was repeated in 2019 primarily in order to provide an educational experience for several committed volunteers, as well as encouragement to an enthusiastic cooperating landowner. The Good IBI score (51) and fair saSVAP (2.8) reflect the interaction of high quality water from a sparsely populated, heavily forested upstream watershed with localized habitat impacts (historic channelization, nearby sediment sources).

TWO GENERAL NOTES WHICH MAY AID IN INTERPRETATION OF RESULTS

- The winter-spring seasons of 2017-2018 and 2018-2019 were characterized by almost continual high flows (but largely without flooding), which probably resulted in involuntary displacement of small, young and weak swimming fish. One result has been nearly uniformly low catch rates throughout the watershed.
- With presumptive future changes in water temperature we are entering uncharted territory. There is suggestive evidence that we are seeing a gradual upstream shift in distribution by some “warm water” species, such as smallmouth bass, yellow perch and rock bass. Rock bass are considered an intolerant species for purposes of IBI. But if native rock bass begin to replace non-native trouts in headwater streams is this an improvement? Perhaps more interesting is the suggestion of an upstream shift in occupancy by some of the darters, particularly greenfin darter. Darters are omitted from the IBI metrics for our smaller streams (watershed areas <7 sq. mi.), but the limiting factor may not be stream volume, but rather temperature. Are they then to be considered in the category of “native invasives” as defined by Mark Scott and Gene Helfman? Attempting to answer this type of question is crucial to our being able to continue to provide quality service to the public.