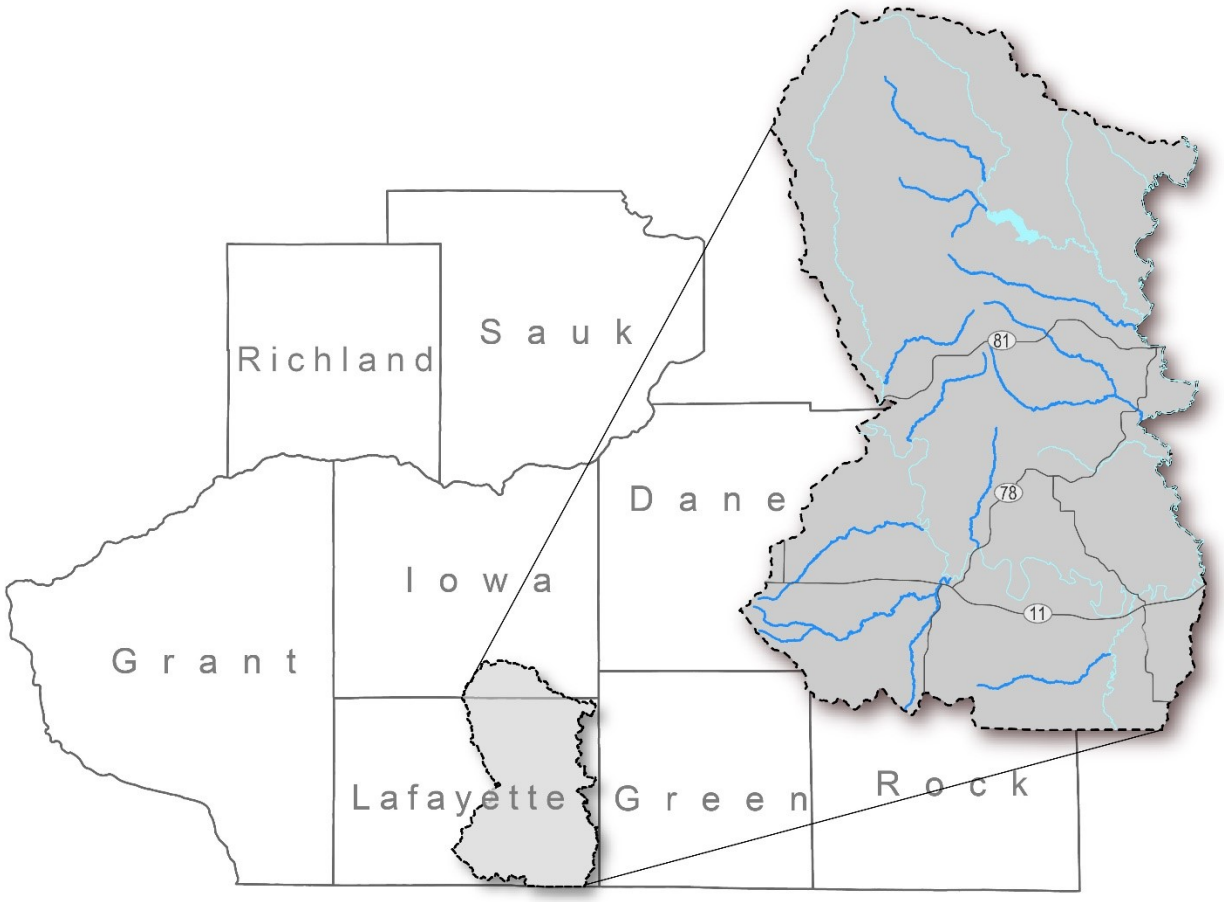
WISCONSIN DEPARTMENT OF NATURAL RESOURCES

Trout Status and Management in the Pecatonica River Basin of Lafayette County

Lafayette County, 2022



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Executive Summary

The trout streams of the Pecatonica River Basin in Lafayette County are a lesser-known trout resource in Southwest Wisconsin. These 13 relatively isolated trout streams are scattered throughout four agriculturally-dominated watersheds (East Branch Pecatonica, Ames Branch – Pecatonica, Spafford Creek – Pecatonica, and Yellowstone River) situated in the eastern half of Lafayette County. These streams contain primarily brown trout populations as well as one brook trout population. All of these trout streams are stocked Class II trout streams, but little is known about the background natural productivity in these populations.

In summer of 2022, DNR staff performed wadeable fish and habitat surveys at 43 locations, distributed in 13 designated and 4 potential trout streams. In general, we found that brown trout catch per unit effort (CPUE; an index of abundance) was extremely low and age-class diversity was limited in all surveyed streams. This low abundance was especially apparent for adult brown trout, where abundances from all streams were considered less than fishable (CPUE < 50 fish/mile). We also found at least three streams (Lovett Creek, Gravel Run Creek, Silver Springs Creek) contained no brown trout. Two streams (Canon Creek, Brown Branch) contained remnant brown trout at such a low abundance (1-2 fish caught), it would not be considered a functional population.

Brown trout exhibited limited recruitment and relative abundance in streams. Age-0 brown trout were only found in two streams (Wolf Creek, Apple Branch). Although natural reproduction of age-0 was limited, 69% of streams were found to contain age-1 fish. The age-1 brown trout abundance observed among streams was very low (age-1 CPUE range = 0.0-34.8 fish/mile). Based on overall distribution and low catch rates of both age-0 and age-1 brown trout, it is evident that the natural reproduction and recruitment was minimal and sporadic. Similarly, the survival of stocked large fingerlings to the adult population was also limited based on poor adult abundance (adult CPUE range = 0.0-36.6 fish/mile). After observing and quantifying widespread habitat limitations such as sedimentation and elevated water temperatures, it became more obvious why brown trout population characteristics were so poor.

Steiner Branch is the only stream with brook trout in Lafayette County and it is also the best performing trout population in the county. Trends in total brook trout relative abundance show that CPUE was high (587-822 fish/mile) during 2010-2012 and then declined in 2013 (247 fish/miles), but from 2013-2022 brook trout CPUE steadily increased and nearly tripled by 2022 (706 fish/mile). During that time period, adult brook trout relative abundance was considered good (>50th percentile for Class I streams in the Driftless Area) in 12 of 13 years and has always been considered fishable. Surprisingly, in 2022, adult brook trout CPUE showed noticeable decline, yet at the same time there was a substantial increase in age-0 CPUE. Based on evidence of consistently suitable environmental conditions for brook trout (flow, temperature, habitat quality, low brown trout abundance), there was no obvious explanation for

declines in adult brook trout. Even with increased signs of beaver activity and some other habitat limitations, the increase in brook trout natural reproduction and overall abundance suggests that these current habitat issues may not be problematic for brook trout. Nonetheless, future habitat improvements and beaver management should be considered in the Steiner Branch to ensure the future success of brook trout.

With the exception of Steiner Branch, our results indicated the trout resources in Lafayette County were extremely limited. Brown trout abundances did not meet the minimum fishable population standard (adult CPUE > 50 fish/mile) both in this assessment and in previous surveys in the last 20 years, indicating that stocking has not been effective in these streams. Additionally, the habitat characteristics and coldwater biotic integrity indicated that many of these streams lack suitable habitat for trout. Based on the low trout abundances and lack of suitable habitat conditions, several major management actions are recommended including discontinuing brown trout stocking and declassification of six trout streams. The remaining classified trout streams should continue to be monitored, with future assessments focused on habitat and biotic integrity before considering resumption of trout stocking.

MANAGEMENT RECOMMENDATIONS

- Goal: Increase and maintain the abundance of age-1 and adult brook trout in Steiner Branch.
- Goal: Maintain abundance of adult brook trout in Steiner Branch for fishing opportunities.
- Declassify Silver Springs Creek, Gravel Run Creek, Brown Branch, Lovett Creek and Cannon Creek.
- Discontinue brown trout stocking all Lafayette County streams.
- Maintain brook trout stocking and monitor contribution of marked hatchery brook trout in Steiner Branch for duration of genetics restoration experiment.
- Deploy temperature loggers prior to the next assessment to better evaluate thermal habitat in remaining classified trout streams.
- Continue beaver management on Steiner Branch.
- Plan and perform brook trout specific habitat improvement work in the Steiner Branch.
- When practical, work with DNR partners to encourage private riparian landowners to engage with watershed conservation groups and implement conservation practices in streams without streambank easements acquisition authority.

WATERSHED LOCATION

- Yellowstone River Watershed (10-digit hydrologic unit code or HUC 10: 0709000307), Iowa and Lafayette Counties

- East Branch Pecatonica River Watershed (i.e., Lower East Branch Pecatonica River Watershed; HUC 10: 0709000308), Lafayette County
- Spafford Creek-Pecatonica Watershed (i.e., Lower Pecatonica Watershed; HUC 10: 0709000309), Lafayette County
- Ames Branch-Pecatonica River Watershed (i.e., Middle Pecatonica River; HUC 10: 0709000303), Lafayette County

PURPOSE OF SURVEY

- Assess current status and trends of trout populations in designated trout streams, including:
    - Natural reproduction of age-0 trout
    - Natural recruitment of age-1 trout
    - Adult trout abundance
- Assess trout potential in unclassified trout streams.
- Assess current status of fish biotic integrity and fish habitat in designated trout streams.
- Utilize this assessment to make recommendations for trout stream management:
    - Trout stream classification
    - Stocking practices
    - Fishing regulations
    - Habitat management

DATES OF FIELDWORK

June 2022 – September 2022.

SPECIES SAMPLED

- American brook lamprey
- Banded darter
- Black bullhead
- Blackside darter
- Bluntnose minnow
- Brassy minnow
- Brook stickleback
- Brook trout
- Brown trout
- Central mudminnow
- Central stoneroller
- Common carp
- Common shiner
- Creek chub
- Fantail darter

- Fathead minnow
- Golden shiner
- Green sunfish
- Hornyhead chub
- Johnny darter
- Largemouth bass
- Mottled sculpin
- Northern pike
- Rosyface/Carmine shiner
- Shorthead redhorse
- Smallmouth bass
- Southern redbelly dace
- Spotfin shiner
- White sucker

Introduction

The trout streams of Lafayette County are found throughout the eastern half of the county in four adjacent watersheds which drain into the East or West Branches of the Pecatonica River. The majority of these cold- and coolwater streams are fairly isolated from each other, where they are separated by considerable distance or by fish movement barriers (e.g., dams and miles of warmwater habitat). Only a few trout waters are directly connected to each other within a drainage network. These small, connected stream networks include Apple Branch and Whiteside Creek; as well as Wolf Creek, its unnamed tributary (WBIC 5041728) and Trout Brook. Beyond these smaller trout stream networks, most trout streams are single-channel streams, isolated within a larger warmwater stream network.

The trout streams of this area are situated in the unglaciated Driftless Area landscape known as the Southwest Savanna, which covers nearly all of the county. The Southwest Savanna Landscape is typically characterized by its prairies and agricultural fields spread across broad ridgetops and its dissected forested valleys which contain highly dendritic networks of rivers and spring streams (DNR 2015). The trout streams of Driftless Area are known to have a relatively high gradient and elevational relief. Surprisingly, the streams in the Pecatonica River Basin often exhibit less elevational relief (Piening et al. 1967).

The karst bedrock geology of the Southwest Savanna Landscape is characterized by sandstone, carbonate and shale formations. This type of geological landscape is known for its abundant groundwater and karst features. Springs are the most notable karst features on the landscape, which pertains directly to trout streams. Springs and other groundwater seepage inputs have an overwhelming influence on trout population carrying capacity, since groundwater regulates streamflow and water temperature, and provides the stream with alkaline-rich water. The Southwest Savanna has 2,549 documented springs, and the highest density of springs in Wisconsin compared to any other Ecological Landscape (Macholl 2007). Therefore, it is no surprise that this spring-rich landscape has the potential to support numerous trout streams.

Like many other Driftless Area trout streams of the Southwest Wisconsin, Lafayette County trout streams have experienced considerable impacts from historical and contemporary land use. Historically, the natural landscape of Southwestern Wisconsin was transformed for agricultural, timber harvest, mining and other land use purposes once European settlers became established (Piening et al. 1967). Farmers plowed up grassland, drained wetlands and channelized streams to cultivate the land. The most notable impacts to streams in this area were related to upland soil erosion, where massive erosion events were the result of poor practices of cultivating hillsides and ridges (Vondracek 2019). This eroded upland soil ended up in floodplains and streams causing numerous habitat issues such as sedimentation, bank aggradation and subsequent floodplain disconnection. As a result, many

streams became entrenched and further degraded (Melchior 2019). Ultimately, all of these historic landscape stressors contributed to habitat degradation, as well as the decline and local extirpation of many native coldwater and coolwater fish species distributed throughout Southwestern Wisconsin, prior to European settlement (Behnke 2002).

In the last 20 years, Lafayette County trout streams have shown some signs of improvement, yet many streams are still impaired. High land use stress has been long recognized as the greatest limitation to fish habitat trout and smallmouth bass streams within the Pecatonica River Basin (DNR 2013). The Southwestern Wisconsin Regional Planning Commission (SWWRPC 2015) recently identified the most prominent land use impacts to Lafayette County streams to include cropland erosion, nonpoint runoff, direct barnyard runoff, and intensive streambank pasturing. These land use impacts have resulted in poor water quality, sedimentation issues, altered flow regimes, bank destabilization and channel degradation (SWWRPC 2015). During the last 15 years, Amrhein (2009, 2011, 2020) identified numerous biological and water quality impairments of varying extents in Lafayette County trout streams. Some trout populations have fared better than others, but the trout population issues that Amrhein (2009, 2011) found suggested the need for continued monitoring to triage future trout management efforts if streams were failing to support trout.

Lafayette County trout streams may not have the notoriety compared to other fisheries in the Pecatonica Basin, but it does have 13 Class II trout streams containing 84 miles of stream length. These streams contain a mix of wild and stocked brook trout and brown trout populations. Prior to European settlement, coldwater streams in Lafayette County likely contained native brook trout (Behnke 2002; J. Lyons, personal communication), but were extirpated from the landscape. Since that time, brook trout have been reintroduced to landscape. Brown trout were also widely introduced on the landscape at this time and appeared show more success than some of the initial brook trout stockings. Rainbow trout were also introduced this stocking at this time but performed poorly compared to brook and brown trout.

Brook trout and brown trout populations have shown some evidence of natural productivity in Lafayette County streams, yet natural reproduction and recruitment has always been limited. Because of the suspected bottlenecks in natural reproduction and recruitment, stocking has been necessary in attempts to sustain trout populations in Lafayette County. DNR maintenance of trout populations via annual stocking has been common practice in Lafayette County since the 1960s. At the time, the marginal nature of Lafayette County trout streams was a main impetus for continuing trout stocking efforts (Piening et al.1967) instead of discontinuing stocking due to poor habitat. In the last 20 years, the DNR continued to find underperforming populations of stocked trout due to habitat limitations (Amrhein 2004, 2009, 2011, 2020). In many of these streams, Amrhein (2009, 2011) questioned the cost-effectiveness and efficiency of stocking trout, due to their poor recruitment and carryover in streams with obvious impairments (Amrhein 2009, 2011).

Not all trout populations in the larger Pecatonica River Basin have shown signs of problems. Several stocked trout populations have shown noticeable improvements because of watershed and riparian land protections as well as the implementation of habitat improvements and land conservation practices (Amrhein, 2020; Haglund 2022). Notable examples of this include the trout populations in Steiner Branch, Williams-Barneveld Creek and East Branch of Pecatonica River. The periodic monitoring efforts of these specific trout populations continue to demonstrate that trout populations can perform well in this basin if appropriate management actions are performed to protect and enhance habitat and water quality.

CURRENT STATUS

STOCKING

As mentioned earlier, Lafayette County trout streams have always required stocking due to limited natural reproduction and recruitment of these trout populations (Table 1). Currently, the primary stocking strategy is “put-and-grow” stocking to maintain fishable levels of adult trout abundance. Restoration and research stocking strategies have also been implemented but these are limited the efforts to reintroduce and conserve brook trout populations. In the past, trout streams were primarily maintained by stocking small fingerling trout. By 2018-2020, the DNR switched to stocking large fingerlings due to improved survival and contribution to trout populations.

Prior to this assessment, trout stocking occurred in eight classified trout streams and one unclassified stream (Tables 1-2). Annual put-and-grow stocking of brown trout was occurring in Canon Creek, Whiteside Creek, Mud Branch, Wolf Creek, Trout Brook, Copper Creek and Lovett Creek. At the same time, annual stocking of brook trout was occurring in Steiner Branch and the unnamed tributary (UNT; WBIC 907000) to the East Branch Pecatonica River. Put-and-grow brook trout stocking has occurred in the Steiner Branch since the late 90s, but as of 2021, this annual stocking became part of a genetics restoration experiment and will be evaluated in 2027. Beyond this brook trout research stocking, brook trout restoration stocking occurred in the unclassified UNT (WBIC 907000) to the East Branch Pecatonica River, which was initiated in 2020. Although most of the active trout management in Lafayette County includes stocking, not all designated trout streams are being stocked. In 2014-2018, brown trout stocking was discontinued in Gravel Run Creek, Silver Spring, Apple Branch and Brown Branch due to marginal habitat limiting the survival stocked fish (Amrhein, 2011). Habitat suitability for trout will need to be further assessed in these streams before brown trout stocking is considered in the future.

REGULATIONS

There are two trout regulations in the Lafayette County. All streams, except for Steiner Branch, adhere to the county base regulations where anglers may harvest

three trout of any species in a day, that is at least 8 inches or greater (Table 1; Figure 2). Steiner Branch utilizes a special regulation, where all trout caught shall be immediately released to the stream after capture. This catch and release regulation was initially implemented to protect the limited trout resource in this easily accessible stream. All designated trout water adheres to the Regular Open Harvest Season (First Saturday in May to October 15) and Early Catch-and-Release Season (First Saturday in January to the first Saturday in May).

HABITAT IMPROVEMENT

Various waterway protection activities have been implemented in Lafayette County trout streams including the installation of fish habitat structures, integrated bank treatments, rip-rap projects, wetland restorations and culvert replacements. Only a handful of fish habitat improvement projects have been implements in trout streams compared to bank stabilization projects. Bank stabilization projects have occurred on nearly all trout streams in Lafayette County and most often utilize riprap to armor banks (DNR Permit data; Hanson 2019). Past fish habitat management practices have been implemented in Steiner Branch, Canon Creek, Lovett Creek, Mud Branch, Copper Creek and Whiteside Creek (Table 1). Many of these projects have included a combination of bank stabilization work and fish habitat improvements. Portions of the Steiner Branch have implemented significant habitat improvement in the early 2000s, which included bank stabilization and brushing treatments, as well as the installation of rock vortex weirs, instream boulders and lunker structures. The work on the Steiner Branch proved to be successful in producing consistent fishable brook trout populations (Amrhein 2020, Hanson 2019).

Not all stream alterations were as successful as Steiner Branch. For instance, a 2001-2002 habitat project was installed in Mud Branch, which resulted in minimal success. Specifically, lunker structures and riprap were installed on a private reach of Mud Branch above CTH G, with a goal to reduce erosion, improve trout populations and habitat (Amrhein 2009; DNR 2011). Unfortunately, this only resulted in a minimal increase in trout numbers and poor coldwater index of biotic integrity (IBI) scores when the Mud Branch was evaluated in 2003 and 2007 (Amrhein 2009). The success or failure of other instream habitat improvements in Lafayette County trout streams (Table 1) have not been well documented, so little is known about the effectiveness of habitat treatments in other streams.

PUBLIC ACCESS

Trout water in Lafayette County can be primarily accessed at bridge crossings within the public Right-Of-Way on public roads. To a lesser extent, trout streams can also be accessed via streambank easements and public land. Although DNR streambank easements and public land are less common in Lafayette County, several public access options are available in streams. Streambank easements can be found along Canon Creek, Lovett Creek and Gravel Run Creek (Figure 3). Beyond streambank easements, Yellowstone State Wildlife Area can be used to access Steiner Branch. The

only other available trout stream access opportunity is the local park connected to the lower reaches of Wolf Creek, which is managed by the Village of Gratiot. DNR property master planning in the Southwest Savanna landscape identified several streams for potential streambank easement acquisition in the future. Canon Branch, Yellowstone River and Apple Branch are eligible for future streambank acquisition for public access and riparian protection. Additionally, any future acquisition of adjacent Fee-Title land to expand the Yellowstone Wildlife Area within its project boundary could also expand public access and riparian protections for the Steiner Branch.

LAND USE

The land cover in these four Pecatonica River watersheds is dominated agricultural land use (Table 3). Agriculture makes up 76.1-86.8% of area in these watersheds, which is a combination of pasture (23.2-40.7% of watershed coverage) and cultivated crop (31.3-63.3% coverage) land uses. Beyond agriculture, the second most dominant watershed land cover was forest (7.4-20.9% coverage), which tends to be primarily Deciduous. Other natural land cover in these watersheds includes wetland (0.2-2.3% coverage), perennial water (0.4-1.2% coverage) and grassland cover (0.1% coverage). The remaining land cover in the watershed reflects impervious land use, which is developed (4.3-5.3% coverage) and barren land cover (0.0-0.1% coverage, e.g., quarries and mines).

WATERSHED SCALE ASSESSMENT AND TROUT CLASSFICATION

Understanding reproduction and recruitment is critical to managing trout populations. In Class I streams, as defined in NR 1.02, there is no need for stocking because there is adequate natural reproduction and recruitment to maintain the fishery. Class II streams differ, since they have insufficient natural reproduction and recruitment to maintain a fishable population. Still, Class II streams have the habitat and resources allowing trout to survive to adult ages. If needed, the DNR will stock Class II streams with fingerling trout to maintain adult abundances. Often, based on the life history strategy of trout, reproduction occurs in stream segments that differ from juvenile and adult habitat types. Natural reproduction is the presence of age-0 fish, which may be more variable in their catchability to electrofishing and may occur upstream in nursery habitats. Natural recruitment is defined by juvenile fish surviving to age 1. Documenting the lack of natural reproduction does not necessarily mean there is a lack of natural recruitment. It means that recruitment may not always occur in the same habitat or connected stream as natural reproduction. Hence, why the DNR uses watershed scale assessments to properly classify trout populations and evaluate population status and management.

Methods

SURVEY DESIGN

These assessments were designed to assess trout streams and potential trout streams within one or more adjacent watersheds (i.e., a trout management planning group) on a 6-year rotation. This watershed-based assessment approach is a cost-effective and biologically meaningful way to assess all designated trout water in Southwest Wisconsin. Within each planning group, survey stations (sites) were allocated based on the length of classified trout streams to adequately characterize all trout populations and habitat. To assess natural reproduction and recruitment in streams, all stocking of fingerling trout (if occurring) was suspended the year prior to these surveys. Stocking will commence again following the completion of the assessment.

SURVEY EFFORT

Trout populations are surveyed during summer baseflow conditions using DNR wadeable stream survey protocols (Simonson 2015). Using this protocol, two types of wadeable electrofishing gear were deployed to sample fish populations and assemblages. Tow-barge electrofishing units with 2-3 DNR staff, equipped with 1-3 probes and 1-3 dip nets (0.125-inch mesh) were used for larger wadeable streams with mean channel width ≥ 3 m. In smaller streams with mean channel width < 3 m, a backpack electrofishing unit with 1 probe and 1 dip net were used. The distance sampled was a minimum of 35 times the mean channel width, except a minimum distance of 100 m was sampled in survey stations with mean stream width < 3 m. At each station, single-pass electrofishing was performed in an upstream direction. All fish encountered were netted and placed in a live-well for processing. All sampled fish were identified to species, enumerated and total length (TL) of gamefish were measured to the nearest 0.1 inch. Fish were returned to the stream immediately after data were collected.

Fish habitat and other environmental data were collected on site either immediately before or after the fish survey to reflect real-time habitat conditions experienced by the fish surveyed. At each survey station, mean wetted channel width, streamflow, water temperature, specific conductivity and dissolved oxygen concentration were collected following DNR standard wadeable survey protocols (Simonson 2015). Streamflow was measured at one transect of each survey station using a HACH FH950 handheld flow meter with survey rod. Water temperature, dissolved oxygen, and specific conductivity were collected using a handheld YSI Pro 2030 meter. We also performed a rapid wadeable qualitative stream habitat assessment to calculate a stream habitat rating, which provided a useful index describing current habitat conditions for fish. For more details on the habitat methods or the DNR Wadeable Stream Qualitative Fish Habitat Rating System (see Simonson et al. 1994).

Regardless of survey type, all wadeable fish and habitat survey protocols were performed in a consistent manner. This was done so that survey data could be compared among trout trend, trout rotation or trout potential surveys. Some

additional information was collected during trend surveys, but those data were not considered in this assessment.

DATA ANALYSIS: TROUT POPULATIONS, HABITAT AND BIOTIC INTEGRITY

The status of trout streams and trout populations was characterized using a suite of fish population, fish assemblage (i.e., fish IBI) and habitat metrics calculated using survey data. We also obtained various land cover, modeled water temperature and modeled streamflow variable from the DNR Stream Natural Community Model within the 24K – Value Added Hydrography Dataset (DNR 2014, https://arcg.is/15jXaH) and through Stroud (2021). These data were geoprocessed through Geographic Information Systems (i.e., ArcGIS Pro; ESRI 2021).

Catch per unit effort (CPUE) metrics were calculated as the number of fish captured per mile of electrofishing to index the relative abundance of brook trout and brown trout. Trout CPUE data were apportioned out by specific length ranges representing the relative abundance of specific age and size class demographics of brook and brown trout. Brook and brown trout natural reproduction and recruitment were described by calculating Age-0 (< 4 inches for both species) and Age-1 (brook trout = 4-6.9 inches, brown trout = 4-7.9 inches) CPUE, respectively. Adult trout abundance is indexed by calculating brown trout CPUE ≥ 8 inches and brook trout CPUE ≥ 7 inches. We also calculated the CPUE of preferred-size trout (brown trout ≥ 12 inches; brook trout ≥ 10 inches) to describe the relative abundance of larger trout. Each CPUE metric was initially calculated for each survey station and then summarized by stream to calculate mean stream CPUE. Mean stream CPUE metrics were compared to Driftless Area catch rate distributions for Class I trout streams to qualify abundance for a particular age or size group, as follows: Percentile ranges of 0-24 (poor or low abundance), 25-49 (fair or low-moderate abundance), 50-74 (good or moderate-high abundance), and 75-100 (excellent or high abundance). Stream-specific mean CPUE values of each grouping were also compared among all streams surveyed in this watershed assessment. For trend surveys, station-specific annual trout CPUE were compared among years within a time-series.

Coldwater fish index of biotic integrity (IBI) was calculated to further describe habitat and water quality conditions in trout streams. Trout CPUE metrics can provide valuable insight into the health of cold- and coolwater stream habitats, but coldwater fish IBI scores can provide a more holistic perspective about environmental conditions, especially when trout population data are lacking. In the absence of high-resolution temperature data, coldwater IBI can also provide reasonable inference about thermal suitability for trout, since the coldwater fish IBI is notably sensitive to elevated water temperature, unlike other IBI values (Lyons 2012). Fish IBI is calculated using species composition data collected during standard DNR wadeable electrofishing surveys. The surveyed fishes are aggregated into metrics based on ecological and biological similarities (e.g., environmental tolerance, thermal habitat, spawning needs), which are then used to calculate IBI scores. See

Lyons et al. (1996) and Lyons et al. (2009) for more information. Fish IBI scores range from 0 (poor) to 100 (excellent) biotic integrity. All IBI scores were calculated at each survey station and were then summarized by stream as a mean IBI score. Mean IBI scores could be compared among streams and watersheds.

Fish habitat in trout streams was assessed using the DNR Wadeable Stream Qualitative Fish Habitat Rating System. As previously mentioned, several specific habitat parameter scores (e.g., width to depth ratio, pool prevalence, riparian width, etc.) were evaluated on site and added together to calculate the overall habitat score at each survey station. For more information about the specifics of the Fish Habitat Rating System, see Simonson et al. (1994). Qualitative habitat scores for survey stations were then summarized by stream. Stream-specific mean habitat scores were then compared among streams and watershed. Stream habitat quality ratings provide an interpretation of the overall habitat status in streams. Qualitative habitat scores can be rated as either Poor (0-24), Fair (25-49), Good (50-74) or Excellent (75-100).

We also characterized streamflow and thermal habitat to further assess fish habitat. To do this, we assembled water temperature (°F) and streamflow data (cubic feet per second or CFS) measured during this assessment as well as flow and thermal regime data from the DNR Streams Natural Community Model (NCM) dataset. The DNR streams (NCM) dataset contains numerous variables that describe the long-term flow and thermal conditions for all Wisconsin streams (available on the DNR Surface Water Data Viewer: https://dnrmaps.wi.gov/H5/?viewer=SWDV). The data from the NCM are model-derived estimates based on 10-30 years of flow and water temperature data. To describe thermal habitat conditions, we first compared measured water temperatures to the upper limits of trout thermal preferences (≤63.7°F for brown trout; Jobling 1981; Dieterman and Mitro 2019). We also compared measured water temperatures and maximum daily mean water temperatures (maximum temperature from 1990-2008; DNR streams NCM) to thermal class thresholds for coldwater (≤69.3°F) and cold-coolwater habitats (≤72.7°F; Lyons et al. 2009). Next, we assessed how our streamflow measurements compared to normal summer baseflows (i.e., August 50% exceedance flow from 1983-2011; DNR streams NCM) to describe habitat availability from groundwater during wet or drought periods. Percentages of normal summer baseflow greater than 90% indicate stable or higher than normal groundwater inputs (i.e., sufficient streamflow and habitat availability), whereas percentages less than 90% may indicate lower than normal flows, potentially due to drought-like conditions (i.e., low groundwater contribution to streamflow and less habitat availability).

Results

During the summer of 2022, DNR staff performed 43 wadeable stream surveys to collect fish and habitat data throughout four HUC-10 watersheds within the Pecatonica River Basin, Lafayette County (Figure 3; Appendix 1). Thirty-nine watershed

rotation surveys (including one trend survey) were conducted on 13 classified trout streams. Four trout potential surveys were conducted on 3 streams with potential trout water.

TROUT POPULATION STATUS

WATERSHED TROUT POPULATION ASSESSMENT

We sampled a total of 120 brown trout during electrofishing efforts performed in 39 surveys distributed across the 13 classified trout streams in Lafayette County during summer of 2022 (Appendix 2). Brown trout were detected in 40% of survey stations and occurred in 10 of the 13 streams. Streams with no trout observed included Silver Spring Creek, Gravel Run Creek and Lovett Creek. Canon Creek, Brown Branch, and Copper Creek had very low catch rates and only a few individual trout were collected.

Brown trout natural reproduction was virtually nonexistent in most streams. Age-0 fish were very rare and only occurred in 5% of survey stations, which were all located in Apple Branch and Wolf Creek. Mean stream CPUE of Age-0 brown trout in streams varied 0.0-89.4 fish/mile (Table 5; Figure 4). Age-0 brown trout relative abundance was considered "Poor" (< 25th percentile) for all streams except Apple Branch, where Age-0 relative abundance was considered "Fair" (25th-50th percentile).

Surprisingly, age-1 brown trout occurred in most streams, yet overall recruitment was extremely low. Age-1 brown trout were sampled in 35% of survey stations and occurred in 9 streams (Table 5; Figure 5). Mean CPUE of Age-1 brown trout in streams varied 0.0-34.8 fish/mile. The relative abundance age-1 brown trout was considered "Poor" (< 25th percentile) in all streams.

When present, adult (≥ 8 inches) brown trout numbers were low, with few instances of preferred size (≥ 12 inches) fish. Adult brown trout were surveyed in 28% of survey stations and were present in 7 streams (Table 5; Figure 6). Mean CPUE of adult brown trout in streams varied 0.0-36.6 fish/mile. No stream exhibited a relative abundance exceeding the 25th percentile standard for the Driftless Area, which means adult brown trout relative abundance was considered "Poor" for all streams. Preferred size brown trout were rare and were only found in 10% of survey stations, including Mud Branch, Wolf Creek and the Unnamed Tributary to Wolf Creek (WBIC 919600). Mean CPUE of preferred-size brown trout in streams varied 0.0-7.3 fish/mile (Table 5; Figure 7). All streams exhibited a "Poor" status for preferred-size brown trout relative abundance, because CPUE values were less than the 25th percentile.

Our assessment of brook trout populations in Lafayette County was considerably different compared to brown trout, since brook trout only occurred in Steiner Branch. We were able to sample 155 brook trout in Steiner Branch and were able to detect brook trout at various life stages in all 4 survey stations of the stream. Age-0 brook trout were ubiquitous throughout the stream. Steiner Branch exhibited a mean Age-0 brook trout CPUE of 228.3 fish/mile (CPUE range = 9.7-629.0 fish/mile), which was

considered “Good” because CPUE was between the 50th-75th percentile for the Driftless Area. Age-1 brook trout were only detected in two survey stations in Steiner Branch. Mean age-1 brook trout CPUE was 15.6 fish/mile (0.0-34.0 fish/mile) and was considered “Poor” (< 25th percentile) compared to Driftless Area benchmarks. Adult brook trout were also found in only two survey stations of Steiner Branch. Mean adult brook trout CPUE was 15.6 fish/mile (0.0-51.0 fish/mile), which was considered “Poor” (< 25th percentile). Preferred-size brook trout were only found in one site of Steiner Branch with a CPUE of 1.4 fish/mile (0.0-5.7), also considered to be “Poor”.

TROUT POPULATION TRENDS

Brook trout relative abundance was quite variable during 2010-2022, yet notable population trends were identified. In general, total brook trout CPUE was high in 2010-2012 and then declined sharply in 2013, but from 2013-2022 total brook trout CPUE exhibited a gradual increase (Figure 8). Both adult and preferred-size brook trout maintained a CPUE ≥ 50th percentile CPUE standard (i.e., adult CPUE≥ 80.5 fish/mile and preferred size CPUE≥ 18.1 fish/mile) during 2010-2021. From 2017-2022, both adult and preferred-size brook trout CPUE declined and eventually fell below the 50th percentile CPUE standard by 2022. Age-0 brook trout CPUE tended to remain at low levels during 2010-2018. Then during 2018-2022, Age-0 CPUE increased and eventually exceeded the 50th percentile CPUE standard (≥ 128.7 fish/mile) in 2021-2022. Age-1 brook trout CPUE was generally low and only exceeded 50th percentile CPUE standard in 2010 and 2012. In general, age-1 brook trout exhibited its highest CPUE during 2010-2015 and then declined during 2016-2022, exhibiting CPUE values lower than the long-term median value (CPUE < 28.3 fish/mile).

Compared to brook trout CPUE trends, brown trout were always less abundant in the Steiner Branch. During 2010-2012, total brown trout CPUE was at its highest level (CPUE = 372-511 fish/mile), but then declined to lower levels (CPUE = 40-207 fish/mile) during 2013-2022 (Figure 9). In 2020, there was a slight increase in total brown trout CPUE, but CPUE declined in 2021-2022. In general, trends in age-0, age-1, adult and preferred-size brown trout CPUE tended to correspond to the overall total brown trout CPUE trend. Specifically, age-1, adult and preferred-size brown trout CPUE values tended exceed the 50th percentile benchmark during 2010-2013, but then rarely attained this benchmark during 2014-2022, when CPUE remained low for these age- and size-groups. Age-0 brown trout CPUE never exceeded the 50th percentile benchmark (CPUE ≥ 129 fish/mile) during the entire time period and only exceeded the 25th percentile benchmark (CPUE ≥ 46 fish/mile) in 2012, 2019 and 2020.

TROUT POTENTIAL SURVEYS FOR NEW CLASSIFICATION

Four trout potential surveys were performed in three streams with suspected trout populations in 2022. Low relative abundances of trout occurred in all three streams (Table 6). In the Unnamed Tributary to the Steiner Branch (WBIC 904100), only age-0 brook trout (CPUE = 26.7 fish/mile) were detected. In the Unnamed Tributary to the East Branch Pecatonica River (WBIC 907000) where brook restoration stocking

occurred, brown trout were the only species sampled. Specially, only adult brown trout (CPUE = 19.7 fish/mile) were sampled there. In the unclassified downstream reach of Wolf Creek, age-1 (CPUE = 13.3 fish/mile) and adult brown trout (CPUE = 37.6 fish/mile) were found, but no age-0 fish were detected.

BIOTIC INTEGRITY STATUS

Fish assemblages sampled at 39 survey stations were used to compute the coldwater fish IBI in 13 classified trout streams in Lafayette County. Mean IBI scores varied 0.0-60.0 per stream, where 84% of stream IBI scores were rated as "Poor" (Table 7). Steiner Branch and the Unnamed Tributary to Wolf Creek (WBIC 919600) were the only streams to have "Fair" or better coldwater fish IBI scores. The strength of IBI scores were positively associated with percent of Top Carnivore species and percent of brook trout within the total Salmonid catch, while also being negatively associated with percent of Tolerant species (species tolerant to environmental degradation).

HABITAT STATUS

HABITAT QUALITY SCORES

Habitat quality scores in trout water of Lafayette County varied considerably both within and among streams. Overall mean habitat quality score per stream varied between 37.7 – 62.5, where 57% of streams exhibited mean habitat scores rated as "Fair" and 43% of streams rated as "Good" (Table 8). Although overall scores for individual streams were rated either "Fair" or "Good", most streams exhibited a gradient of habitat quality throughout the length of the stream. For example, streams with high variation in site-level habitat scores included Mud Branch, Trout Brook, Copper Creek and Silver Spring. Site-level habitat quality scores were associated with bank erosion, riparian buffer width and fine sediment metrics in each survey station. This indicated that better habitat quality was tied to sites with less bank erosion, larger riparian buffer widths, and proportionally less fine sediments.

STREAMFLOW AND WATER TEMPERATURE

Streamflow and water temperature data from 2022 survey measurements and the DNR Stream Natural Community Model were assessed to provide additional insight about the trout habitat suitability in streams. By stream, model-derived estimates of normal summer baseflows varied between 0.4-4.3 CFS and measured streamflow varied from 0.6-5.8 CFS (Table 8). Eleven of the 39 survey sites exhibited summer streamflow values that were lower than normal. At least 7 sites had measured streamflow < 75% of the normal summer baseflow. Only Lovett Creek and Canon Creek exhibited lower than normal summer streamflow conditions across all survey stations. Other than that, stations exhibiting lower than normal streamflow conditions primarily occurred in the upstream reaches of trout streams. By stream, model estimates of maximum daily mean water temperature varied 67.1-71.8° F and measured water temperature varied 63.1-74.5° F. Approximately 80% of survey sites exhibited both measured and modelled maximum water temperatures exceeding the

brown trout thermal preference range (>63.7° F). Six stations exhibited measured temperatures (>73.4° F) considered to be near-lethal water temperatures. These came from Whiteside Creek, Canon Creek, Silver Spring Creek, Trout Brook, and Gravel Run Creek.

Discussion

BROWN TROUT

Overall brown trout abundance is very low and fishable populations appear to be nonexistent in all Lafayette County trout streams. Limited age-0 and age-1 brown trout abundance indicates there is little to no natural reproduction or recruitment in these streams. Similarly, low adult numbers indicate that stocking has not sustained minimum fishable population abundance of adult brown trout (i.e., adult CPUE > 50 fish/mile). Historic data further indicate that brown trout populations may have only had fishable abundances 15% of the time in the last 20 years in Lafayette County. Currently, nearly half of these designated trout streams showed little to no evidence of a trout population, where either no trout were detected or 1-2 remnant trout were found, which included Canon Creek, Brown Branch, Lovett Creek, Silver Springs Creek and Gravel Run Creek. It is apparent that widespread stocking efforts have not been successful at creating fishable abundances of brown trout in most Lafayette County trout streams. Therefore, it is recommended that all brown trout stocking be discontinued for the foreseeable future. It is also recommended that the five streams not containing trout populations should be declassified.

The current and historic brown trout numbers suggests that many of these streams lack the habitat necessary to support trout populations. Historically, habitat suitability was probably not considered in many of these streams when they were initially stocked with trout to create angler opportunities. It is likely that many of these streams did not contain the suitable habitat conditions (e.g., thermal habitat) necessary for trout survival (Piening et al. 1967). This includes some streams that probably contained suitable trout habitat at one point, but then became degraded and unsuitable over time.

The least suitable streams often contained elevated water temperatures. At least 75% of survey locations exceeded thermal preference ranges for brown trout (>63.7° F). Over half of these streams have exhibited stressful water temperatures approaching a near-lethal water temperature range (73.9-77.7° F). Brown trout can only tolerate these temperatures for just a few days before showing noticeable mortality (Jobling 1981; Dieterman and Mitro 2019). These near-lethal temperatures were observed in reaches within Gravel Run Creek, Silver Springs Creek, Lovett Creek, Brown Branch, Canon Creek, Whiteside Creek and Trout Brook during this assessment. Past temperature data from Amrhein (2011) showed that mean daily temperatures in reaches within Silver Springs Creek, Wolf Creek, Copper Creek and Brown Branch

reached near-lethal temperatures, with some streams exhibiting these near-lethal temperatures for several days. Not surprisingly, nearly all the streams that we found with near-lethal temperatures were also the same streams containing little to no trout. Poor thermal habitat further supports the recommendation to remove trout stream classifications and discontinuing stocking of Gravel Run Creek, Silver Springs Creek, Lovett Creek, Brown Branch and Canon Creek.

Coldwater biotic integrity provided further indication about thermal limitations impacting these streams. In this assessment, 80% of surveyed sites exhibited poor coldwater fish IBI. Coldwater biotic integrity very poor the sites with the most stressful temperatures for trout. Streams with elevated water temperatures contained fish assemblages with proportionately more coolwater and warmwater fish species than coldwater fish species. Typically, fish assemblages in coldwater streams have few species present, namely trout and sculpins (Lyons et al. 2006; Lyons et al. 2009). As warmwater species become more diverse and abundant, coldwater IBI scores often decrease (Lyons 2012). Based on this assessment, the observed fish assemblages and poor IBI values further indicates thermal habitat is marginal and not optimal for trout in the majority of these streams.

Beyond the thermal limitations, trout streams were also limited by poor physical habitat quality. This was often related to riparian buffer width, streambank erosion and sedimentation. Most streams in this assessment exhibited a range of habitat quality among sites, which made it sometimes difficult to describe the overall habitat quality of a particular stream. For example, many streams with a fair overall habitat quality contained sites with both good and poor habitat conditions. In general, sites with lowest habitat scores had minimal riparian buffer, high rates of erosion and high sedimentation rates. All three of these factors are known to impact water quality, biotic integrity and trout populations. Sedimentation seems to be the most noticeable of these factors to impact brown trout populations, since the accumulation of fine sediments over coarse substrates (e.g., gravel) directly limits brown trout natural reproduction.

Sedimentation issues were found in all streams but the streams with the greatest sedimentation occurred in Brown Branch, Silver Spring Creek, Whiteside Creek, Steiner Branch, Wolf Creek, and Apple Branch. Some of these streams probably are beyond habitat rehabilitation, but Steiner Branch, Wolf Creek, and Apple Branch may have potential for improved sediment dynamics. With the exception of Steiner Branch, the DNR cannot perform habitat improvements with Trout Stamp funding in any streams lacking streambank easements for public access. In light of this fact, opportunities for habitat improvements are still possible. When practical, DNR staff should work with our partners in the NRCS and the County Land and Conservation Department to encourage private riparian landowners to implement conservation practices to improve stream habitat and water quality.

Despite the fact that brown trout abundances were generally low, remnant brown trout populations still occurred in Steiner Branch, Mud Branch, Apple Branch, Whiteside Creek, Copper Creek, Wolf Creek, Unknown tributary (WBIC 919600) to Wolf Creek and Trout Brook. Among these streams, Apple Branch and Wolf Creek showed signs of natural reproduction. However, none of these remnant streams had brown trout populations capable of supporting fishable opportunities. Regardless of these limitations, these streams still meet definition of a Class II trout stream and should retain their current classification for the time being. As mentioned previously, further stocking of these streams is not advised unless habitat conditions show signs of improvement. Future assessment of these seven streams will be needed to determine any changes to existing trout classifications. Additionally, the use of temperature loggers is recommended in all of these streams during the next assessment to better assess thermal habitat suitability for trout. Improved temperature monitoring will not only help determine which streams still have trout potential but will also identify where future management efforts can be prioritized, if necessary.

BROOK TROUT

Unlike the brown trout streams in Lafayette County, the status of brook trout in the Steiner Branch was fairly positive. Steiner Branch represents one of the few streams where brook trout have been successfully reintroduced in southwestern Wisconsin. The long-term trends have shown consistently “good” levels of adult brook trout abundance over time. The recent increase in natural reproduction provides a solid indication of adequate groundwater seepage coming into the Steiner Branch. It is not surprising that Steiner Branch is highly suitable for brook trout, since 78% of its stream length is surrounded public land (i.e., Yellowstone State Wildlife Area) which helps to protect and enhance habitat and water quality. It was also notable that although persistent, the naturalized brown trout in the stream do not appear to be at densities to warrant concern about negative interactions with brook trout. Often, the co-occurrence of brown trout and brook trout poses a significant challenge for managers attempting to improve fishery potential since brown trout often displace brook trout through negative community interactions (e.g., predation and competition, Dieterman and Mitro 2019). Continued trend monitoring will be necessary for proactive management in case of brown trout becoming more prevalent.

Despite the overall high abundance of brook trout in Steiner Branch, it was concerning that adult and preferred-size brook trout CPUE showed decline for the last 3-4 years. Explanations for this the decline are not clear, especially considering that brook trout natural reproduction has increased. Nonetheless, we did observe recent establishment of beaver dams in Steiner Branch and much of riparian corridor has high banks that are disconnecting the floodplain from the stream channel. Considering these issues, beaver management measures to protect the habitat and future bank sloping and instream habitat improvements throughout the Steiner Branch should be considered to enhance floodplain connectivity and mitigate

impacts from high flow events and bank erosion. Additionally, enhancing and maintaining riparian habitat will also be an important future consideration. Being proactive with habitat management could allow for greater and brook trout population stability over time in Steiner Branch.

Beyond the Steiner Branch, no other brook trout restoration stockings have proven to be successful, including most recent restoration stocking in 2020, in the unnamed tributary (WBIC 907000) to the East Branch of the Pecatonica River. Although brook trout were only stocked for one-year, adult brook should have been detected during these surveys if this stream were suitable for brook trout. Finding natural brown trout instead of brook trout also indicates that stream may not be appropriate for brook trout. Based on the lack of adult brook trout surveyed, no further stocking of brook trout or other management action should be considered for the unnamed tributary (WBIC 907000) to the East Branch of the Pecatonica River.

Management Recommendations

1. **Brook trout abundance:**
    - **Goal:** Maintain abundance of brook trout in Steiner Branch to provide quality fishing opportunities
    - **Objective:**
        - Adult brook trout CPUE ≥ 355 fish/mile (long-term mean value)
    - **Strategies:**
        - Stock brook trout, habitat improvements, habitat protections, beaver management and continue catch and release fishing regulation.
2. **Brook trout recruitment:**
    - **Goal:** Increase and maintain brook trout natural recruitment in Steiner Branch
    - **Objective:**
        - Age-1 brook trout CPUE ≥ 80.5 fish/mile (25^{th} percentile for Driftless Area streams)
    - **Strategies:**
        - Implement habitat improvements, habitat protections and beaver management.

Additional Recommendations

1. **Trout classification:**
    - Declassify Silver Springs, Gravel Run Creek, Brown Branch, Lovett Creek, Copper creek and Cannon Creek.
2. **Assessment and monitoring:**
    - Deploy temperature loggers during next assessments to further evaluate thermal suitability in remaining classified streams.

- Monitor contribution of stocked brook trout (clipped adipose fin) to Steiner Branch.

3. **Stocking:**
    - Discontinue stocking brown trout in Lafayette County streams assessed in this report.
4. **Habitat management:**
    - When practical, work with agency partners, watershed conservation groups, and private landowners to implement conservation projects on streams without streambank easement acquisition authority.

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Tables and Figures

Table 1. A summary of the current management for trout streams in Lafayette County as of 2022. The management reflects aspects of the trout species managed, reproductive category, habitat management history, and harvest regulations. Harvest regulation abbreviations include 3x8 = 3 fish daily bag limit with an 8-inch minimum length limit for all trout, and C&R = catch and release fishing for all trout. Abundance Maintenance abbreviations include NR = Natural Reproduction, S = Stocked, and UNK = Unknown Recruitment. Annual stocking regime abbreviations include LGF = Large Fingerling, SMF = Small Fingerling, BNT = brown trout, and BKT = brook trout.

WATERSHED	STREAM	SPECIES MANAGED	TROUT CLASS	TROUT WATER MILEAGE	REPRODUCTIVE CATEGORY	ANNUAL STOCKING	HABITAT MANAGEMENT HISTORY	HARVEST REGULATION
Yellowstone River	Steiner Branch	Brook	Class II	4.74	NR & S	357 LGF BKT	2003, 2007, 2010	C&R
	Canon Creek	Brown	Class II	7.67	NR & S	500 LGF BNT	2012	3x8
East Branch Pecatonica River	Mud Branch	Brown	Class II	6.52	NR & S	450 LGF BNT	2001-2002	3x8
	Whiteside Creek	Brown	Class II	7.12	NR & S	1000 LGF BNT	2004	3x8
	Apple Branch	Brown	Class II	4.90	NR & S	Dropped in 2017		3x8
Spafford Creek-Pecatonica River	Wolf Creek	Brown	Class II	11.08	NR & S	1404 LGF BNT		3x8
	Unnamed Trib. to Wolf Creek	Brown	Class II	3.26	NR & S			3x8
	Trout Brook	Brown	Class II	5.96	NR & S	510 LGF BNT		3x8
	Lovett Creek	Brown	Class II	6.78	NR & S	848 LGF BNT	2012	3x8
	Copper Creek	Brown	Class II	9.05	NR & S	1131 LGF BNT	2005	3x8
	Silver Springs	Brown	Class II	5.90	UNK	Dropped in 2017		3x8
	Brown Branch	Brown	Class II	6.81	UNK	Dropped in 2017		3x8
Ames Branch-Pecatonica River	Gravel Run	Brown	Class II	6.74	UNK	Dropped in 2017		3x8

Table 2. A five-year history of small and large fingerling annual stocking quotas prior to the trout population assessment in the Pecatonica River Watersheds, in Lafayette County, 2022.

				FIVE-YEAR TIMELINE				
WATERSHED	STREAM	TROUT SPECIES	HATCHERY PRODUCT	2017	2018	2019	2020	2021
Spafford Creek Pecatonica River	Wolf Creek	Brown	Small fingerling	2327				
		Brown	Large fingerling		1000	1450	1404	
	Trout Brook	Brown	Small fingerling	1056	1035	1035		
		Brown	Large fingerling				358	
	Lovett Creek	Brown	Small fingerling	302	300	300		
		Brown	Large fingerling				848	
	Copper Creek	Brown	Small fingerling					
		Brown	Large fingerling		1000	925	975	
Ams Branch Pecatonica River	Gravel Run Creek	Brown	Small fingerling	776				
East Branch Pecatonica River	Whiteside Creek	Brown	Small fingerling	1552				
		Brown	Large fingerling				579	
	Mud Branch	Brown	Small fingerling	948	900			
		Brown	Large fingerling			450	463	
	Unnamed tributary (907000) to East Branch Pecatonica River	Brook	Large fingerling				500	
Yellowstone River	Steiner Branch	Brook	Small fingerling	1148	600	600		
		Brook	Large fingerling				200	357
	Canon Creek	Brown	Small fingerling	1034	1050			
		Brown	Large fingerling			525	540	

Table 3. Summary of Land cover percentages by cover type in each of the Pecatonica River Watersheds containing classified trout streams in Lafayette County.

COVER TYPE	WATERSHED AND AREAL PERCENTAGE OF LAND COVER WITHIN BASIN			
	Yellowstone River	**East Branch Pecatonica River**	**Spafford Creek-Pecatonica River**	**Ames Branch-Pecatonica River**
Perennial Water	1.2	0.2	0.1	0.1
Developed	4.3	4.9	4.7	5.3
Barren	0.1	0.0	0.1	0.1
Forest	20.9	18.9	9.1	7.4
Grassland	0.1	0.1	0.1	0.1
Agriculture	72.1	73.6	85.5	86.8
Wetland	1.4	2.3	0.4	0.2

Table 4. Brown and brook trout CPUE (fish/mile) percentile summary for stream surveys conducted in Class I trout streams in the Driftless Area, where at least 1 trout was collected, 2012-2021.

		DRIFTLESS AREA PERCENTILES						
SPECIES	**CPUE METRIC**	**10th**	**25TH**	**35TH**	**50TH**	**65TH**	**75TH**	**90th**
Brown Trout	Age-0 (<4”)	15.1	40.2	71.1	136.1	256.1	405.4	856.7
	Age-1 (4-7.9”)	27.9	82.6	135.6	229.9	383.2	518.8	877.1
	Adult (≥8”)	40.2	128.7	191.6	330.8	509.7	677.6	1194.2
	Preferred size (≥12”)	16.1	31.9	42.9	63.2	85.8	115.0	181.5
Brook Trout	Age-0 (<4”)	16.0	46.0	68.6	128.7	209.2	321.9	787.1
	Age-1 (4-6.9”)	12.4	30.5	44.9	80.5	150.9	234.2	548.7
	Adult (≥7”)	12.8	30.0	47.9	80.5	124.0	177.7	347.0
	Preferred size (≥10”)	6.5	11.1	14.3	16.1	29.1	37.5	64.4

Table 5. Brown trout catch per unit effort (CPUE; number of fish/mile) summary for classified trout streams in Lafayette County, during 2022. Stream-specific means and ranges (min to max values in parentheses) of CPUE were calculated to describe densities of Age-0 (<4 in.), Age-1 (4-7.9 in.), Adult (≥8 in.), and Preferred-size (≥12 in.) brown trout.

Watershed	Stream	Survey Count	Age-0 CPUE (fish/mile)	Age-1 CPUE (fish/mile)	Adult CPUE (fish/mile)	Preferred-Size CPUE (fish/mile)
Yellowstone River	Steiner Branch	4	0.0	9.9 (0.0-39.7)	0.0	0.0
	Canon Creek	3	0.0	3.3 (0.0-9.9)	0.0	0.0
East Branch Pecatonica River	Mud Branch	3	0.0	21.8 (0.0-55.0)	8.7 (0.0-15.7)	2.6 (0.0-7.9)
	Whiteside Creek	3	0.0	6 (0.0-12.3)	6.0 (0.0-12.3)	0.0
	Apple Branch	3	*89.4 (0.0-268.2)	34.8 (0.0-82.5)	14.1 (0-21.7)	0.0
Spafford Creek-Pecatonica River	Wolf Creek	3	37.6 (0.0-150.2)	4.7 (0.0-13.2)	14.6 (0-35.3)	4.0 (0.0-11.5)
	Unnamed Trib. to Wolf Creek (919600)	2	0.0	7.3 (0.0-14.6)	36.6 (0.0-73.2)	7.3 (0.0-14.6)
	Trout Brook	3	0.0	17.3 (0.0-44.9)	7.5 (0.0-22.5)	0.0
	Lovett Creek	3	0.0	0.0	0.0	0.0
	Copper Creek	3	0.0	0.0	11.9 (0.0-35.8)	0.0
	Silver Springs	3	0.0	0.0	0.0	0.0
	Brown Branch	3	0.0	6.2 (0.0-18.6)	0.0	0.0
Ames Branch-Pecatonica River	Gravel Run	3	0.0	0.0	0.0	0.0

**Exceeds 25th Percentile CPUE benchmark for Class I streams in the Driftless Area*

Table 6. Brook and brown Trout catch per unit effort (CPUE; number of fish/mile) summary of trout potential surveys to assess unclassified trout streams in Lafayette County, during 2022. Stream-specific means and ranges (min to max values in parentheses) of CPUE were calculated to describe densities of Age-0 (<4 in.), Age-1 (brown trout = 4-7.9 in.; Brook trout 4-6.9 in.), Adult (brown trout ≥8 in.; brook trout ≥7 in), and Preferred-size (brown trout ≥12 in.; brook trout ≥10 in.) trout.

Watershed	Stream	Survey Count	Species	Age-0 CPUE (fish/mile)	Age-1 CPUE (fish/mile)	Adult CPUE (fish/mile)	Preferred-Size CPUE (fish/mile)
Yellowstone River	Unnamed Tributary to Steiner Branch (904100)	1	Brook trout	26.7	0.0	0.0	0.0
East Branch Pecatonica River	Unnamed Tributary to East Branch Pecatonica River (907000)	2	Brown trout	0.0	0.0	19.7 (0.0-39.3)	0.0
Spafford Creek-Pecatonica River	Wolf Creek	1	Brown trout	0.0	13.3	37.6	4.4

Table 7. Summary of Coldwater Index of Biotic Integrity (IBI) scores for all classified trout streams in Lafayette County, during 2022. Steam specific means and ranges (min to max values in parentheses) of IBI scores. IBI ratings are associated with the following IBI scores: 0-9 = Very Poor, 10-29 = Poor, 30-59 = Fair, 60-79 = Good and 80-100 = Excellent.

WATERSHED	STREAM	SURVEY COUNT	COLDWATER IBI
Yellowstone River	Steiner Branch	4	60.0 (30-80)
	Canon Creek	3	0.0 (0)
East Branch Pecatonica River	Mud Branch	3	16.7 (10-20)
	Whiteside Creek	3	10.0 (10-10)
	Apple Branch	3	16.7 (10-20)
Spafford Creek-Pecatonica River	Wolf Creek	4	22.5 (20-30)
	Unnamed Trib. to Wolf Creek (919600)	2	35.0 (30-40)
	Trout Brook	3	26.7 (10-50)
	Lovett Creek	3	13.3 (10-20)
	Copper Creek	3	23.3 (20-30)
	Silver Springs	3	20.0 (20-20)
	Brown Branch	3	3.3 (0-10)
Ames Branch-Pecatonica River	Gravel Run	3	13.3 (10-20)

Table 8. Summary of Habitat Quality scores, streamflow and thermal characteristics of the classified trout streams in Lafayette County, surveyed during 2022. Stream-specific means and ranges (min to max values in parentheses) calculated for each environmental variable.

WATERSHED	STREAM	SURVEY COUNT	HABITAT QUALITY SCORE	Normal Summer Baseflow (CFS)	MEASURED STREAMFLOW (CFS)	MAX. DAILY MEAN WATER TEMPERATURE (°F)	MEASURED WATER TEMPERATURE (°F)
Yellowstone River	Steiner Branch	4	62.5 (50-87)	1.4 (0.7-2.4)	2.1 (0.5-4)	67.1 (66.6-67.6)	65.5 (60.6-70.3)
	Canon Creek	3	44.0 (42-47)	1.5 (0.8-2.3)	1.4 (0.8-2.1)	70.3 (70.2-70.7)	73.8 (67.5-77.7)
East Branch Pecatonica River	Mud Branch	3	60.7 (33-92)	1.8 (1.2-2.4)	2.6 (1.5-3.5)	69.6 (68.5-70.7)	64.6 (61.3-67.5)
	Whiteside Creek	3	56.0 (52-63)	2.2 (1.2-2.8)	2.6 (0.5-4.7)	70.2 (69.6-70.7)	68.2 (60.3-76.0)
	Apple Branch	3	42.0 (22-52)	2.6 (1.5-3.4)	2.8 (0.9-4.6)	70.0 (69.3-70.5)	67.8 (66.0-69.3)
Spafford Creek-Pecatonica River	Wolf Creek	4	37.8 (28-43)	4.3 (0.3-10.8)	5.8 (1-14.7)	71.1 (70.7-71.4)	64.8 (61.0-69.1)
	Unnamed Trib. to Wolf Creek (919600)	2	50.5 (48-53)	0.4 (0.3-0.5)	0.6 (0.5-0.7)	71.1 (70.9-71.2)	65.8 (64.0-67.6)
	Trout Brook	3	48.3 (28-82)	1.0 (0.3-1.4)	2.7 (0.2-5.2)	70.0 (69.6-70.9)	68.2 (64.2-74.7)
	Lovett Creek	3	55.3 (45-63)	1.3 (0.8-2.2)	0.8 (0.1-2.1)	70.7 (69.8-71.2)	70.9 (69.4-72.0)
	Copper Creek	3	51.7 (25-68)	1.9 (0.7-3.8)	3.2 (2-4.9)	71.8 (70.7-72.7)	63.1 (57.4-68.7)
	Silver Springs	3	37.7 (23-57)	1.3 (0.3-2.2)	1.1 (0.3-1.6)	70.9 (70.3-71.4)	68.7 (64.2-77.2)
	Brown Branch	3	38.0 (28-43)	1.3 (0.8-1.8)	2.2 (1.3-2.8)	70.9 (70.3-71.8)	67.3 (62.8-72.9)
Ames Branch-Pecatonica River	Gravel Run	3	48.0 (33-58)	2.0 (0.6-2.8)	2.1 (0.7-3.1)	70.7 (70.3-71.2)	70.5 (63.9-76.5)

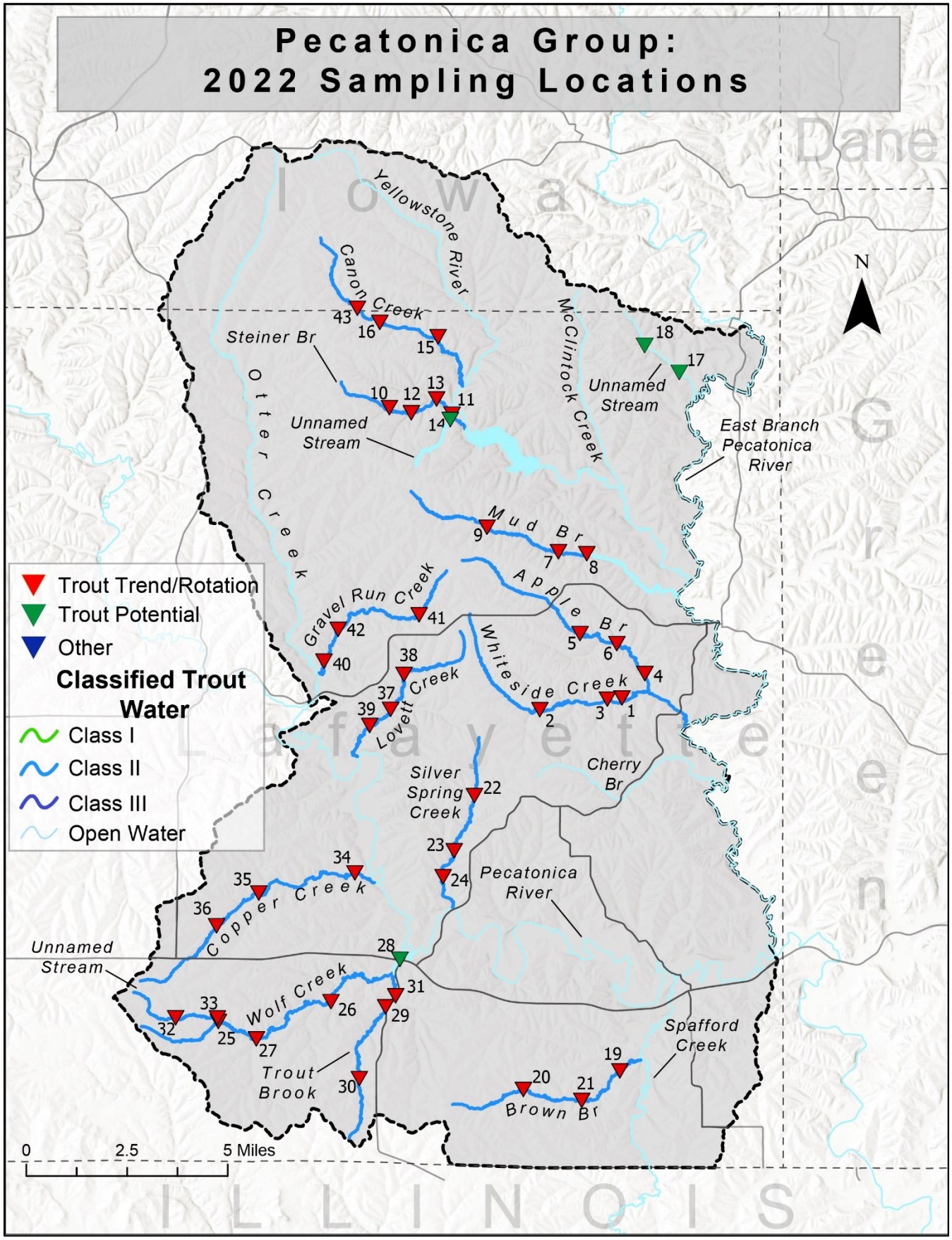

Figure 1. A map showing the distribution of classified trout water in station locations where fish and habitat survey data were collected for this watershed trout assessment.

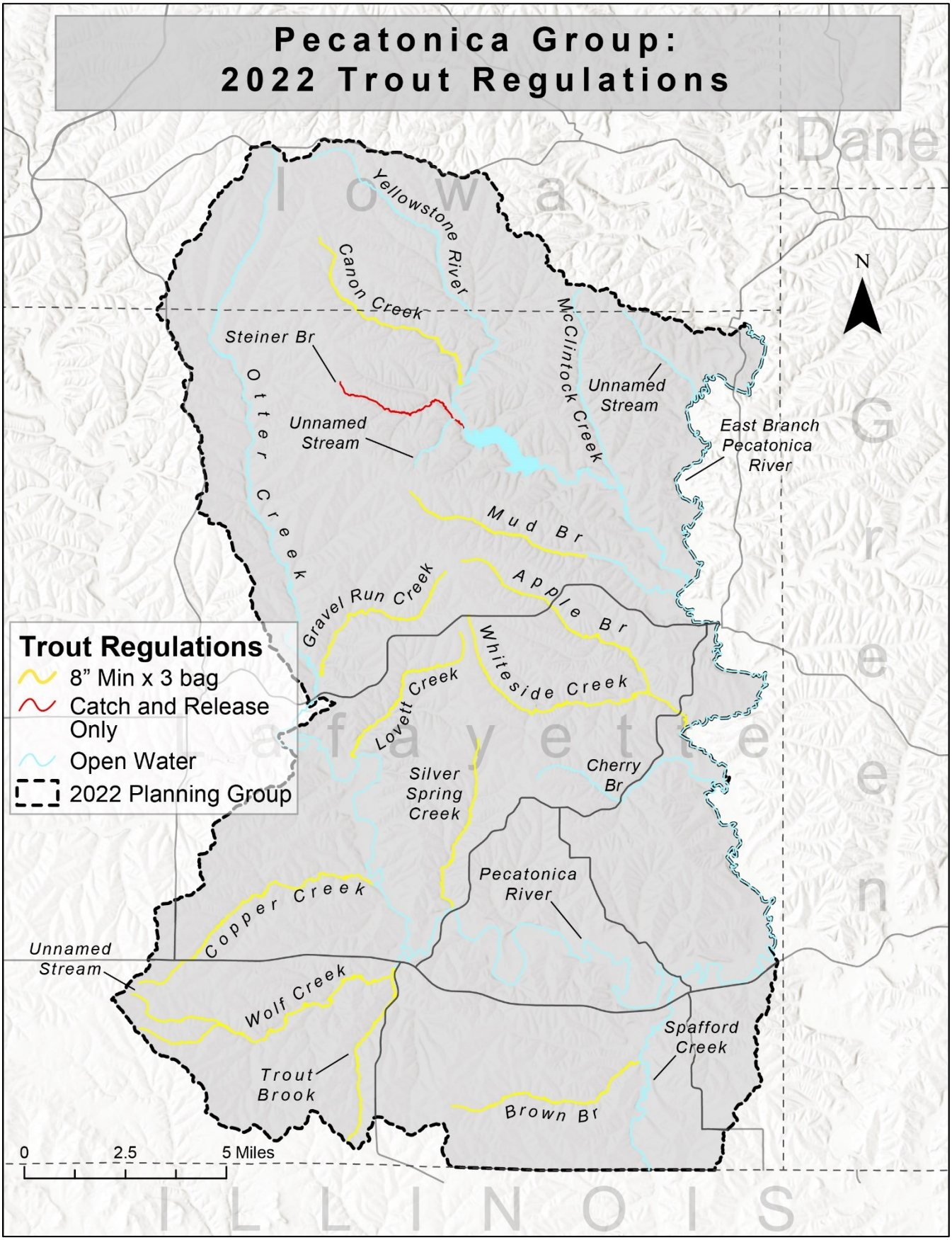

Figure 2. A map showing the current trout Fishing Regulations established in Lafayette County. See Table 1 for further information.

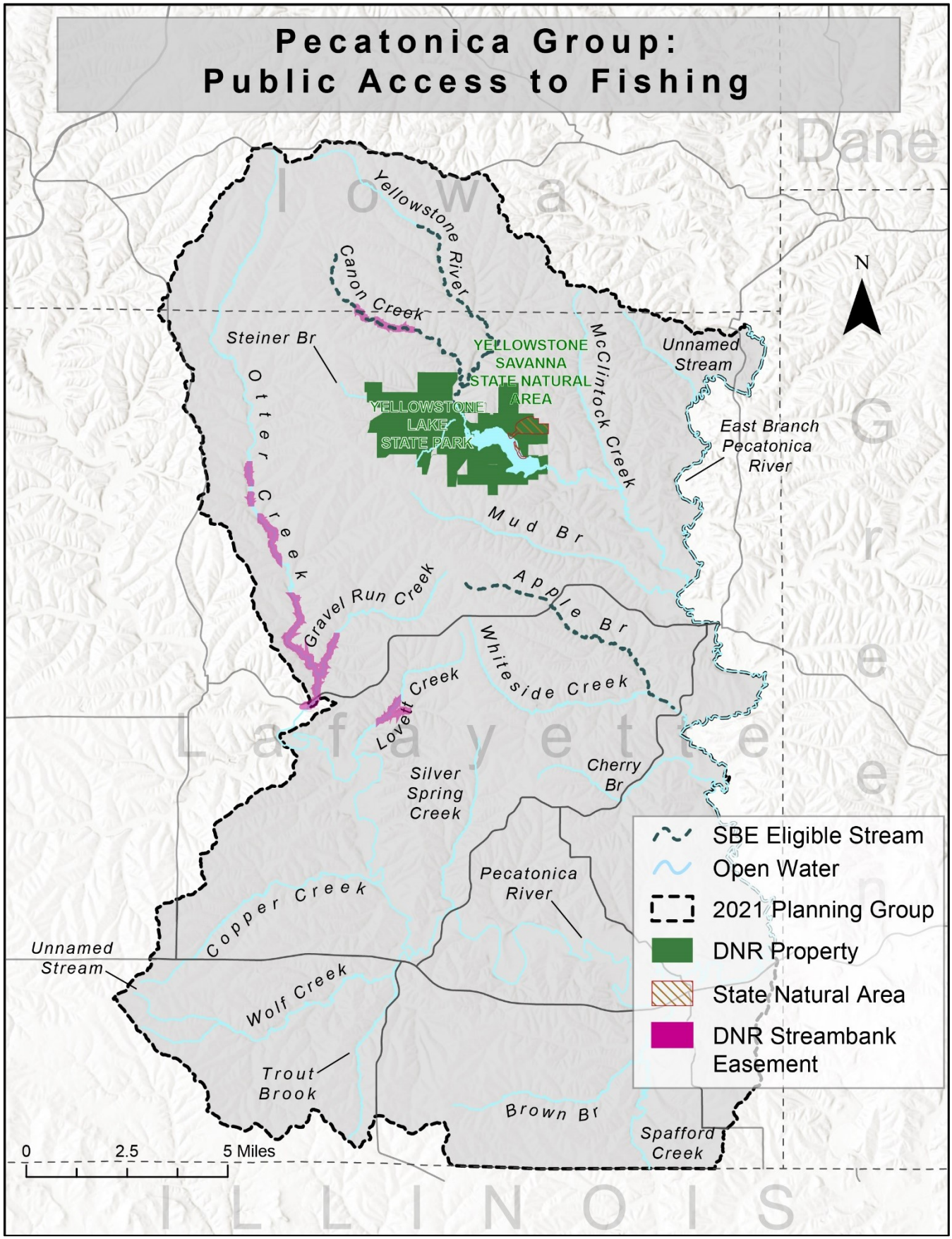

Figure 3. A map showing the currently available DNR public lands and easements to access trout streams in Lafayette County. This map also shows streams that are approved by the Natural Resource Board for potential future acquisition of stream bank easements.

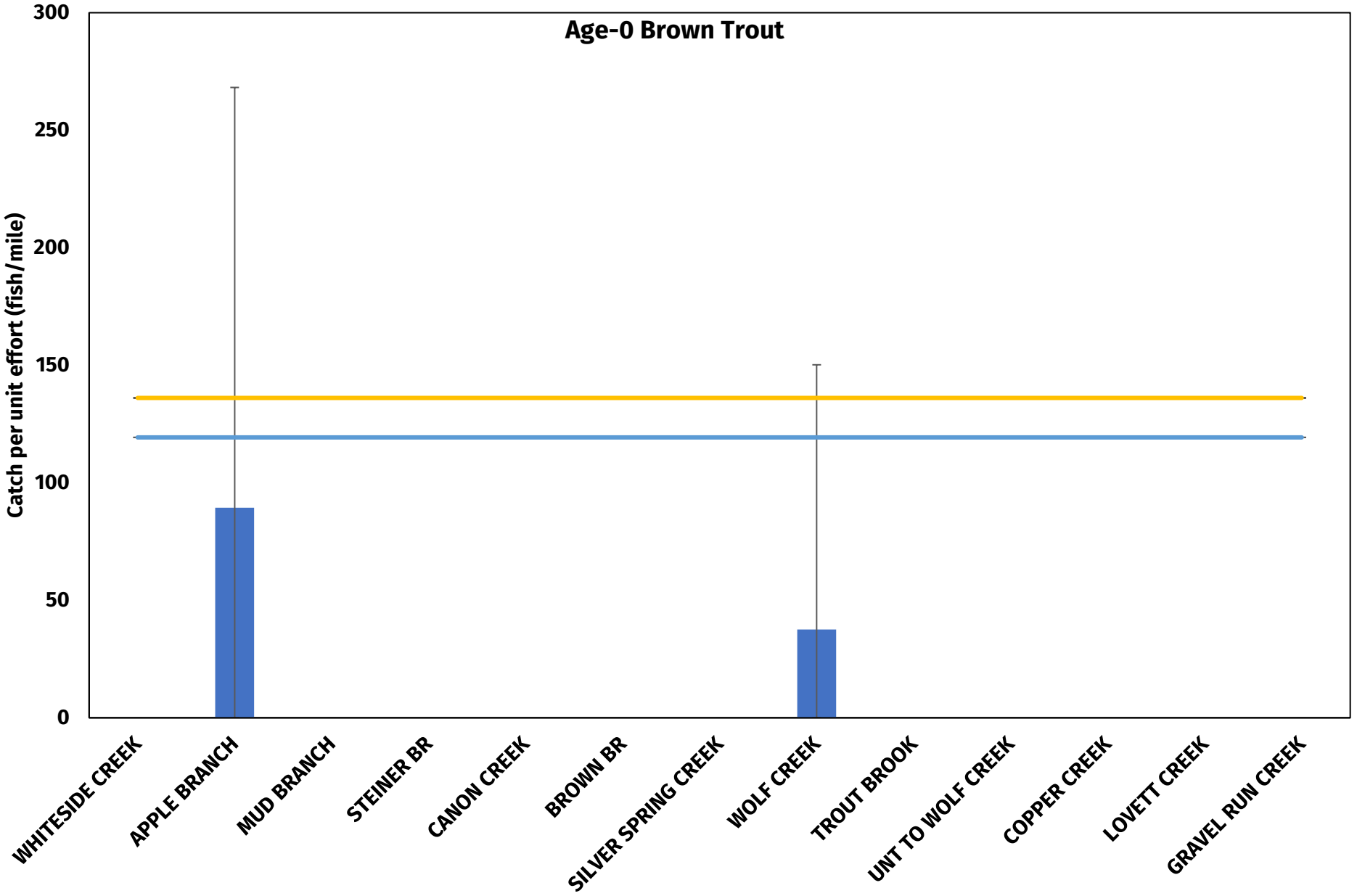

Figure 4. Age-0 brown trout relative abundance in Lafayette County trout streams surveyed during 2022. Relative abundance is described as catch per unit effort (CPUE) of age-0 brown trout (total length < 4 inches). The horizontal lines reference the age-0 brown trout CPUE 50th percentile standards for the Driftless Area (orange line) and the State of Wisconsin (blue line).

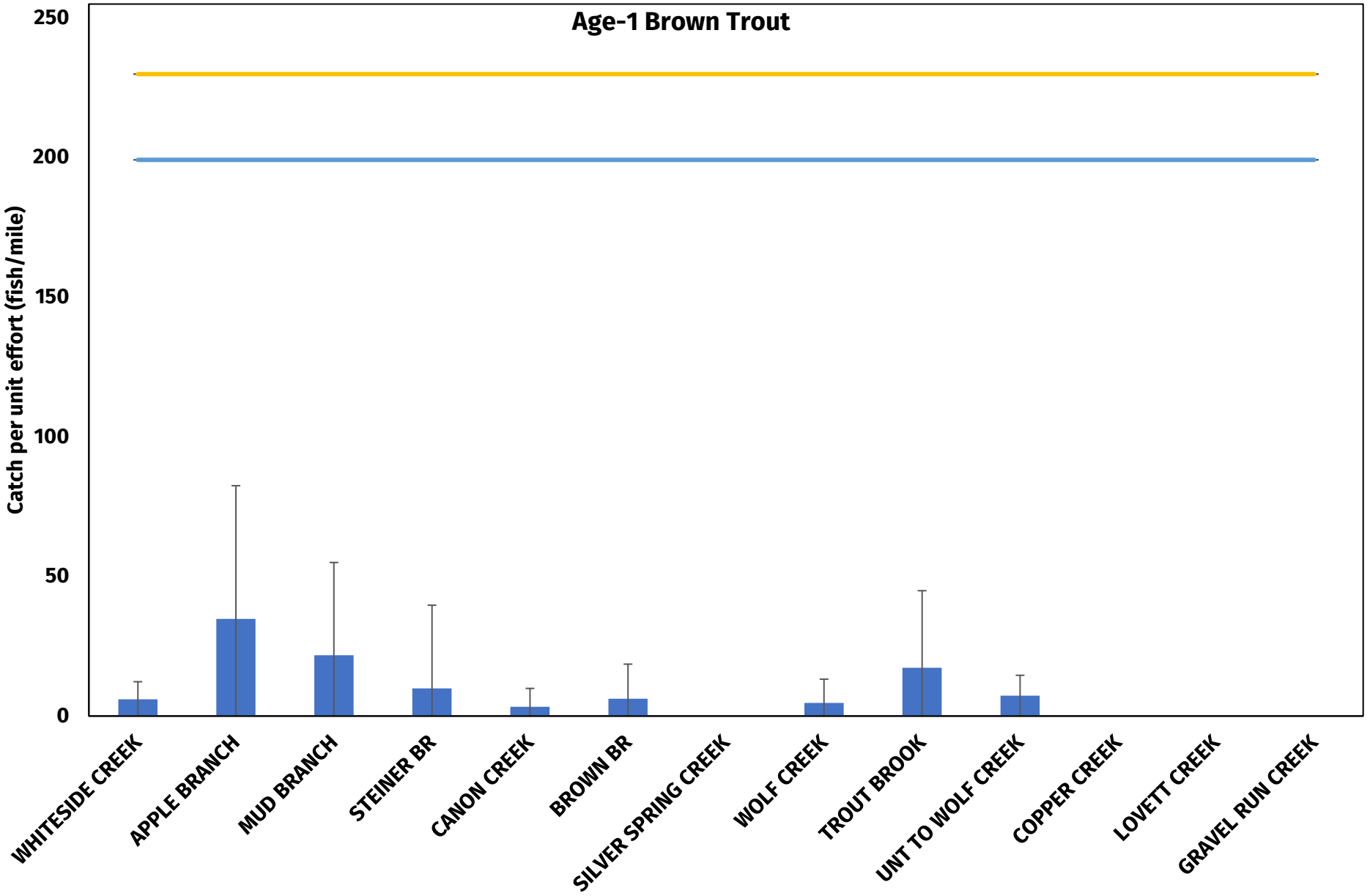

Figure 5. Age-1 brown trout relative abundance in Lafayette County trout streams surveyed during 2022. Relative abundance is described as catch per unit effort (CPUE) of age-1 brown trout (total length: 4-7.9 inches). The horizontal lines reference the age-1 brown trout CPUE 50th percentile standards for the Driftless Area (orange line) and the State of Wisconsin (blue line).

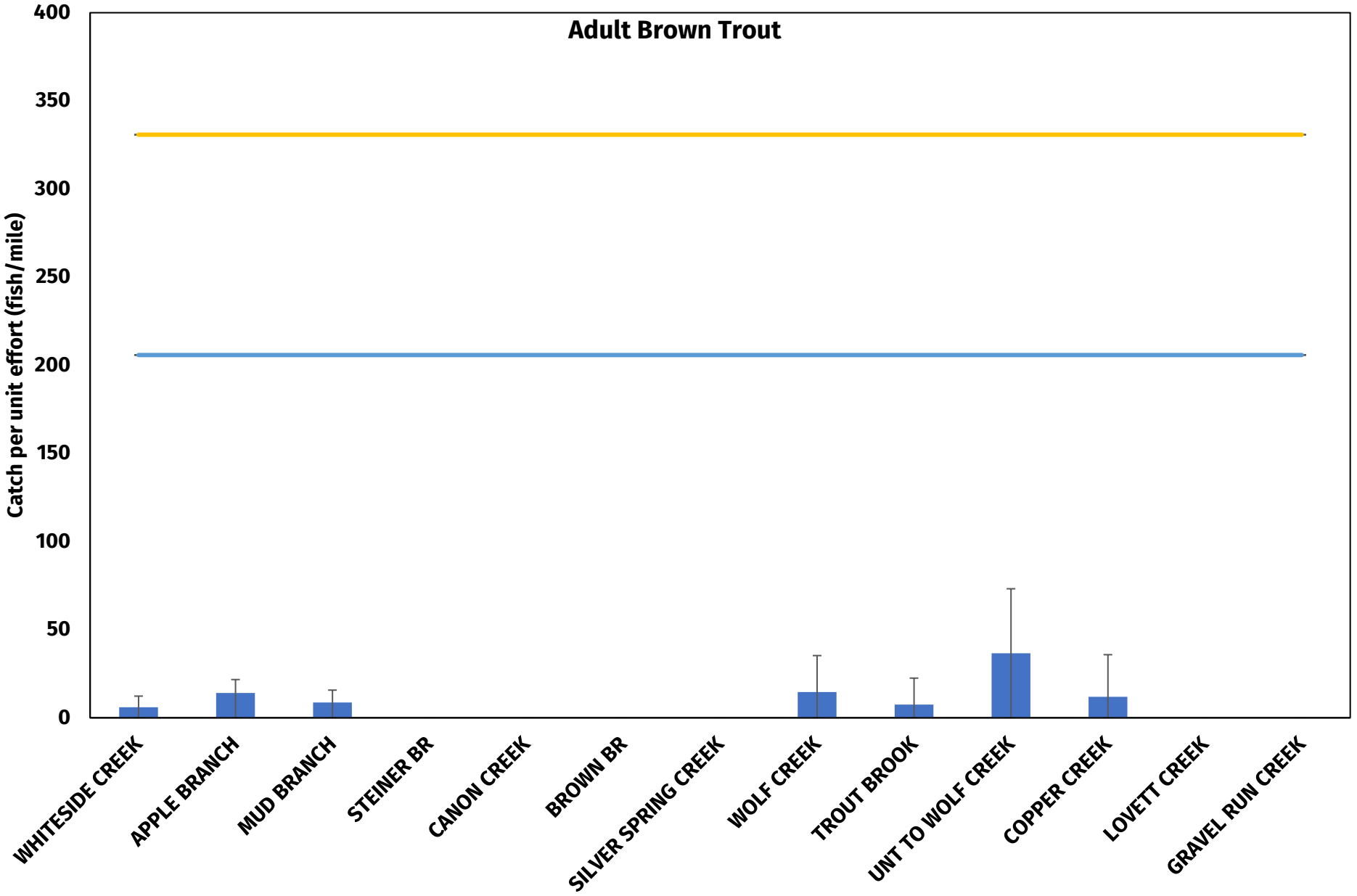

Figure 6. Adult brown trout relative abundance in Lafayette County trout streams surveyed during 2022. Relative abundance is described as catch per unit effort (CPUE) of adult brown trout (total length ≥ 8 inches). The horizontal lines reference the adult brown trout CPUE 50th percentile standards for the Driftless Area (orange line) and the State of Wisconsin (blue line).

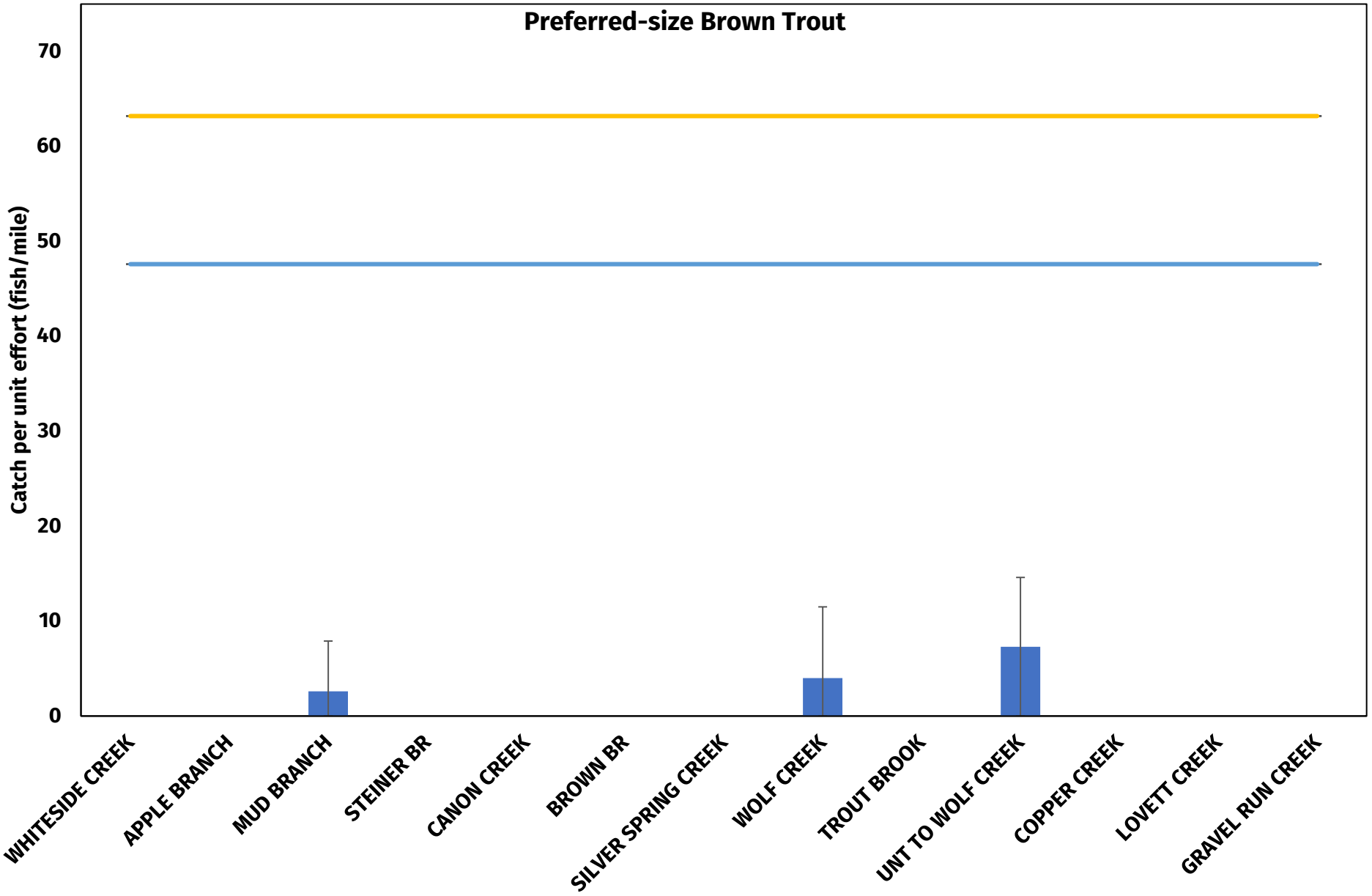

Figure 7. Preferred-size brown trout relative abundance in Lafayette County trout streams surveyed during 2022. Relative abundance is described as catch per unit effort (CPUE) of preferred-size brown trout (total length ≥ 12 inches). The horizontal lines reference the preferred-size brown trout CPUE 50th percentile standards for the Driftless Area (orange line) and the State of Wisconsin (blue line).

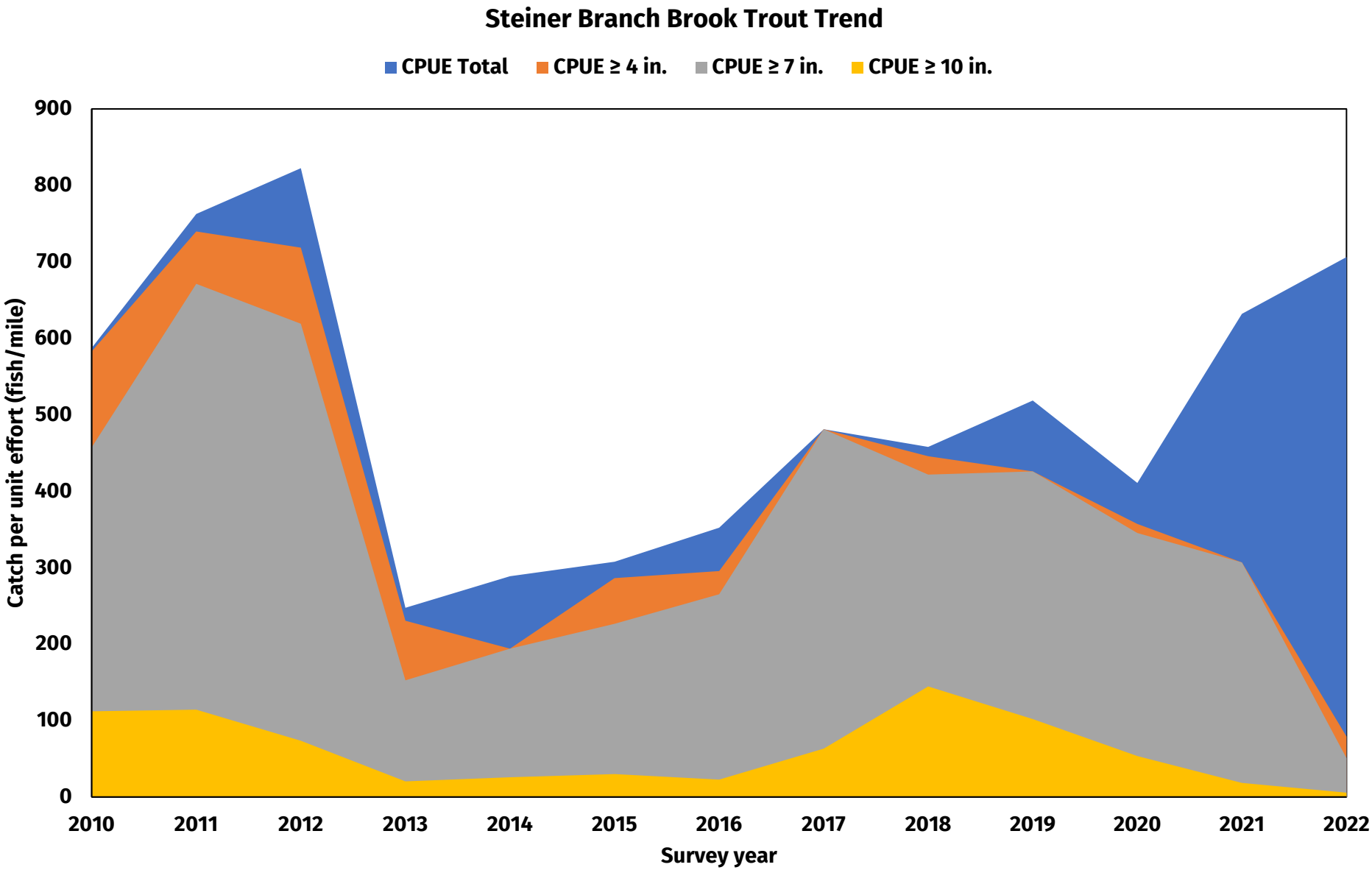

Figure 8. Long-term trends of brook trout catch per unit effort in Steiner Branch, Lafayette County, during 2010-2022. The various overlapping color layers colors represent specific size groups of brook trout as listed in the legend. This plot shows adult (CPUE ≥ 7 inches) and preferred-size (CPUE ≥ 10 inches) brook trout CPUE Trends. Age-0 brook trout CPUE trends can be interpreted as the blue plotted area showing difference between Total CPUE and CPUE ≥ 4 inches. Age-1 brook trout CPUE trends can be interpreted as the orange plotted area showing the difference between CPUE ≥ 4 inches and CPUE ≥ 7 inches.

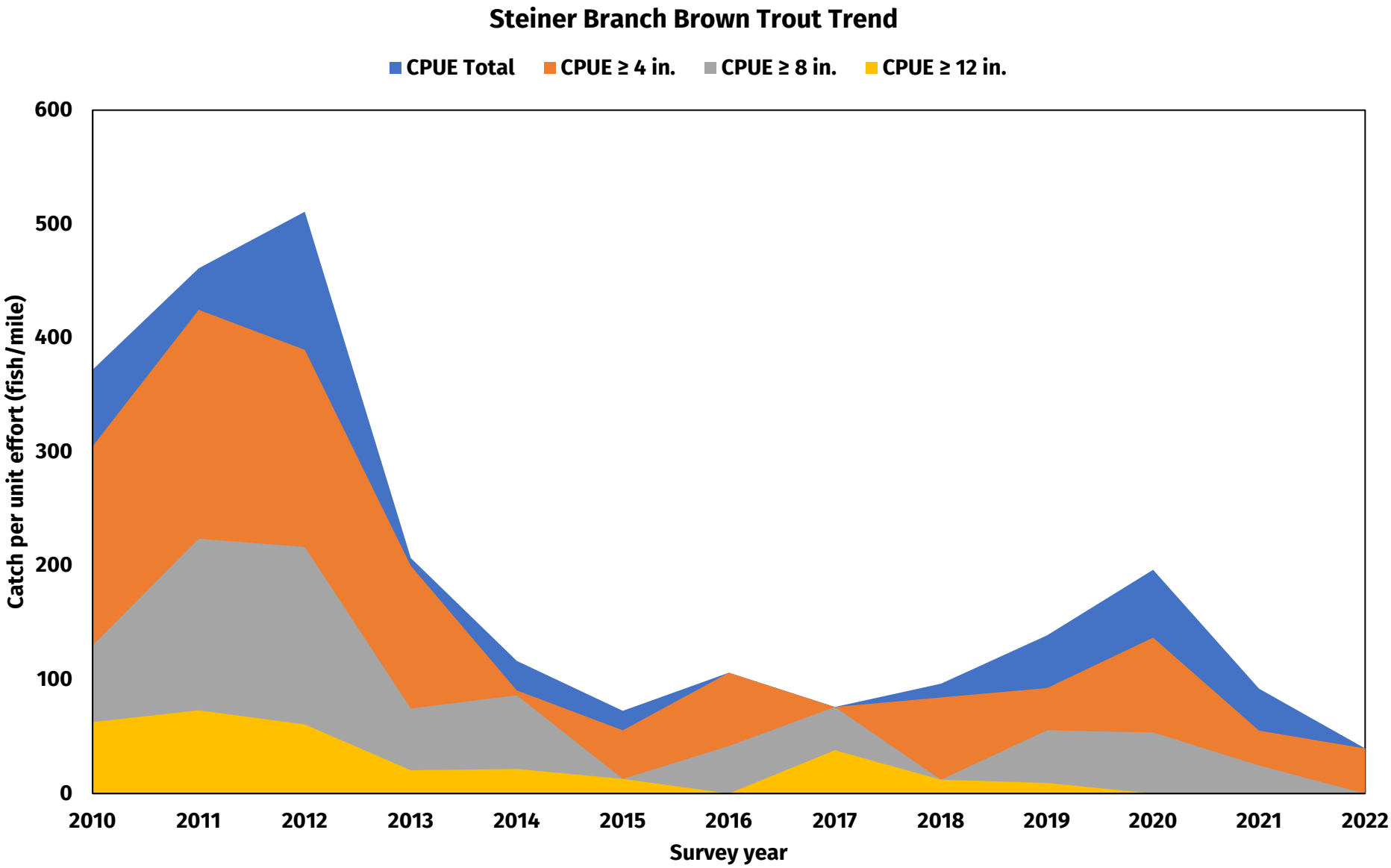

Figure 9. Long-term trends of brown trout catch per unit effort in Steiner Branch, Lafayette County, during 2010-2022. The various overlapping color layers colors represent specific size groups of brown trout as listed in the legend. This plot clearly shows adult (CPUE ≥ 8 inches) and preferred-size (CPUE ≥ 12 inches) brown trout CPUE Trends. Age-0 brown trout CPUE trends can be interpreted as the visible blue plotted area showing difference between Total CPUE and CPUE ≥ 4 inches. Age-1 brown trout CPUE trends can be interpreted as the visible orange plotted area showing the difference between CPUE ≥ 4 inches and CPUE ≥ 8 inches.

Appendix 1. Survey station locations and site information

WATERBODY AND STATION NAME	STATION NUMBER	LATITUDE	LONGITUDE	SURVEY TYPE	STREAMFLOW (CFS)	STREAM WIDTH (M)
WHITESIDE CREEK - HILL ROAD	1	42.674236	-89.91582	ROTATION	2.72	6.00
WHITESIDE CREEK - NORTH ROAD	2	42.670033	-89.95586	ROTATION	0.46	2.60
WHITESIDE CREEK - 0.5 MILE US FROM HILL RD	3	42.673815	-89.92293	ROTATION	4.70	5.50
APPLE BRANCH - SPORE RD	4	42.682978	-89.90471	ROTATION	4.56	5.00
APPLE BRANCH - APPLE GROVE CH RD	5	42.697376	-89.93623	ROTATION	0.88	2.90
APPLE BRANCH - APPLE BRANCH RD	6	42.693752	-89.91831	ROTATION	2.93	6.50
MUD BRANCH - 5079FT US OF CTH G	7	42.726807	-89.94675	ROTATION	3.50	3.40
MUD BRANCH - US CTH G BRIDGE	8	42.726093	-89.93292	ROTATION	2.75	5.20
MUD BRANCH - WEDIG PROPERTY	9	42.735613	-89.98159	ROTATION	1.52	2.00
STEINER BRANCH - STATION 3	10	42.778618	-90.02925	ROTATION	0.46	1.90
STEINER BRANCH - BASELINE LOWER	11	42.77625	-89.99864	ROTATION	1.87	3.20
STEINER BRANCH BASELINE UPPER	12	42.776752	-90.01856	ROTATION	2.01	2.00
STEINER BRANCH - 2007 HABITAT WORK	13	42.781727	-90.0062	TREND	4.03	3.00
UNNAMED TRIBUTARY (904100) S OF CTH F, US OF STEINER BR	14	42.774323	-89.99951	POTENTIAL	0.25	1.50
CANON CREEK - CTH S	43	42.81419	-90.04512	ROTATION	0.78	2.30
CANON CREEK - GILBERSTON ROAD	15	42.804085	-90.00549	ROTATION	2.08	5.30
CANON CREEK - STATION 1	16	42.809246	-90.03394	ROTATION	1.38	3.20
UNNAMED TRIBUTARY (907000) TO E BR PEC, OLD Q RD	17	42.791242	-89.88766	POTENTIAL	0.35	1.00
UNNAMED TRIBUTARY (907000) TO E BR PEC, INGWELL RD	18	42.800925	-89.90458	POTENTIAL	1.09	2.00
BROWN BRANCH - TOLLAKSON RD	19	42.54017	-89.91701	ROTATION	2.65	3.50
BROWN BRANCH - 250FT E OF BROWN RD	20	42.533491	-89.96397	ROTATION	1.31	2.50
BROWN BRANCH - FRITZGES RD	21	42.529564	-89.93558	ROTATION	2.75	3.80
SILVER SPRING CREEK - BASELINE, WALNUT RD	22	42.63915	-89.98775	ROTATION	0.32	1.30
SILVER SPRING CREEK - ROLLI PASTURE, E OF TISH RD	23	42.619324	-89.99763	ROTATION	1.48	3.20
SILVER SPRING CREEK - SILVER SPRING RD	24	42.60999	-90.00301	ROTATION	1.55	4.20

WATERBODY AND STATION NAME	STATION NUMBER	LATITUDE	LONGITUDE	SURVEY TYPE	STREAMFLOW (CFS)	STREAM WIDTH (M)
WOLF CREEK - 380FT DS OF KINGSLEY ROAD	25	42.557908	-90.11236	ROTATION	0.95	2.00
WOLF CREEK - DUNBARTON ROAD	26	42.565075	-90.05758	ROTATION	5.62	7.00
WOLF CREEK - BASELINE, CLUB HOLLOW RD	27	42.55165	-90.09387	ROTATION	1.87	5.50
WOLF CREEK - HWY. 11, GRATIOT	28	42.58028	-90.02403	POTENTIAL	14.73	8.20
TROUT BROOK - STATION 1, DUNBARTON RD	29	42.563248	-90.03099	ROTATION	5.19	3.90
TROUT BROOK - STATION 2, US WHITE CROSSING RD	30	42.537428	-90.04377	ROTATION	0.21	2.00
TROUT BROOK - STATION 1	31	42.56718	-90.02612	ROTATION	2.79	4.10
UNNAMED TRIBUTARY (919600) TO WOLF CREEK - CTH P	32	42.55921	-90.13315	ROTATION	0.49	1.50
UNNAMED TRIBUTARY (919600) TO WOLF CREEK S OF KINGSLEY RD	33	42.559198	-90.11286	ROTATION	0.74	2.20
COPPER CR - STATION 1, 150FT NE CTH K	34	42.611366	-90.04598	ROTATION	4.87	5.60
COPPER CR - DS CUB HOLLOW RD	35	42.604084	-90.09276	ROTATION	2.75	3.50
COPPER CR - STATION 3, US AMES RD	36	42.59229	-90.1133	ROTATION	2.05	2.60
LOVETT CR - WEST DOBBS RD	37	42.670152	-90.02863	ROTATION	0.42	1.20
LOVETT CR - LANCASTER RD	38	42.682697	-90.02208	ROTATION	0.35	1.50
LOVETTS CR - BERRY RD	39	42.66436	-90.03881	ROTATION	2.12	5.10
GRAVEL RUN CR - 0.75 MILE US OF OTTER CR	40	42.687459	-90.06112	ROTATION	3.14	5.00
GRAVEL RUN CR - CENTER LAMONT RD	41	42.704129	-90.01473	ROTATION	0.67	1.80
GRAVEL RUN CR - US GRAVEL RUN RD	42	42.6989	-90.0542	ROTATION	2.54	5.00

Appendix 2. Trout population characteristics by survey station (CPUE=catch per unit effort, number of fish per mile of electrofishing)

WATERBODY AND STATION NAME	TROUT SPECIES	NUMBER SAMPLED	AGE-0 CPUE (<4")	AGE-1 CPUE (4-7.9")	ADULT CPUE (≥8")	PREFERRED SIZE CPUE (≥12")
WHITESIDE CREEK - HILL ROAD	BROWN	2	0.0	5.7	5.7	0.0
WHITESIDE CREEK - NORTH ROAD	BROWN	0	0.0	0.0	0.0	0.0
WHITESIDE CREEK - 0.5 MILE US FROM HILL RD	BROWN	4	0.0	12.3	12.3	0.0
APPLE BRANCH - SPORE RD	BROWN	0	0.0	0.0	0.0	0.0
APPLE BRANCH - APPLE GROVE CH RD	BROWN	36	268.2	82.5	20.6	0.0
APPLE BRANCH - APPLE BRANCH RD	BROWN	8	0.0	21.7	21.7	0.0
MUD BRANCH - 5079FT US OF CTH G	BROWN	2	0.0	10.5	10.5	0.0
MUD BRANCH - US CTH G BRIDGE	BROWN	9	0.0	55.0	15.7	7.9
MUD BRANCH - WEDIG PROPERTY	BROWN	0	0.0	0.0	0.0	0.0
STEINER BRANCH - STATION 3	BROWN	0	0.0	0.0	0.0	0.0
STEINER BRANCH - BASELINE LOWER	BROWN	0	0.0	0.0	0.0	0.0
STEINER BRANCH BASELINE UPPER	BROWN	0	0.0	0.0	0.0	0.0
STEINER BRANCH - 2007 HABITAT WORK	BROWN	7	0.0	39.7	0.0	0.0
UNNAMED TRIBUTARY (904100) S OF CTH F, US OF STEINER BR	BROWN	0	0.0	0.0	0.0	0.0
CANON CREEK - CTH S	BROWN	1	0.0	9.9	0.0	0.0
CANON CREEK - GILBERSTON ROAD	BROWN	0	0.0	0.0	0.0	0.0
CANON CREEK - STATION 1	BROWN	0	0.0	0.0	0.0	0.0
UNNAMED TRIBUTARY (907000) TO E BR PEC, OLD Q RD	BROWN	0	0.0	0.0	0.0	0.0
UNNAMED TRIBUTARY (907000) TO E BR PEC, INGWELL RD	BROWN	3	0.0	0.0	39.3	0.0
BROWN BRANCH - TOLLAKSON RD	BROWN	2	0.0	18.6	0.0	0.0
BROWN BRANCH - 250FT E OF BROWN RD	BROWN	0	0.0	0.0	0.0	0.0
BROWN BRANCH - FRITZGES RD	BROWN	0	0.0	0.0	0.0	0.0
SILVER SPRING CREEK - BASELINE, WALNUT RD	BROWN	0	0.0	0.0	0.0	0.0

WATERBODY AND STATION NAME	TROUT SPECIES	NUMBER SAMPLED	AGE-0 CPUE (<4")	AGE-1 CPUE (4-7.9")	ADULT CPUE (≥8")	PREFERRED SIZE CPUE (≥12")
SILVER SPRING CREEK - ROLLI PASTURE, E OF TISH RD	BROWN	0	0.0	0.0	0.0	0.0
SILVER SPRING CREEK - SILVER SPRING RD	BROWN	0	0.0	0.0	0.0	0.0
WOLF CREEK - 380FT DS OF KINGSLEY ROAD	BROWN	0	0.0	0.0	0.0	0.0
WOLF CREEK - DUNBARTON ROAD	BROWN	5	0.0	5.8	23.1	11.5
WOLF CREEK - BASELINE, CLUB HOLLOW RD	BROWN	14	150.2	0.0	0.0	0.0
WOLF CREEK - HWY. 11, GRATIOT	BROWN	11	0.0	13.2	35.3	4.4
TROUT BROOK - STATION 1, DUNBARTON RD	BROWN	9	0.0	44.9	22.5	0.0
TROUT BROOK - STATION 2, US WHITE CROSSING RD	BROWN	0	0.0	0.0	0.0	0.0
TROUT BROOK - STATION 1	BROWN	1	0.0	7.1	0.0	0.0
UNNAMED TRIBUTARY (919600) TO WOLF CREEK - CTH P	BROWN	0	0.0	0.0	0.0	0.0
UNNAMED TRIBUTARY (919600) TO WOLF CREEK S OF KINGSLEY RD	BROWN	6	0.0	14.6	73.2	14.6
COPPER CR - STATION 1, 150FT NE CTH K	BROWN	0	0.0	0.0	0.0	0.0
COPPER CR - DS CUB HOLLOW RD	BROWN	0	0.0	0.0	0.0	0.0
COPPER CR - STATION 3, US AMES RD	BROWN	3	0.0	0.0	35.8	0.0
LOVETT CR - WEST DOBBS RD	BROWN	0	0.0	0.0	0.0	0.0
LOVETT CR - LANCASTER RD	BROWN	0	0.0	0.0	0.0	0.0
LOVETTS CR - BERRY RD	BROWN	0	0.0	0.0	0.0	0.0
GRAVEL RUN CR - 0.75 MILE US OF OTTER CR	BROWN	0	0.0	0.0	0.0	0.0
GRAVEL RUN CR - CENTER LAMONT RD	BROWN	0	0.0	0.0	0.0	0.0
GRAVEL RUN CR - US GRAVEL RUN RD	BROWN	0	0.0	0.0	0.0	0.0
STEINER BRANCH - STATION 3	BROOK	4	47.3	0.0	0.0	0.0
STEINER BRANCH - BASELINE LOWER	BROOK	1	9.7	0.0	0.0	0.0
STEINER BRANCH BASELINE UPPER	BROOK	25	227.0	34.0	11.3	0.0
STEINER BRANCH - 2007 HABITAT WORK	BROOK	125	629.0	28.3	51.0	5.7
UNNAMED TRIBUTARY (904100) S OF CTH F, US OF STEINER BR	BROOK	1	26.4	0.0	0.0	0.0