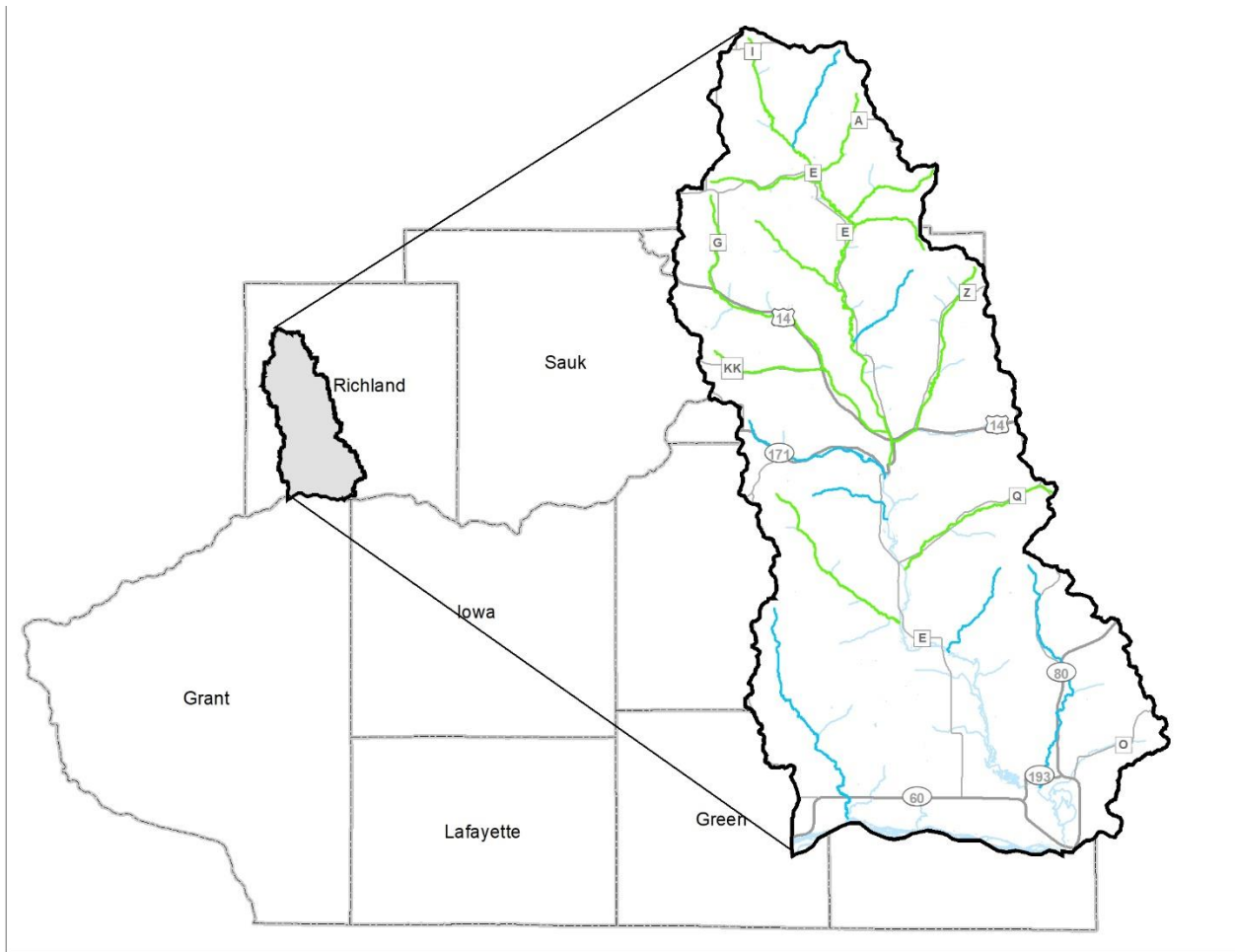


**Trout Management and Status Report of the Mill Creek Watershed,
Richland County, Wisconsin 2019**



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EXECUTIVE SUMMARY

Stream electrofishing surveys were conducted on Mill Creek and its major tributaries including Babb Hollow, Core Hollow, Coulter Hollow, Dieter Hollow, East Branch Mill Creek, Fox Hollow, Higgins Creek, Hood Hollow, Hoosier Hollow, John Hill Creek, Kepler Branch, and West Branch Mill in 2019. Stream surveys occurred at 38 sites from June 19th to August 8th, 2019. The entire mainstem and majority of tributaries are class 1 trout water. The exceptions are Core Hollow, Higgins Creek and Miller Branch which are Class 2 trout water. No fingerling trout are stocked in the Mill Creek watershed and therefore all reproduction and recruitment observed is natural.

The Mill Creek watershed is clearly dominated by Brown Trout throughout. Brown Trout CPUE was highest in the upper mainstem of Mill Creek at English Hollow Road where 1,846 total Brown Trout per mile were sampled. CPUE was also high in lower tributaries such as Fox Hollow and Dieter Hollow where site specific catch rates were 1,499 and 1,419 total Brown Trout per mile respectively. Site specific age 0 CPUE was highest in Dieter Hollow, where 548 Brown Trout (< 4") per mile were captured. Sites on West Branch Mill Creek and Ryan Hollow trailed only slightly, capturing 652 and 645 age-0 Brown Trout per mile respectively. Yearling (4"-7.9") and adult (>8") Brown Trout were highest in upper Mill Creek at the English Hollow road site with 506 and 1,224 per mile captured.

Brook Trout were collected in seven streams within the Mill Creek watershed. No Brook Trout were captured in the mainstem of Mill Creek. Reproduction of Brook Trout was highest in Dieter Hollow Creek upstream of Dieter Hollow road where CPUE was 646 age-0 (<4") fish per

mile. Recruitment was highest, yet low, in West Branch Mill Creek averaging only 26 yearlings (4"-6.9") per mile. Adult Brook Trout (>7") abundance was highest in Byrds Creek, averaging 163 fish per mile, followed by Coulter Hollow at 145 adults per mile. Overall, Brook Trout populations within the Mill Creek watershed are sporadic and exhibit low to moderate densities compared to the overwhelming numbers of Brown Trout that dominate the fishery.

Management goals will focus on maintaining the excellent Brown Trout fishery throughout Mill Creek and its tributaries. This will include pursuing easements along the middle and lower Mill Creek tributaries where fishable populations exist and where streambank protection is needed. Expanded fishing opportunities will also be pursued along the current catch and release section of Mill Creek. This includes a regulation change from catch and release to a daily bag limit of 5 trout under 12 inches. This will allow for harvest of fish within the high-density size classes while protecting larger adults. DNR will also plan to restore in-stream habitat and streambanks along the middle reaches of the upper sub watershed of Mill Creek where habitat degradation and erosion is the greatest. The Sabin Springs Fishery Area and Remnant Fee title property will be re-designated to Habitat Areas and the REM easements will be re-designated into the Streambank Easement Program during the upcoming Masterplan for the Driftless Coulees and Ridges region.

Watershed Location

Mill Creek Watershed, Richland County

Purpose of Survey

Assess natural reproduction and recruitment
Assess trout stream classification
Assess current status and abundance of trout populations
Evaluate regulations

Dates of Fieldwork

June 19, 2019 – August 8, 2019

Species Sampled

Black Bullhead, Bluntnose Minnow, Brook Stickleback, Burbot, Creek Chub, Fantail Darter, Green Sunfish, Johnny Darter, Mississippi Silvery Minnow, Mottled Sculpin, Smallmouth Bass, Southern Redbelly Dace, Western Blacknose Dace, and White Sucker.

Introduction

Mill Creek is a highly productive trout fishery located within the Lower Wisconsin River region. This portion of the Driftless Area is unglaciated and characterized by steep bluffs and karst topography. These streams are typically higher in gradient, have faster flows, and are embedded in complex floodplains (WDNR 2013). They also include streams where groundwater recharge is high and spring complexes are abundant, leading to excellent cold-water resources. The Mill Creek watershed flows into the Lower Wisconsin River, eventually flowing into the Mississippi River. Mill Creek is class 1 (re-classified as of January 1, 2020), small to medium sized, has a range of fair to excellent habitat, and a fishable population of both Brown and Brook Trout with opportunities to catch preferred size (>12") fish.

The Mill Creek watershed contains a number of classified tributaries that contribute to its productivity (Figure 1). Many of these streams provide natural reproduction and these fish eventually recruit to the fishery both in stream and to Mill Creek itself. These tributaries include Higgins Creek, Kepler Branch, Coulter Hollow, Babb Hollow, Hood Hollow, Pine Valley Creek, Miller Branch, West Branch Mill, and East Branch Mill in the upper sub watershed. In the middle and lower sub watersheds, trout water becomes limited due to both excessive fine sediments and increasing temperatures. Within these sub watersheds, Core Hollow, Vanek Branch, Fox Hollow, Dieter Hollow, John Hill, and Hoosier Hollow contribute to the mainstem. Byrds Creek is technically not within the lower Mill Creek sub watershed and flows directly to the lower Wisconsin River.

Higgins Creek is a spring fed tributary that feeds Mill Creek on the upper reaches. This stream is considered class 2 trout water and an exceptional resource water (ERW). This

tributary historically contained a large impoundment; however, this impoundment has been modified and no longer retains water but still acts as a barrier to fish movement due to the perched culvert. DNR owns streambank easement rights on approximately half of the entire stream length.

Kepler Branch is a small class 1 trout water located near the headwaters of Mill Creek. The DNR owns extensive streambank easements along the banks of Kepler Branch along with a small DNR owned fee title parcel. Historically, both Brook and Brown Trout have been found in Kepler Branch, despite issues with water quality resulting from agricultural barnyard runoff (Ripp et al. 2002).

Coulter Hollow is a class 1 tributary to the upper reaches of Mill Creek. DNR owns streambank easements intermittently throughout Coulter Hollow. This stream has been ranked high for nonpoint source pollution reduction in the past; however, it seems that property ownership and land use changes have changed significantly (Ripp et al. 2002). The headwaters of this stream are heavily row cropped but shift to wooded corridors along with extensive grassland buffers in the lower reaches.

Babb Hollow is a class 1 tributary to Mill Creek that historically had high numbers of Brook Trout. This has since shifted and is now dominated by Brown Trout. DNR owns a somewhat isolated Sabin Springs Fishery Area property at the upper reaches of this stream along Cournia Lane. This land was acquired by the DNR to restore the springs and remove the degraded spring pond. Impacts to this fishery include channelization in the past along with the

development of several spring ponds. Because of this, increasing sediment and temperatures may be limiting factors for the trout population.

Hood Hollow is a small spring-fed, class 1 tributary to Mill Creek and considered an ERW. DNR owns streambank easement frontage along the lower reaches with private lands throughout the upper reaches. Land use practices surrounding the stream consist of grazed agricultural lands in the lower reaches and extensive wooded corridors in the upper portion.

Pine Valley is another class 1, ERW trout water that contributes to the upper Mill Creek sub-watershed. DNR owns a small fee title parcel along the upper reaches of Pine Valley with close to a mile of streambank easement frontage along the lower reaches. Historically, barnyard runoff and heavily pastured corridors have contributed to water quality issues. However, based on the recent stream re-classification, this may no longer be an issue.

Miller Branch is a small, class 2 spring fed tributary to Mill Creek. This stream is higher in gradient and is thought to have good water quality; however, few surveys have been conducted in the past and little is known about this waterbody (Ripp et al. 2002). The stream corridor is wooded in the upper reaches, but as the stream progresses, the canopy opens, and several spring pond impoundments are found along the stream. These spring ponds, along with grazing and row-cropping may impact the stream to some degree.

West Branch Mill is an excellent class 1 water located in the upper Mill Creek sub watershed. This stream is known for having an excellent Brook Trout population and was used frequently as a broodstock source for the DNR's wild trout hatchery program. Channelization and beaver activity have caused issues in the past for this stream, but it seems that the water

quality continues to prevail. Although, based on the topography and underlying geology, erosion continues to be problematic and the flooding events are responsible for movement of large quantities of gravel, cobble, and rubble annually.

Ryan Hollow is small spring fed, class 1 tributary that flows to West Branch Mill Creek. Ryan Hollow has supported a healthy Brook and Brown Trout fishery in the past despite channelization and limited habitat for fish. This has since shifted and habitat is now excellent with good width, depth, flow and cool temperatures, likely due to the streamside habitat and local catchment which consists mainly of wooded corridors and extensive buffers.

East Branch Mill Creek is a class 1 trout fishery that flows into the middle Mill Creek sub-watershed. This ERW has seen limited reproduction of Brook and Brown Trout in the past and has been ranked high for nonpoint source pollution reduction as there are a number of farming operations located along this stream. These operations, along with past channelization, sedimentation and temperature issues contribute to habitat and water quality issues (Ripp et al. 2002).

Core Hollow is a seepage and spring fed, class 2 tributary that flows to the middle Mill Creek sub watershed south of Boaz. Natural reproduction of Brown Trout has been observed in Core Hollow in the past. Habitat throughout this stream ranges from fair to good, although streambank erosion continues to be problematic. Because of this, sediment deposition is a problem and likely limits natural reproduction of trout species.

Unnamed tributary, locally known as Vanek Branch, is a small class 2 tributary that flows to Mill Creek downstream of the Core Hollow confluence. Not much is known about this

stream, but it may have potential to host a population of trout. If so, it would likely harbor fish in the lower reaches as the upper portion is much too small with limited flow.

Fox Hollow is a small, class 1, spring fed tributary to Mill Creek. Intensive grazing has been known to impact this stream in terms of water quality and in-stream habitat. Channelization has also caused some issues in the past although it has been able to maintain class 1 status. The DNR does not own any fee title property or streambank easements along this stream and should be on the radar for future acquisition.

Dieter Hollow is another small spring fed tributary that flows to the middle Mill Creek sub-watershed. This stream was recently re-classified to class 1 water based on the high reproductive potential for Brook Trout. Canopy cover is minimal at best with intermittent row-cropping throughout. Despite these land use issues that typically reduce the potential for trout, Dieter Hollow seems to be doing quite well as a tributary used for spawning adults.

John Hill Creek is a small class 2 tributary that flows to the lower Mill Creek sub-watershed. Not much information is known about this stream and it may be too small with lower than normal flows to harbor much of a trout population, if any. John Hill was recently included in a research study to determine survival rates of F1, F2, and domestic Brook Trout. This study will be assessed by the research department and follow-up watershed surveys in 2025.

Hoosier Hollow is an isolated class 2 trout stream that flows to the lower Mill Creek sub-watershed. This stream contains fair habitat throughout with sediment deposition being a

major issue. Water quality may be impacted as this stream flows throughout extensive agricultural property as well as a major salvage yard.

Byrds Creek is not located within the Mill Creek watershed, but rather resides in its own watershed that flows to the lower Wisconsin River. This trout stream is class 2 and has good habitat in the lower reaches with fair habitat in the middle and upper reaches. Other than the headwaters, canopy cover is limited and the stream is mainly surrounded by row crops and grazed pastures.

Current Status

The Mill Creek watershed consists of three HUC 12 sub watersheds. The upper watershed contains the majority of classified waters in the watershed with good/excellent habitat throughout and a mix of Brook and Brown Trout. The middle Mill Creek watershed is unclassified along the mainstem with classified tributaries contributing to this portion, dominated by Brown trout with some Brook Trout reproduction in the tributaries. Mill Creek in the lower sub watershed is unclassified and only has one classified tributary containing Brown Trout.

Stocking

Currently, the only fish stocked into the Mill Creek watershed are adult broodstock from the hatcheries. These are surplus adult fish no longer needed for hatchery production. Historically, stocking has been extensive throughout this watershed as many of the tributaries and mainstem have been stocked with Brook Trout, Brown Trout, and even Rainbow Trout. These stocking events included small fingerlings, large fingerlings, yearlings, and adult

broodstock. The Brook Trout were mainly stocked as original plantings in 1997 with a few intermittent events between then and now. The majority of the stocking events for Brown Trout were from 1996-2011. In fact, the only stream surveyed during this evaluation that had never been stocked was Fox Hollow and the unnamed tributary to Hoosier Hollow. With the recent re-classification to nearly all class 1 water, it's unlikely that stocking will occur in the near future.

Regulations

The classified trout waters in the Mill Creek watershed are managed using two different regulations (Figure 2). Trout in Mill Creek upstream from STH 14 in Boaz to Quarry Hill Road are managed under a catch and release special regulation. This regulation was originally implemented to limit the potential for overharvest, as stream access in this location was abundant. All other portions of Mill Creek and its tributaries within the HUC 10 watershed are managed under the county base regulation allowing the harvest of 3 fish over 8 inches.

Habitat Improvement

Mill Creek had a series of habitat improvement projects completed in 2000. These projects took place on the stretch of stream between Coulter Hollow and the confluence of Babb Hollow as well as downstream of the CTH E crossing south of Quarry Hill Road, downstream to Miller Branch. Improvements included brushing work, bank stabilization, cross channel logs, rock weirs, in stream boulders, and plunge pools. Funding for these projects was provided by the Wisconsin Department of Natural Resources through the trout stamp program.

Public Access

Public access along the banks of Mill Creek and its tributaries is plentiful due to DNR owned fee title property and streambank easements. These lands contain over 11.1 miles of publicly accessible trout water and flow through a total of 139 acres of the above-mentioned properties. Mill Creek fishing easements and habitat areas allow for public access along the stream corridor for a variety of uses including hunting (fee title only), fishing, hiking, wildlife observation, and cross-country skiing (Figure 3).

Land use

The Mill Creek watershed, including Byrds Creek, is located entirely in Richland county and covers approximately 130 square miles. A total of 56.9 miles are classified trout water and 12.6 miles are managed as warm-water sport fishery. Land use consists of approximately 38.6% forest cover, 46% agriculture, 11.9% grassland, 2.3% wetland, and 1.2% of other (Table 1).

Watershed Scale Assessment

Understanding reproduction and recruitment is critical to managing trout populations. In class 1 streams, as defined in NR 1.02, there is no need for stocking because there is adequate natural reproduction to maintain the fishery. In streams where there is insufficient natural reproduction and recruitment to maintain a fishable population but adequate survival of trout to adulthood, the department stocks fingerling trout. These are designated as class 2 streams and the stocking is referred to as “put and grow”. 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 (young of the year trout) does not necessarily mean there is lack of natural recruitment.

Methods

Summer stream sampling on both trend (sampled every year) and rotation (sampled on a rotation) sites spanned from June 19th – August 8th (Figure 1; Table 2). All 38 stream sites were surveyed with either a tow behind barge stream shocking unit or backpack electrofishing unit. Backpack shocking units consist of a backpack mounted control box in which the operator controls the anode with one hand and dips fish with the other. These are used on small streams that are typically shallow in nature. Tow behind stream shockers are larger units in which the generator is mounted in a barge that is towed by one individual. Two individuals then shock the stream with anodes connected to the output box and capture fish. These units are used in larger waters that are also wadable.

The number of sites varies depending on the stream segment length. One site is sampled on segments less than 1.5 miles, two sites on segments from 1.5-3 miles, and one site per three miles on segments greater than three miles. Length of stream site sampled is determined by stream width, with site length being 35 times the mean stream width on segments greater than 3 meters. On streams less than 3 meters wide, a minimum of 100 meters is sampled. All fish are collected on trend sites where gamefish, exotic species, and threatened/endangered species are measured to total length. Only the first 200 fish are measured if large numbers of gamefish are encountered. Young-of-year are counted and a

subsample of 50 fish are measured. All other fish are counted to conduct an index of biotic integrity (IBI). Other specifics can be found in the Fisheries Management Handbook chapter 510 (Simonson 2015).

Water quality and habitat metrics were also collected at each survey site. Streamflow was calculated at one transect, at each site, using a HACH FH950 handheld flow meter. Temperature, dissolved oxygen, and specific conductivity were also measured using a handheld YSI Pro 2030 meter.

Population Assessment

Once gamefish and other fish species have been collected, we computed the number of fish per mile based on the number of fish collected and the length of stream station sampled. This allows us to compare catch rates both within and among stream sites. Total CPUE, as well size specific-catch rates were calculated for age 0 fish (young-of-year, <4.0 inches), yearlings (4.0-7.9 inches for Brown Trout and 4.0-6.9 inches for Brook Trout), and adults (≥ 8 inches for Brown Trout and ≥ 7 inches for Brook Trout). Median values for size-specific trout CPUE metrics presented in several of the tables and figures in this paper were generated from summaries of WDNR fishery surveys of class 1 trout streams in the Driftless Area as well as statewide from 2007-2014 where at least one trout was collected in the survey (surveys where the catch was zero were excluded; Table 3). We used these regional and statewide summaries to compare our stream specific abundance data as low abundance (<35th percentile), medium (35th-65th percentile), and high (>65th percentile; Table 3).

Index of Biotic Integrity

The Index of Biotic Integrity (IBI) for coldwater fish communities is used to assess aquatic ecosystem health based on the structure, composition, and functional organization of fish assemblages (Lyons et al. 1996). This index rates the aforementioned with regional and habitat specific expectations derived from comparable ecosystems (Lyons et al. 1996). For our analyses, IBI's were computed at sites where greater than 100 trout were captured.

Results

Overall, 38 stream sites were sampled within the Mill Creek watershed (Figure 1; Table 2). Data were compiled based on both individual stream site (Table 5; Table 6) and grouped based on stream segments. For segments than combined multiple stream sites, CPUE was averaged (Figure 4-11).

CPUE

Brown Trout reproduction was observed in streams throughout the Mill Creek Watershed. In fact, only four streams did not have evidence of reproduction and these included Coulter Hollow, Higgins Creek, John Hill Creek, and Vanek Branch. Streams that exceeded both Driftless Area and statewide median values of Brown Trout YOY CPUE included: Babb Hollow, Dieter Hollow, Fox Hollow, Hood Hollow, Hoosier Hollow, Kepler Branch, Mill Creek, Miller Branch, Pine Valley, Ryan Hollow, and West Branch Mill. Mean reproductive values were lower than these median values in Byrds Creek, Core Hollow, and East Branch Mill. Reproduction was highest at sites within Dieter Hollow, West Branch Mill, and Ryan Hollow with 658, 652, and 645 YOY per mile respectively (Table 5; Figure 4). Overall, reproduction of Brown Trout within the Mill Creek watershed was excellent.

Reproduction of Brook Trout within the Mill Creek watershed was more limited and overall lacking in many tributaries. Only five streams exhibited natural reproduction and these included Byrds Creek, Core Hollow, Dieter Hollow, East Branch Mill, and West Branch Mill. Dieter Hollow, East Branch Mill and West Branch Mill exceeded the Driftless Area and statewide median values (Table 6; Figure 5). Dieter Hollow exhibited the highest reproductive values for Brook Trout, followed by West Branch Mill and East Branch Mill with 646, 222, and 161 YOY per mile respectively. Byrds Creek and Core Hollow fell well below these median values and reproduction was considered low with 7 and 11 YOY per mile respectively (Figure 5).

Average recruitment of yearling Brown Trout was highest in Fox Hollow, Dieter Hollow, and Ryan Hollow averaging 296, 235, and 226 fish per mile respectively (Table 5; Figure 6). These rates of recruitment were above and beyond the Driftless Area and statewide median values. Fox Hollow had the best recruitment overall with sites ranging from 105-487 yearlings per mile. However, the site that had the single highest number of yearlings surveyed was Mill Creek upstream of English Hollow Road at 506 yearlings per mile. The only streams that did not show signs of recruitment were Byrds Creek, John Hill and Vanek Branch.

Recruitment of yearling Brook Trout was very low throughout the entire Mill Creek watershed (Table 6; Figure 7). Only four streams contained yearling Brook Trout: Byrds Creek, Dieter Hollow, East Branch Mill, and West Branch Mill. None of these exceeded either Driftless Area or statewide median values and all were below the 35th percentile (Table 3). Overall, West Branch Mill Creek had the greatest average recruitment at 26 yearlings per mile. The site that exhibited highest recruitment was West Branch Mill Creek at Cortland Drive with 56 yearlings per mile (Site 128).

Adult Brown Trout were found in highest concentrations within the mainstem of Mill Creek (Table 5; Figure 8). Adult Brown Trout averaged 554 fish per mile based on the 6 sites surveyed. The site with the highest density of adult fish was Mill Creek at station 5B along CTH E (site 133) at 1,224 fish per mile. Adult Brown Trout were also found at high densities in Coulter Hollow, Fox Hollow, and Higgins Creek, with average abundance above both Driftless Area and statewide medians (Table 5; Figure 8). Streams with low abundance of Brown Trout below the 35th percentiles were Byrds Creek, Hood Hollow, Hoosier Hollow, and John Hill Creek. No adult Brown Trout were surveyed in Miller Branch or Vanek Branch. Preferred size Brown Trout (>12") were also found in many streams throughout the watershed (Figure 10). Fox Hollow and Higgins Creek also had average populations of preferred size Browns above and beyond the Driftless Area and statewide median values. East Branch Mill and Mill Creek also had sites where preferred Brown Trout were present in high densities (Sites 126, 141, 133, and 134). Preferred size Brown Trout were absent in Hood Hollow, John Hill, Kepler Branch, Miller Branch, and Vanek Branch.

Adult Brook Trout were only found sporadically in streams throughout the Mill Creek watershed. The only streams harboring adult Brook Trout were Babb Hollow, Byrds Creek, Coulter Hollow, Dieter hollow, East Branch Mill and West Branch Mill (Table 6; Figure 9). Two streams, Byrds Creek and Coulter Hollow had higher densities averaging 163 and 145 adult Brook Trout per mile respectively. Both of these streams were above the Driftless Area and statewide median values. West Branch Mill and East Branch Mill had moderate CPUE's of Brook Trout averaging 51 and 48 fish per mile respectively. Babb Hollow and Dieter Hollow exhibited low CPUE's on average. Preferred size Brook Trout were found in Babb Hollow, Byrds Creek,

East Branch Mill and West Branch Mill with highest densities in Byrds Creek averaging 49 fish per mile and site 109 containing 113 fish per mile (Table 6).

During this watershed assessment, several non-trout species were also collected. These included: Black Bullhead (*Ameiurus melas*), Bluntnose Minnow (*Pimephales notatus*), Brook Stickleback (*Culaea inconstans*), Burbot (*Lota lota*), Creek Chub (*Semotilus atromaculatus*), Fantail Darter (*Etheostoma flabellare*), Green Sunfish (*Lepomis cyanellus*), Johnny Darter (*Etheostoma nigrum*), Mississippi Silvery Minnow (*Hybognathus nuchalis*), Mottled Sculpin (*Cottus bairdii*), Smallmouth Bass (*Micropterus dolomieu*), Southern Redbelly Dace (*Chrosomus erythrogaster*), Western Blacknose Dace (*Rhinichthys obtusus*), and White Sucker (*Catostomus commersonii*).

Index of Biotic Integrity

IBI's were conducted at sites where greater than 100 trout were captured. We captured >100 fish at five sites on Dieter Hollow (122), Fox Hollow (131), Mill Creek (133 and 134) and West Branch Mill Creek (143). Based on the stream natural communities, all these stations are considered a cool-cold mainstem. The definition of cool (cold-transition) mainstem is considered moderate to large water but still wadable with cool to cold summer temperatures. Coldwater fishes are common to uncommon, transitional fishes are abundant to common, and warm water fishes are uncommon to absent. Headwater species are common to absent, mainstem species are abundant to common, and river species are common to absent (WDNR 2020). Therefore, the cool-cold IBI rating was used and station 122 scored 50, station 131

scored 40, station 133 scored 70, station 134 scored 50 and station 143 scored 70. The Driftless Area 5-year median score is 50 and statewide 5-year median score is 60.

Discussion

The Mill Creek watershed is a Brown Trout dominated fishery. Brown Trout of varying age and size classes were found in all surveyed streams, except for Vanek Branch, which doesn't seem to support trout of any species. Brown Trout were found in high densities in a number of these streams, exhibiting natural reproduction and recruitment to the fisheries. Despite the lack of stocking, natural reproduction was observed and exceeded the Driftless Area and statewide median values in over half of all streams surveyed. Interestingly, yearling recruits were found in higher densities within tributaries of the lower Mill Creek sub-watershed and adult Browns were found in varying densities throughout. Unfortunately, it seems as though Brook Trout in the Mill Creek watershed are decreasing and the underlying factors such as interspecific competition and climate change may be playing large roles in the declines.

The mainstem of Mill Creek in the upper sub-watershed is classified as class 1 trout water with natural reproduction and recruitment to sustain the fishery. This is evident based on the lack of stocking in recent history, coupled with moderate recruitment to yearlings and high densities of adult Brown Trout throughout. Levels of adult fish averaged 553 fish per mile and one site exceeded 1200 fish per mile (Table 5; Figure 8; Figure 12; Figure 13). The mainstem of Mill Creek provides excellent angling opportunities and even provides some preferred size fishing opportunities.

Mill Creek in the middle and lower sub-watersheds is non-classified trout water. These reaches, although they may exhibit cold temperatures, likely don't have the habitat to support trout populations due to streambank erosion and excessive siltation along the streambed. The several tributaries that flow to the lower sub-watersheds that contain much better habitat and colder temperatures will likely continue to hold most of the fish in these lower reaches. Also, with the absence of public land along lower Mill Creek, DNR habitat restoration projects will be difficult to achieve. Therefore, management within the middle and lower sub-watersheds will focus primarily on the classified coldwater tributaries that have quality habitat and the likelihood to maintain trout populations.

Higgins Creek is a small class 2 tributary within the upper reaches of the Mill Creek watershed. This tributary has excellent habitat with cold temperatures but may be too small to maintain fishable populations of trout. Although habitat is great and temperatures are cold, no natural reproduction was present during 2019 surveys. However, yearling and adult fish were found, and adult fish even exceeded both statewide and Driftless Area median values. One limiting factor for this stream is the dry dam in the middle of the stream reach. A plunge pool exists and movement of fish above this is dam is non-existent. If reproduction is occurring, it's likely occurring above the dry dam and fish are moving downstream after recruiting to yearlings or adults.

Kepler is a small class 1 tributary to upper Mill Creek with fair to good habitat throughout. This stream historically held Brook Trout, yet no Brook Trout were encountered during 2019 surveys. The only site that had Brown Trout was the lower site above the confluence with Mill Creek. Stream temperatures were also surprisingly warm at these sites

with 67 degree water temperature at the upper site and 66 degrees at the lower site. Perhaps stream temperatures and habitat are playing a role limiting trout from utilizing this small tributary. In the headwaters of Kepler Branch, overhead cover is limited with heavy grazing and row-cropping surrounding streambanks. These activities are likely increasing runoff and sediment load within the stream and a cause of increasing temperatures. Stream temperatures cool as the stream progresses and flows through the wooded state land and private properties as it approaches Mill Creek. Implementing best management practices in the headwaters could help improve habitat and water quality for Kepler Branch in the future.

Coulter Hollow is a smaller class 1 tributary with a surprisingly productive fishery. This stream was recently reclassified from class 2 to class 1 in January of 2021. Habitat is excellent based on qualitative surveys with good substrate and extensive buffers in the lower reaches, which likely help temperatures stay low throughout this reach. No reproduction was found for either Brook or Brown Trout, but adult Brook trout were found in moderate numbers and Brown Trout numbers were considered high. This is a significant increase from 2013 surveys where only 17 Brook Trout per mile were found. Although Brown Trout numbers were high, they were less than half of those found in the 2013 surveys. These fish are likely utilizing the majority of available habitat in Coulter Hollow and hopefully reproduction will rebound in years to come.

Babb Hollow is another small class 1 tributary to the upper sub-watershed of Mill Creek. This stream has good to excellent habitat with temperatures suitable for trout. This stream has seen dramatic shifts in fish community structure since 2013 surveys. Historically, Babb Hollow was a productive Brook Trout fishery within the watershed. However, in recent years, with land

use change and interspecific competition, Brown Trout have taken over. Only low numbers of Brook Trout were found in 2019 surveys. Brown Trout exhibited high natural reproduction, recruitment, and adult retention. These shifts are becoming more prevalent with the effects of climate change and the aggressive nature of Brown Trout. Babb Hollow will likely retain its trout fishery in the future, but Brook Trout may become non-existent.

Hood Hollow is another small tributary to Mill Creek that was reclassified to class 1 trout water in 2021. This stream has good to excellent habitat, low flows, and cold temperatures. This is another stream that historically held Brook Trout but were nonexistent in 2019 surveys. Brown Trout dominated the catch in Hood Hollow, with high rates of reproduction and low recruitment to age 1. This stream is likely too small to hold yearling and adult fish and these fish likely move down to the mainstem of Mill Creek after their first summer. Hood Hollow should continue to be a good nursery stream for Brown Trout in the years ahead.

Pine Valley is a class 1 tributary to upper Mill Creek that contains cold temperatures and good to excellent habitat. This stream had issues with barnyard runoff in the past but based on habitat scores and fish populations, has since rebounded. Pine Valley had good reproduction at both survey sites with moderate rates throughout. No other size classes were found at the upper site, but recruitment to yearlings and adults proved productive as these rates were moderate in both categories.

Miller Branch is one of the remaining class 2 trout fisheries located within the Mill Creek watershed. This small stream, although containing good habitat and temperatures below 60 degrees, is likely too small to hold adult fish. However, reproduction was high at 225 young of

year per mile, approaching the 70th percentile for Driftless Area streams. Recruitment was low, only sampling 16 fish per mile. Miller Branch seems to be acting as a nursery stream for the Mill Creek mainstem, with good spawning habitat. Once fish recruit to age-1 they move out to Mill Creek where stream size is larger, and habitat is more abundant. Because fish are utilizing this tributary for spawning purposes and yearling trout are holding over to utilize the available habitat, Miller Branch should be considered for re-classification to class 1 trout water during the next classification cycle in 2022.

West Branch Mill Creek is one of the tributaries in the watershed that contains a fishable population of Brook Trout. Reproduction of Brook Trout was high at site 140, with 222 fish per mile. Although reproduction was high, recruitment was low at all sites surveyed based on statewide medians. This is probably due to competition between Brook and Brown Trout within this stream (Figure 14). Brown Trout reproduction was much higher at site 140, with 652 Brown Trout young of year per mile. Recruitment of Brown Trout at this site was moderate with a high density of adults at 320 fish per mile. These adult densities were even higher at site 143 downstream, with 500 adult Brown Trout per mile. This stream was historically dominated by Brook Trout, but with trends favoring Brown Trout, Brook Trout in West Branch Mill Creek may struggle to thrive in the future.

Ryan Hollow is a tributary to West Branch Mill Creek and is likely contributing to the high density of Brown Trout within these streams. Although temperatures are a bit higher in this stream, size is nearly 5 meters wide with excellent habitat throughout to provide cover for trout. In fact, CPUE of Brown Trout was 1,110 fish per mile in 2019, nearly double that captured in 2013 surveys where only 563 Brown Trout per mile were sampled. Brook Trout numbers

were also down from 2013 where 16 Brook Trout were found, compared to 0 in 2019 surveys. This stream is favoring Brown Trout with excellent rates of reproduction and moderate recruitment to age-1 and adulthood based on both statewide and Driftless Area standards. Ryan Hollow Creek will continue to hold its own as a standalone fishery, while also contributing to the fishery of West Branch Mill Creek.

East Branch Mill Creek has a surprisingly good population of both Brook and Brown Trout. The upstream site at Tuckaway Valley road favors Brook trout with high rates of reproduction based on Driftless Area standards with low recruitment to age-1 and moderate abundances of adult fish. This stream transitions to Brown Trout water in the lower reaches with the lower site dominated by Brown Trout. Reproduction and recruitment were moderate with high densities of adults. Brook Trout numbers were higher in 2019 than 2013 surveys where densities increased from 160 to 274 fish per mile. Brown Trout actually decreased at the upper site, from 225 fish per mile in 2013, to 60 fish per mile in 2019. Overall, Brook Trout are trending positively in upper East Branch Mill Creek as Brown Trout have stabilized in the lower reaches. Considering that East Branch Mill Creek has a high density of adults, easement acquisition should be pursued along this stream for angler access.

Core Hollow is currently considered a class 2 trout fishery in the lower Mill Creek sub watershed that contains good to excellent habitat, cold temperatures, and plenty of flow to sustain a fishable population of trout. Brown Trout are currently thriving in Core Hollow and CPUE of Brown Trout is up from 2013 surveys. In 2013 surveys, 341 Brown Trout per mile were surveyed at the upper site, whereas 468 Brown Trout per mile were surveyed in 2019. Unfortunately, Brook Trout numbers have decreased since 2013. Only 15 YOY per mile were

found in 2019, compared to 82 per mile in 2013. This is likely due in part from competition between Brook and Brown Trout. This will likely be the case in the future as we continue to see the impacts from interspecific competition and climate change. Due to the increased population of Brown Trout with good natural reproduction, recruitment to age 1 and adulthood, Core Hollow should be re-classified as class 1 trout water during the next classification cycle in 2022.

Vanek Branch is a class 2 tributary to lower Mill Creek and should not be considered classified trout water. Vanek Branch did not contain any trout during the sampling events in 2019, or the previous survey in 2013. Based on qualitative surveys, habitat seems to be good; however, the stream is likely too small with too low of flows to holdover any trout. Land use is also a limiting factor for this stream. Intensive row crops up to the streambank, extensive grazing, and little to no buffers may be increasing sediment contribution to the streambed, further limiting available spawning habitat. The likelihood of this stream rebounding is low, especially with other nearby tributaries containing good habitat and temperatures available to trout. Therefore, Vanek Branch should be de classified.

Fox Hollow is an excellent class 1 tributary to the lower Mill Creek sub watershed. This stream has an excellent self-sustaining population of Brown Trout. Fox Hollow was not surveyed during the last watershed rotation in 2013 but was surveyed two years prior in 2011. Once again, no Brook Trout were discovered, but high densities of Brown Trout were sampled. Numbers were down slightly at both sites. Upstream at CTH Q densities approached 1,500 Brown Trout per mile, down from 1,915 per mile in 2011. Reproduction, recruitment to age-1 and recruitment to adulthood was high and exceeded both statewide and Driftless Area

standards. Numbers were also down slightly at the Jackson Road bridge site, exhibiting 385 fish per mile compared to 434 fish per mile in 2011. Fox Hollow should be pursued for easement acquisition in the future, especially along the lower reaches where streamside buffers and overhead canopy cover are limited, and row cropping and grazing are widespread.

Dieter Hollow is another tributary to lower Mill Creek that contains a healthy population of both Brown and Brook Trout. The upstream site had excellent reproduction of both species, with 645 Brook Trout per mile and 658 Brown Trout per mile. However, recruitment of Brook Trout was not favorable with only 13 fish per mile reaching adulthood compared to a much higher density of Brown Trout at the lower site. Brown Trout at the lower site had a balanced population exhibiting rates above the 75th percentile for both Driftless Area and statewide standards. This stream also has some of the highest numbers of preferred size fish in the watershed, with densities of Brown Trout >12 inches at 41 fish per mile. This could prove to be an excellent fishery if access was more abundant; therefore, easement acquisition along Dieter Hollow in the future is recommended.

John Hill is a small, isolated tributary to lower Mill Creek. This stream is small, although flows and temperatures are adequate to provide a small trout fishery. Interestingly, only one adult Brown Trout was sampled in John Hill Creek. This stream may benefit from stocking events in the future to increase the density to a fishable size. DNR research stocked 1500 Brook Trout in John Hill during the 2019 fall stocking season as part of an F1/F2/domestic stocking study. It has yet to be seen but perhaps these fish may hold on and recruit to the fishery. If survival and recruitment is observed, more attention should be focused on this tributary in the future.

Hoosier Hollow is one of the largest tributaries to lower Mill Creek. Densities of Brown Trout were down slightly at 146 fish per mile, compared to 193 fish per mile in 2012. Brook Trout were also nonexistent in 2019 surveys, compared to 16 Brook Trout per mile in 2012. This decline isn't surprising given the expansion of a salvage yard on the upper reaches of Hoosier Hollow. It's possible this may be contributing to a decline in water quality within this stream reach. In the upper reaches, wooded corridors are plentiful, but as the stream progresses, increases in row cropping and grazing are apparent. If streambank buffers were expanded, Hoosier Hollow has the ability to maintain a good Brown Trout population, given the size, flow and cool temperatures. Without land use practice changes, sediment will continue to be an issue and limit the potential for this stream.

Byrds Creek is a small stream located in its own sub watershed that flows directly to the lower Wisconsin River. This stream has excellent potential to maintain a productive Brook Trout fishery because of its cold temperatures, excellent habitat and flows contributed by a series of springs located along the upper-middle reaches. Moderate rates of reproduction were observed for both Brook and Brown Trout; however, Brook Trout had more consistent recruitment to age-1 and a high density of adults at 403 fish per mile. Brook Trout were only stocked in three years and originated from the Melancthon/Mill Creek broodstock and should exhibit genetics native to the Wisconsin River basin. Genetics samples have been collected and will be analyzed to determine origin. As long as the Brown Trout population remains low, Brook Trout should continue to thrive in this isolated tributary. Further, the Byrds Creek watershed should be pursued for easement acquisition, as the springs located along this stream should be protected from further development.

Only two different regulations are used to manage trout populations in the Mill Creek watershed. These include one special regulation and the Richland County base regulation. The special catch and release regulation along the middle mainstem of Mill Creek has been used for a number of years to restrict harvest of all trout species and age classes. It was once thought that this reach provided the reproduction and recruitment for the majority of the stream. However, many tributaries and upper reaches of Mill Creek also play a large role in reproduction and recruitment. To provide more opportunities for anglers, this stream reach should be opened for harvest. Therefore, the following regulation is suggested: a daily bag limit of 5 trout in total under 12 inches. This regulation will allow for harvest of the higher density size classes found in this stream reach. By reducing densities, this should improve growth rates and size structure while protecting preferred size fish to promote a quality fishery.

The Mill Creek watershed resides in a highly agricultural region of the Driftless Area (Table 1). However, despite this landcover statistic, the water quality continues to provide for an excellent fishery within Mill Creek and its contributing tributaries. Only three sites surveyed had a rating of fair, while all the other sites were considered good or excellent (Table 4). Stream temperatures were also cool to cold and only two sites approached or exceeded 70 degrees (Table 4). Mill Creek has been impacted by large rainfall events and flooding during the last few years. Because of this, habitat has been severely degraded and needs restoration. A future habitat project should be planned for the middle Mill Creek mainstem, aimed at sloping and stabilizing streambanks, reconnecting the stream to the floodplain, and incorporating in stream structures such as vortex weirs, cross logs and boulders. This would help provide more habitat

for adult and preferred sized trout as well as reduce impacts of flooding and sedimentation to ensure spawning habitat is available and abundant.

Management Recommendations

- 1) **Goal:** Provide harvest opportunity and increase average length of Brown Trout in middle Mill Creek (CTH E trend site)

Objectives: Increase mean length from 9.5 inches to 10 inches (above both statewide and Driftless Area medians). Increase density of fish >12 inches from 62 fish per mile to 100 fish per mile. This is based on the 75th percentile for Driftless Area streams and 85th percentile statewide. Increase density of fish >15 inches from 7 fish per mile to 20 fish per mile. This is based on the 85th percentile for Driftless Area streams and 90th percentile statewide.

Strategy: Regulation Change. Remove catch and release regulation from STH 14, upstream to Quarry Hill Road. Implement new regulation: 5 trout under 12 inches.

- 2) **Goal:** Restore in-stream habitat and streambanks along middle Mill Creek.

Objective: Improve 1 mile of streambank and in stream habitat by 2026.

Strategy: Initiate habitat improvement project along middle Mill Creek easement lands north and south of Pine Valley Road. Evaluate and schedule future follow-up habitat project.

- 3) **Goal:** Increase streambank easement mileage by 3 miles in the lower Mill Creek sub watersheds.

Objective: Acquire authority to purchase streambank easements during the next streambank easement review cycle.

Strategy: Expand streambank easement authority along middle and lower Mill Creek tributaries with fishable populations of trout: Byrds Creek, Dieter Hollow, East Branch Mill Creek and Fox Hollow.

Additional Management Recommendations:

- Declassify Unnamed Tributary to Mill Creek (Vanek Branch, WBIC: 1216800).
 - No trout were surveyed in 2019 or in other recent surveys despite numerous Brown Trout stocking events since 1996. Declassify during the classification cycle in the fall of 2022.
- Reclassify Core Hollow and Miller Branch to class 1 trout water during classification cycle in 2022.
- Re-designate Sabin Springs Fishery Area and Kepler-REM fee title area to the statewide habitat area program. This can be completed during the Driftless Coulees and Ridges master planning process.
- Re-designate the REM Mill Creek easements to the Mill Creek – Streambank Easement Program. This can be completed during the Driftless Coulees and Ridges master planning process.

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Table 1. Watershed and Riparian Land Cover Statistics within the Mill Creek watershed.

Land Cover	Percent of Watershed	
Forest (total)	38.6	
Broad-Leaf Deciduous		38.3
Coniferous		0.3
Agriculture	46.0	
Grassland	11.9	
Wetland (total)	2.3	
Emergent/Wet Meadow		1.5
Forested		0.6
Lowland Shrub		0.2
Other	1.2	

Table 2. Sampling locations by stream and station.

Stream	Station Name	Station Number	Sampling Date	Lat.	Long.
Mill Creek	MILL CREEK #2 (ABOVE DAM)	138	30-Jul-2019	43.4436	-90.5811
	MILL CREEK #1 (UPPER) AT ROBBSON RD	141	30-Jul-2019	43.4389	-90.5743
	MILL CREEK ABOVE CONFL ALONG HWY E	137	30-Jul-2019	43.4274	-90.5651
	MILL CREEK US OF ENGLISH HOLLOW RD	133	25-Jul-2019	43.4151	-90.5492
	MILL CREEK ST. 5B ALONG HWY E	134	25-Jul-2019	43.3842	-90.5471
	Mill Creek at 171 in Boaz	139	30-Jul-2019	43.3319	-90.5281
Higgins Creek	Higgins Creek	141	26-Jun-2019	43.4433	-90.5725
Kepler Branch	Upper Kepler	107	3-Jul-2019	43.4245	-90.5881
	Lower Kepler	124	11-Jul-2019	43.4274	-90.5657
Coulter Hollow	Coulter Hollow	108	19-Jun-2019	43.4325	-90.5561
Babb Hollow	BABB HOLLOW ~560 FT DS COURNIA LN	116	27-Jun-2019	43.4252	-90.5341
	BABB HOLLOW CREEK AT ENGLISH RIDGE ROAD	117	2-Jul-2019	43.4181	-90.5435
Hood Hollow	HOOD HOLLOW 1200 FEET BELOW HOOD HOLLOW RD	112	19-Jun-2019	43.4142	-90.5361
	HOOD HOLLOW OFF PRIVATE DRIVE BRIDGE 120 FT ABV MILL CREEK	111	19-Jun-2019	43.4126	-90.5441
Pine Valley	PINE VALLEY CREEK ~75FT DS OF CONFLUENCE TO UNNAMED TRIB	118	1-Jul-2019	43.4041	-90.5782
	Pine Valley Cr ~2600 ft DS of Bayne Lane	110	8-Jul-2019	43.3972	-90.5623
Miller Branch	Miller Branch	113	26-Jun-2019	43.3746	-90.5433
West Branch Mill Creek	WEST BRANCH MILL CREEK AT UPPER HWY 14 BRIDGE CROSSING	119	17-Jul-2019	43.3906	-90.6097
	WEST BR MILL CREEK OFF PRIVATE DR	140	1-Aug-2019	43.3831	-90.5921
	MILL CREEK, W BRANCH - CORTLAND DR	128	17-Jul-2019	43.3729	-90.5635
	West Branch Mill Creek downstream off Luke Miller Property	143	8-Aug-2019	43.3586	-90.5548
Ryan Hollow	Ryan Hollow	125	11-Jul-2019	43.3637	-90.5642
East Branch Mill Creek	E BRANCH MILL CREEK - TUCKAWAY VALLEY RD	126	17-Jul-2019	43.3663	-90.5048
	E. BRANCH MILL UPSTREAM FROM HWY 14	127	17-Jul-2019	43.3441	-90.5455
Core Hollow	CORE HOLLOW STATION 2	130	3-Jul-2019	43.3336	-90.5656
	CORE HOLLOW STATION 1	120	9-Jul-2019	43.3291	-90.5306
Vanek Branch	Vanek Branch	114	26-Jun-2019	43.3193	-90.5317

Fox Hollow	FOX HOLLOW CREEK CTY Q BRIDGE	131	8-Jul-2019	43.3123	-90.4965
	FOX HOLLOW CREEK (JACKSON DR BRIDGE)	121	9-Jul-2019	43.2992	-90.5185
Dieter Hollow	DIETER HOLLOW STATION 4, 30M US DIETER HOLLOW RD	122	9-Jul-2019	43.3064	-90.5645
	DIETER HOLLOW STATION 2 ALONG DIETER HOLLOW RD (2)	123	9-Jul-2019	43.2939	-90.5537
John Hill	John Hill	132	1-Aug-2019	43.2739	-90.4956
Hoosier Hollow Creek	HOOSIER HOLLOW AT PRIVATE DRIVE ABV LAST HWY 80 CROSSING	136	6-Aug-2019	43.5228	-90.4427
	HOOSIER HOLLOW AT HONER RD	135	6-Aug-2019	43.2691	-90.4527
	Unnamed Trib to Hoosier Hollow 60M US of Hoosier Hollow	142	7-Aug-2019	43.2671	-90.4475
Byrds Creek	Byrds Creek Upper Site	106	15-Jul-2019	43.2641	-90.5786
	Byrds Creek Along Byrds Creek Valley Drive	129	16-Jul-2019	43.2481	-90.5689
	Byrds Creek US Thingold Lane	109	17-Jul-2019	43.2414	-90.5619

Table 3. Statewide and Driftless Area percentiles for Brook and Brown Trout Populations. These values were summarized for class 1 trout populations sampled from 2007-2014 where at least 1 trout was collected.

	Statewide Percentiles			Driftless Percentiles		
	35 th	Median	65 th	35 th	Median	65 th
Brown						
<4 inches	12.4	50	154.1	16.7	75	180
4 to 8 inches	95.7	188.46	325	108.3	213.89	363.6
>8 inches	66.7	155.56	300	150.9	300	460
>12 inches	7.7	24	48.5	22.2	44.44	70
Brook						
<4 inches	16.7	66.67	161.9	10.3	41.99	127.3
4 to 8 inches	87	173.33	301.9	42.8	100	216.7
>7 inches	33.3	57.89	100	33.3	60	111.1
>10 inches	0	0	4.4	0	0	10

Table 4. Station metrics for Mill Creek and classified tributaries.

Station Name	Habitat Rating	Trout Class	Gear	Station Length (miles)	Mean Stream Width (m)	Flow (CFS)	Stream Temp (°F)
MILL CREEK #2 (ABOVE DAM)	Good	1	Backpack	0.068	2.2	4.29	58
MILL CREEK #1 (UPPER) AT ROBBSON RD	Excellent	1	Backpack	0.076	2.1	7.42	58.1
MILL CREEK ABOVE CONFL ALONG HWY E	Excellent	1	Backpack	0.062	3	13.06	66.6
MILL CREEK US OF ENGLISH HOLLOW RD	Excellent	1	Shocker	0.085	4.3	28.96	60.1
MILL CREEK ST. 5B ALONG HWY E	Good	1	Shocker	0.144	9.5	44.85	61.4
Mill Creek at 171 in Boaz	Fair	1	Shocker	0.137	8.2	77.69	65
Higgins Creek	Excellent	2	Backpack	0.062	1.4	2.83	54.6
Upper Kepler	Fair	1	Backpack		2	1.09	67.4
Lower Kepler	Good	1	Backpack	0.084	2	5.29	66.5
Coulter Hollow	Excellent	1	Backpack	0.062	2.1	2.47	54.4
BABB HOLLOW ~560 FT DS COURNIA LN	Good	1	Backpack	0.062	1.6	1.06	61.2
BABB HOLLOW CREEK AT ENGLISH RIDGE ROAD	Excellent	1	Backpack	0.091	3.3	2.83	58.4
HOOD HOLLOW 1200 FEET BELOW HOOD HOLLOW RD	Good	1	Backpack	0.062	1.2	1.06	56.3
HOOD HOLLOW OFF PRIVATE DRIVE BRIDGE 120 FT ABV MILL CREEK	Excellent	1	Backpack	0.062	1.1	1.41	55.5
PINE VALLEY CREEK ~75FT DS OF CONFLUENCE TO UNNAMED TRIB	Good	1	Backpack	0.068	2	1.06	59.3
Pine Valley Cr ~2600 ft DS of Bayne Lane	Excellent	1	Backpack	0.082	3	2.9	56.6
Miller Branch	Good	2	Backpack	0.062	1.2	1.41	58.3
WEST BRANCH MILL CREEK AT UPPER HWY 14 BRIDGE CROSSING	Good	1	Backpack	0.101	2.7	1.76	67.9
WEST BR MILL CREEK OFF PRIVATE DR	Excellent	1	Shocker	0.072	4.6	4.24	57.1
MILL CREEK, W BRANCH - CORTLAND DR	Good	1	Backpack	0.108	3.2	8.12	64.9
West Branch Mill Creek downstream off Luke Miller Property	Excellent	1	Backpack	0.14	6.8	13.06	66.5
Ryan Hollow	Excellent	1	Backpack	0.062	2.4	4.59	66.2
E BRANCH MILL CREEK - TUCKAWAY VALLEY RD	Excellent	1	Backpack	0.062	2.5	2.83	64.2
E. BRANCH MILL UPSTREAM FROM HWY 14	Excellent	1	Backpack	0.062	3	8.48	69.4

CORE HOLLOW STATION 2	Excellent	2	Backpack	0.068	1.4	6.99	64.2
CORE HOLLOW STATION 1	Good	2	Backpack	0.075	2.2	7.77	58.2
Vanek Branch	Good	2	Backpack	0.062	1	1.77	54.9
FOX HOLLOW CREEK CTY Q BRIDGE	Excellent	1	Backpack	0.076	3.2	1.61	57.3
FOX HOLLOW CREEK (JACKSON DR BRIDGE)	Excellent	1	Backpack	0.086	2.1	12.01	57.7
DIETER HOLLOW STATION 4, 30M US DIETER HOLLOW RD	Excellent	1	Backpack	0.079	3.7	1.77	62
DIETER HOLLOW STATION 2 ALONG DIETER HOLLOW RD (2)	Good	1	Backpack	0.074	2	6	61
John Hill	Good	2	Backpack	0.062	1.3	3.53	55.7
HOOSIER HOLLOW AT PRIVATE DRIVE ABV LAST HWY 80 CROSSING	Good	2	Backpack	0.068	1.2	2.3	61
HOOSIER HOLLOW AT HONER RD	Fair	2	Backpack	0.111	3	5.23	65
Unnamed Trib to Hoosier Hollow 60M US of Hoosier Hollow	Good	0	Backpack	0.062	0.9	2.12	57.4
Byrds Creek Upper Site	Good	2	Backpack	0.062	1.4	0.57	71.3
Byrds Creek Along Byrds Creek Valley Drive	Good	2	Backpack	0.058	1.8	4.66	55.7
Byrds Creek US Thingold Lane	Excellent	2	Backpack	0.062	3.1	5.79	54

Table 5. Brown Trout CPUE by stream and station.

Stream	Station Name	Station Number	CPUE (fish/mile)	Brown <4	Brown 4-7.9	Brown ≥8	Brown ≥12
Mill Creek	MILL CREEK #2 (ABOVE DAM)	138		58.8	14.7	14.7	0.0
	MILL CREEK #1 (UPPER) AT ROBBSON RD	141		236.8	302.6	657.9	78.9
	MILL CREEK ABOVE CONFL ALONG HWY E	137		64.5	145.2	516.1	32.3
	MILL CREEK US OF ENGLISH HOLLOW RD	133		117.6	505.9	1223.5	58.8
	MILL CREEK ST. 5B ALONG HWY E	134		0.0	145.8	909.7	62.5
	Mill Creek at 171 in Boaz	139		0.0	0.0	0.0	0.0
Higgins Creek	Higgins Creek	141		0.0	112.9	371.0	48.4
Kepler Branch	Upper Kepler	107		0.0	0.0	0.0	0.0
	Lower Kepler	124		71.4	95.2	154.8	0.0
Coulter Hollow	Coulter Hollow	108		0.0	145.2	516.1	32.3
Babb Hollow	BABB HOLLOW ~560 FT DS COURNIA LN	116		596.8	64.5	0.0	0.0
	BABB HOLLOW CREEK AT ENGLISH RIDGE ROAD	117		219.8	219.8	274.7	11.0
Hood Hollow	HOOD HOLLOW 1200 FEET BELOW HOOD HOLLOW RD	112		467.7	32.3	0.0	0.0
	HOOD HOLLOW OFF PRIVATE DRIVE BRIDGE 120 FT ABV MILL CREEK	111		419.4	48.4	16.1	0.0
Pine Valley	PINE VALLEY CREEK ~75FT DS OF CONFLUENCE TO UNNAMED TRIB	118		176.5	0.0	0.0	0.0
	Pine Valley Cr ~2600 ft DS of Bayne Lane	110		109.8	256.1	341.5	12.2
Miller Branch	Miller Branch	113		225.8	16.1	0.0	0.0
West Branch Mill Creek	WEST BRANCH MILL CREEK AT UPPER HWY 14 BRIDGE CROSSING	119		19.8	0.0	29.7	0.0
	WEST BR MILL CREEK OFF PRIVATE DR	140		652.8	166.7	319.4	13.9
	MILL CREEK, W BRANCH - CORTLAND DR	128		314.8	46.3	259.3	9.3
	West Branch Mill Creek downstream off Luke Miller Property	143		192.9	150.0	500.0	28.6
Ryan Hollow	Ryan Hollow	125		645.2	225.8	241.9	16.1
East Branch Mill Creek	E BRANCH MILL CREEK - TUCKAWAY VALLEY RD	126		0.0	32.3	32.3	0.0
	E. BRANCH MILL UPSTREAM FROM HWY 14	127		80.6	64.5	371.0	64.5
Core Hollow	CORE HOLLOW STATION 2	130		58.8	132.4	279.4	14.7

	CORE HOLLOW STATION 1	120	13.3	53.3	253.3	26.7
Vanek Branch	Vanek Branch	114	0.0	0.0	0.0	0.0
Fox Hollow	FOX HOLLOW CREEK CTY Q BRIDGE	131	407.9	486.8	605.3	26.3
	FOX HOLLOW CREEK (JACKSON DR BRIDGE)	121	0.0	104.7	279.1	69.8
Dieter Hollow	DIETER HOLLOW STATION 4, 30M US DIETER HOLLOW RD	122	658.2	50.6	12.7	0.0
	DIETER HOLLOW STATION 2 ALONG DIETER HOLLOW RD (2)	123	418.9	418.9	581.1	40.5
John Hill	John Hill	132	0.0	0.0	16.1	0.0
Hoosier Hollow Creek	HOOSIER HOLLOW AT PRIVATE DRIVE ABV LAST HWY 80 CROSSING	136	73.5	29.4	44.1	14.7
	HOOSIER HOLLOW AT HONER RD	135	0.0	9.0	72.1	27.0
	Unnamed Trib to Hoosier Hollow 60M US of Hoosier Hollow	142	209.7	80.6	0.0	0.0
Byrds Creek	Byrds Creek Upper Site	106	0.0	0.0	0.0	0.0
	Byrds Creek Along Byrds Creek Valley Drive	129	85.6	0.0	0.0	0.0
	Byrds Creek US Thingold Lane	109	0.0	0.0	32.2	32.2

Table 6. Brook Trout CPUE by stream and station

Stream	Station Name	Station Number	CPUE (fish/mile)	Brook <4	Brook 4-6.9	Brook ≥7	Brook ≥10
Mill Creek	MILL CREEK #2 (ABOVE DAM)	138		0.0	0.0	0.0	0.0
	MILL CREEK #1 (UPPER) AT ROBBSON RD	141		0.0	0.0	0.0	0.0
	MILL CREEK ABOVE CONFL ALONG HWY E	137		0.0	0.0	0.0	0.0
	MILL CREEK US OF ENGLISH HOLLOW RD	133		0.0	0.0	0.0	0.0
	MILL CREEK ST. 5B ALONG HWY E	134		0.0	0.0	0.0	0.0
	Mill Creek at 171 in Boaz	139		0.0	0.0	0.0	0.0
Higgins Creek	Higgins Creek	141		0.0	0.0	0.0	0.0
Kepler Branch	Upper Kepler	107		0.0	0.0	0.0	0.0
	Lower Kepler	124		0.0	0.0	0.0	0.0
Coulter Hollow	Coulter Hollow	108		0.0	0.0	145.2	0.0
Babb Hollow	BABB HOLLOW ~560 FT DS COURNIA LN	116		0.0	0.0	16.1	16.1
	BABB HOLLOW CREEK AT ENGLISH RIDGE ROAD	117		0.0	0.0	0.0	0.0
Hood Hollow	HOOD HOLLOW 1200 FEET BELOW HOOD HOLLOW RD	112		0.0	0.0	0.0	0.0
	HOOD HOLLOW OFF PRIVATE DRIVE BRIDGE 120 FT ABV MILL CREEK	111		0.0	0.0	0.0	0.0
Pine Valley	PINE VALLEY CREEK ~75FT DS OF CONFLUENCE TO UNNAMED TRIB	118		0.0	0.0	0.0	0.0
	Pine Valley Cr ~2600 ft DS of Bayne Lane	110		0.0	0.0	0.0	0.0
Miller Branch	Miller Branch	113		0.0	0.0	0.0	0.0
West Branch Mill Creek	WEST BRANCH MILL CREEK AT UPPER HWY 14 BRIDGE CROSSING	119		89.1	19.8	99.0	9.9
	WEST BR MILL CREEK OFF PRIVATE DR	140		222.2	27.8	69.4	0.0
	MILL CREEK, W BRANCH - CORTLAND DR	128		55.6	55.6	37.0	9.3
	West Branch Mill Creek downstream off Luke Miller Property	143		0.0	0.0	0.0	0.0
Ryan Hollow	Ryan Hollow	125		0.0	0.0	0.0	0.0
East Branch Mill Creek	E BRANCH MILL CREEK - TUCKAWAY VALLEY RD	126		161.3	16.1	96.8	16.1
	E. BRANCH MILL UPSTREAM FROM HWY 14	127		0.0	0.0	0.0	0.0
Core Hollow	CORE HOLLOW STATION 2	130		14.7	0.0	0.0	0.0
	CORE HOLLOW STATION 1	120		0.0	0.0	0.0	0.0

Vanek Branch	Vanek Branch	114	0.0	0.0	0.0	0.0
Fox Hollow	FOX HOLLOW CREEK CTY Q BRIDGE	131	0.0	0.0	0.0	0.0
	FOX HOLLOW CREEK (JACKSON DR BRIDGE)	121	0.0	0.0	0.0	0.0
Dieter Hollow	DIETER HOLLOW STATION 4, 30M US DIETER HOLLOW RD	122	645.6	0.0	12.7	0.0
	DIETER HOLLOW STATION 2 ALONG DIETER HOLLOW RD (2)	123	0.0	27.0	13.5	0.0
John Hill	John Hill	132	0.0	0.0	0.0	0.0
Hoosier Hollow Creek	HOOSIER HOLLOW AT PRIVATE DRIVE ABV LAST HWY 80 CROSSING	136	0.0	0.0	0.0	0.0
	HOOSIER HOLLOW AT HONER RD	135	0.0	0.0	0.0	0.0
	Unnamed Trib to Hoosier Hollow 60M US of Hoosier Hollow	142	0.0	0.0	0.0	0.0
Byrds Creek	Byrds Creek Upper Site	106	0.0	0.0	0.0	0.0
	Byrds Creek Along Byrds Creek Valley Drive	129	34.5	17.2	86.2	34.5
	Byrds Creek US Thingold Lane	109	0.0	0.0	403.2	112.9

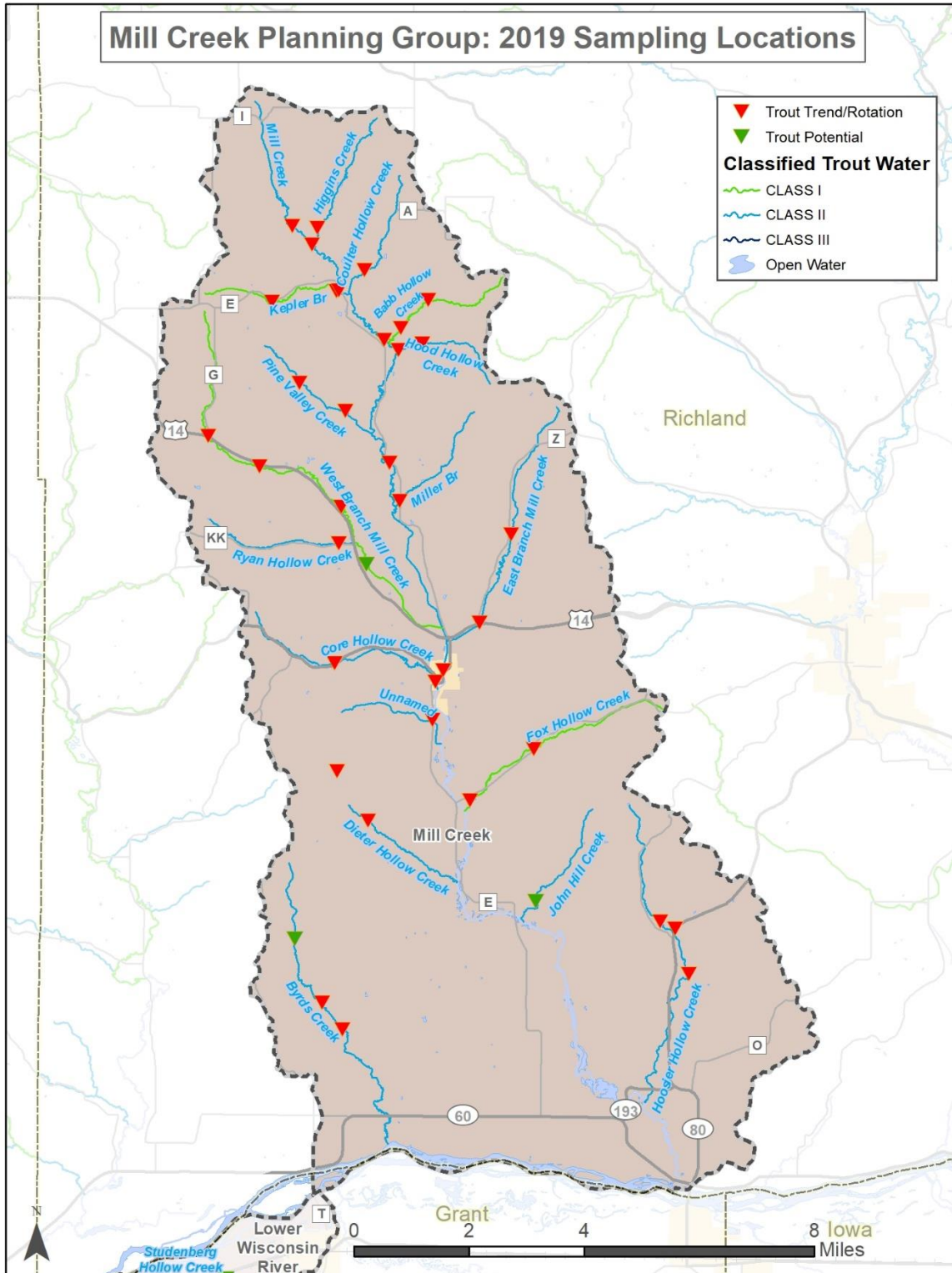


Figure 1. All sampled locations within the Mill Creek watershed in 2019. Note that Mill Creek, Coulter Hollow, Hood Hollow, Pine Valley, Ryan Hollow, East Branch Mill, and Dieter Hollow were reclassified to class 1 as of January 1, 2021.

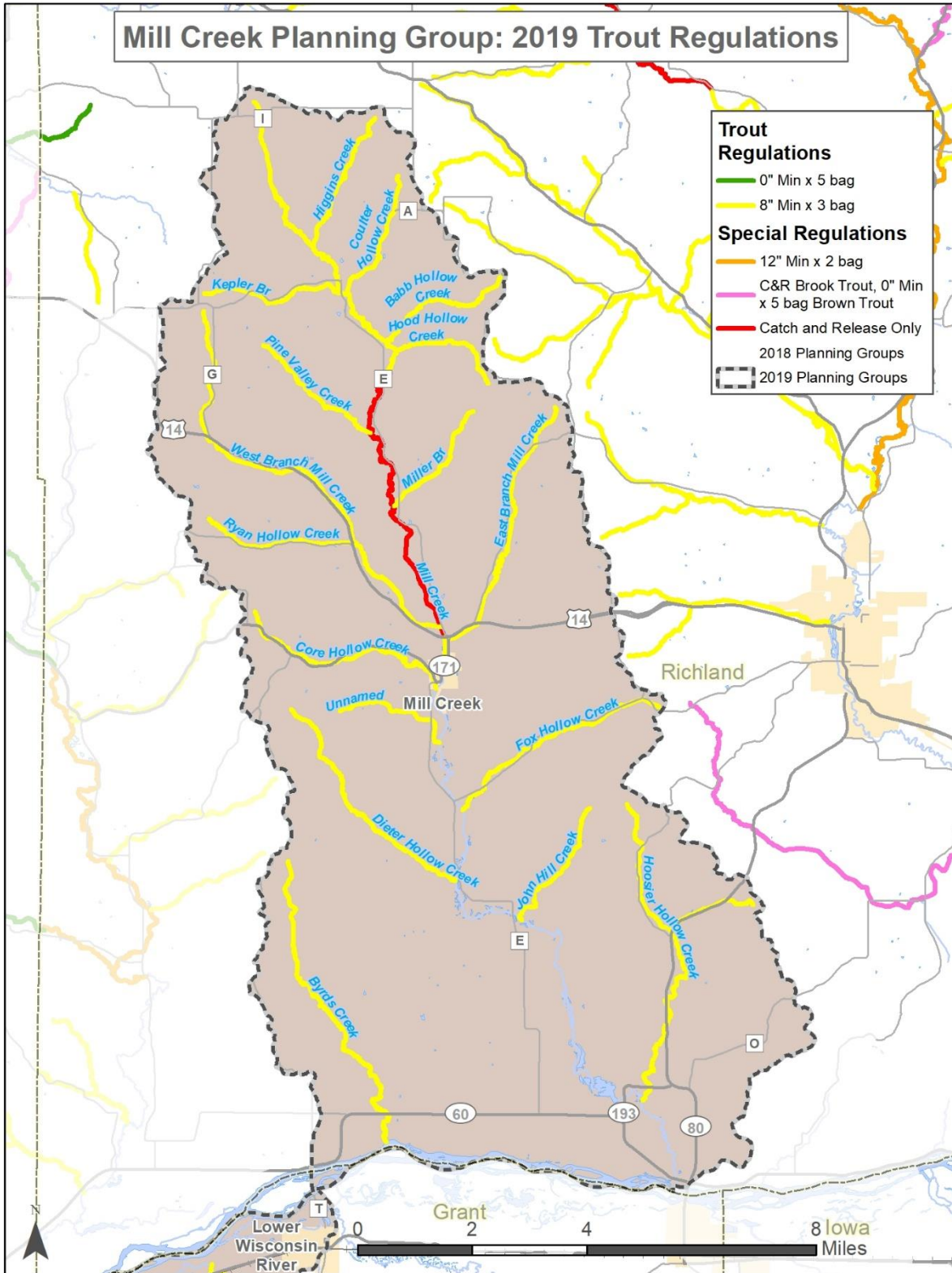


Figure 2. Trout regulation map within the Mill Creek watershed.

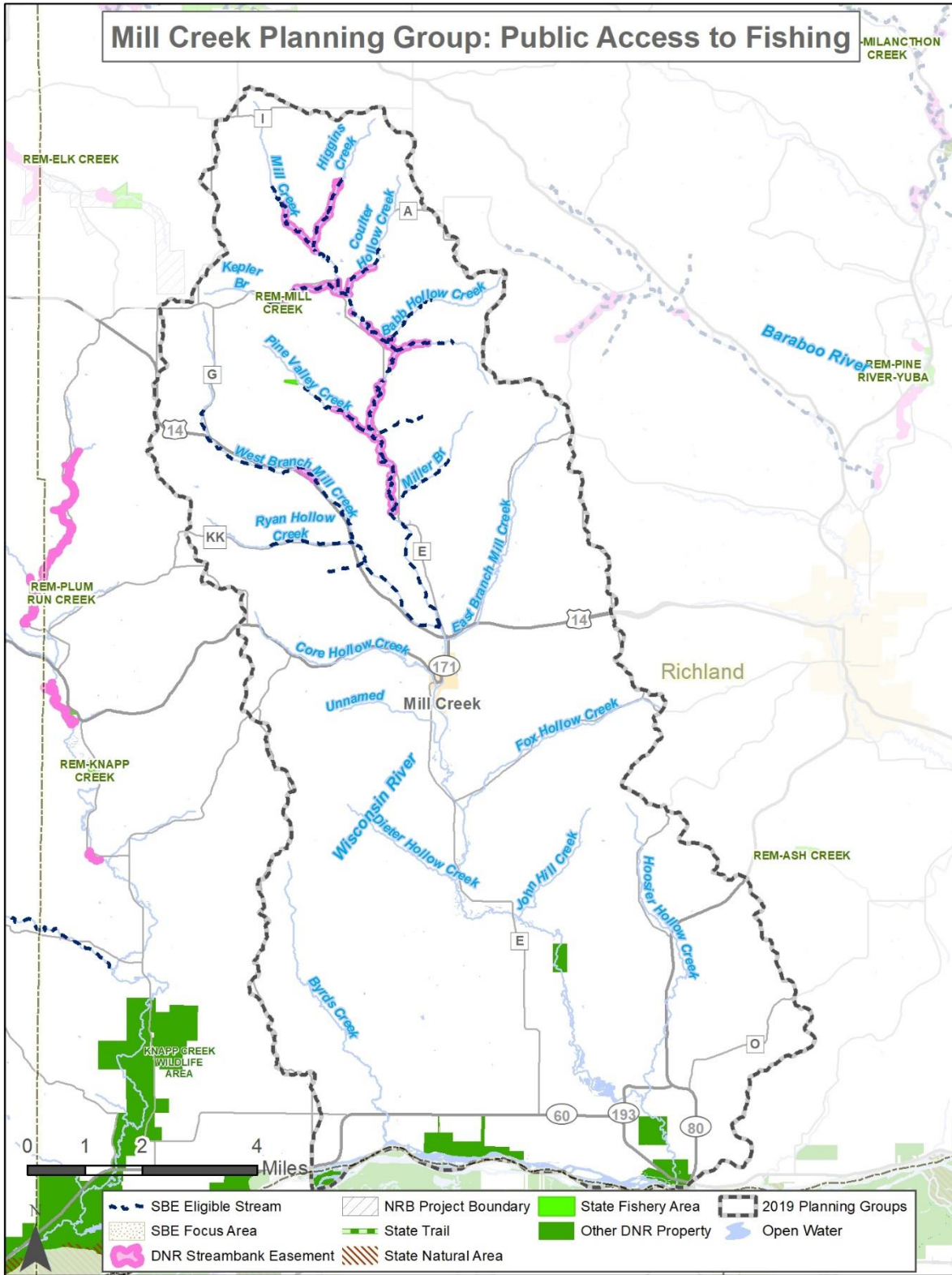


Figure 3. Current public access locations along Mill Creek and its tributaries.

CPUE of Age 0 Brown Trout (<4")

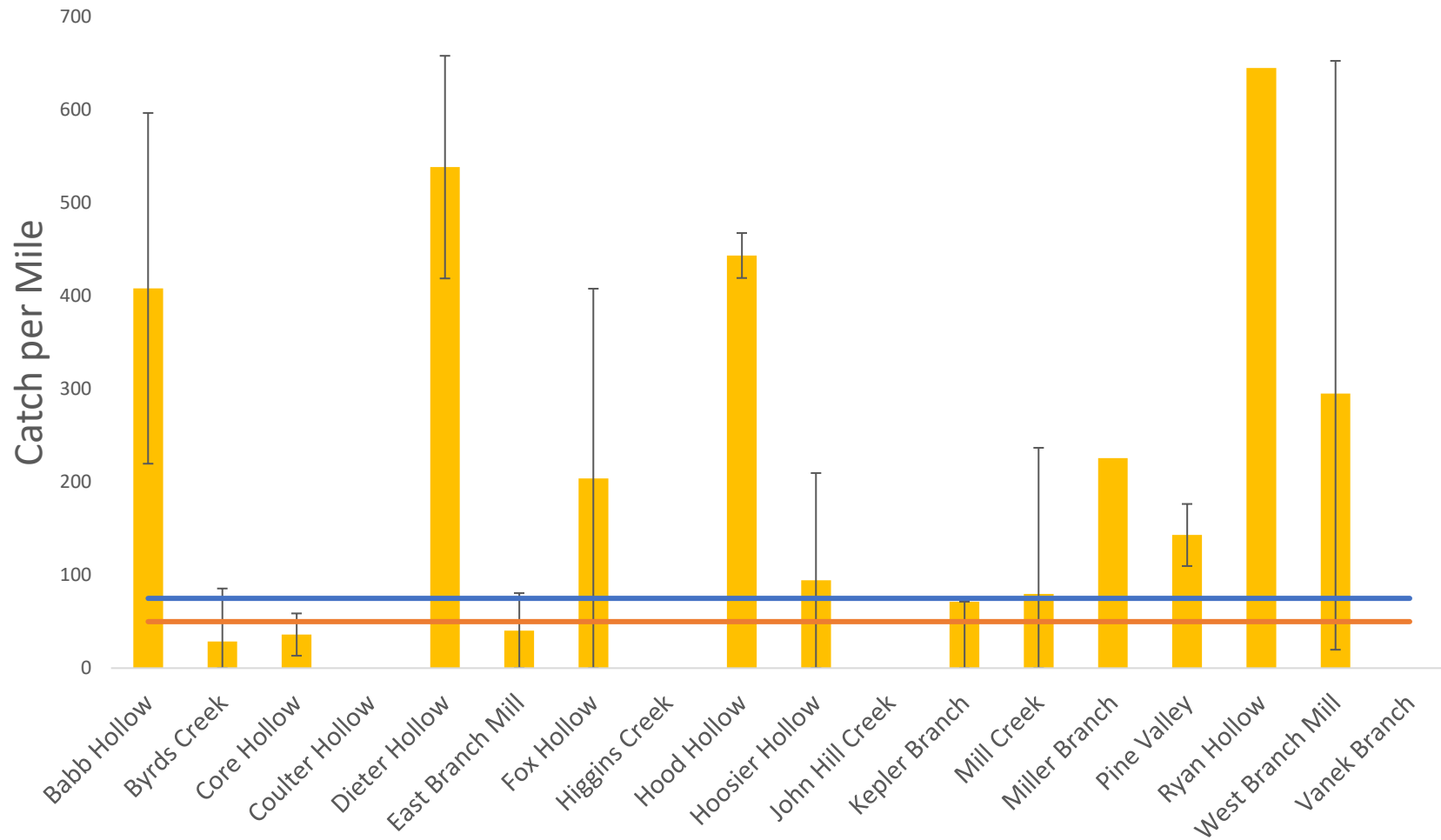


Figure 4. CPUE of age-0 Brown Trout in the Mill Creek watershed. Blue line refers to the Driftless Area median (75) while the Orange line refers to the statewide median (50).

CPUE of Age 0 Brook Trout (<4")

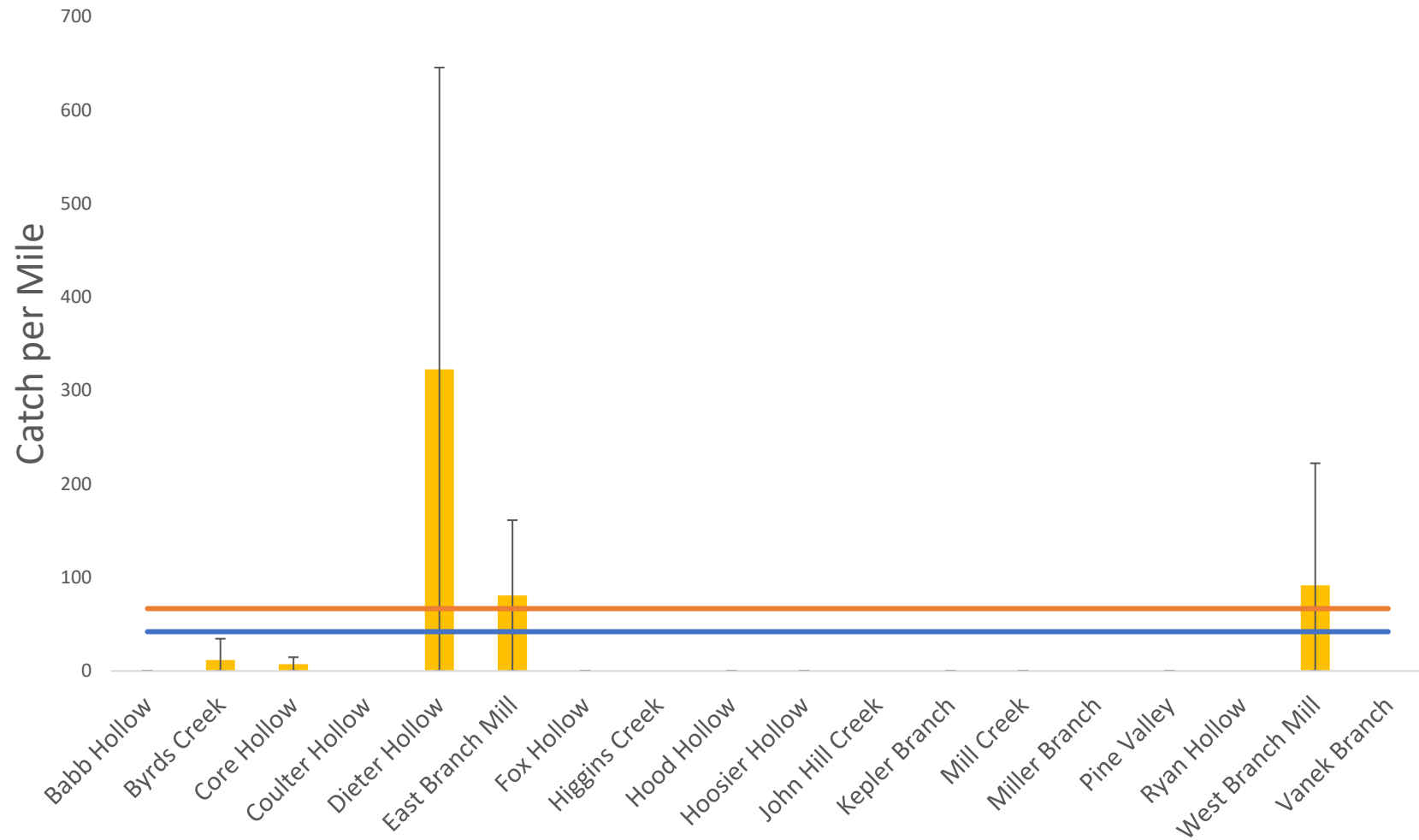


Figure 5. CPUE of age-0 Brook Trout in the Mill Creek watershed. Blue line refers to the Driftless Area median (42) while the Orange line refers to the statewide median (66.7).

CPUE of Yearling Brown Trout (4-7.9")

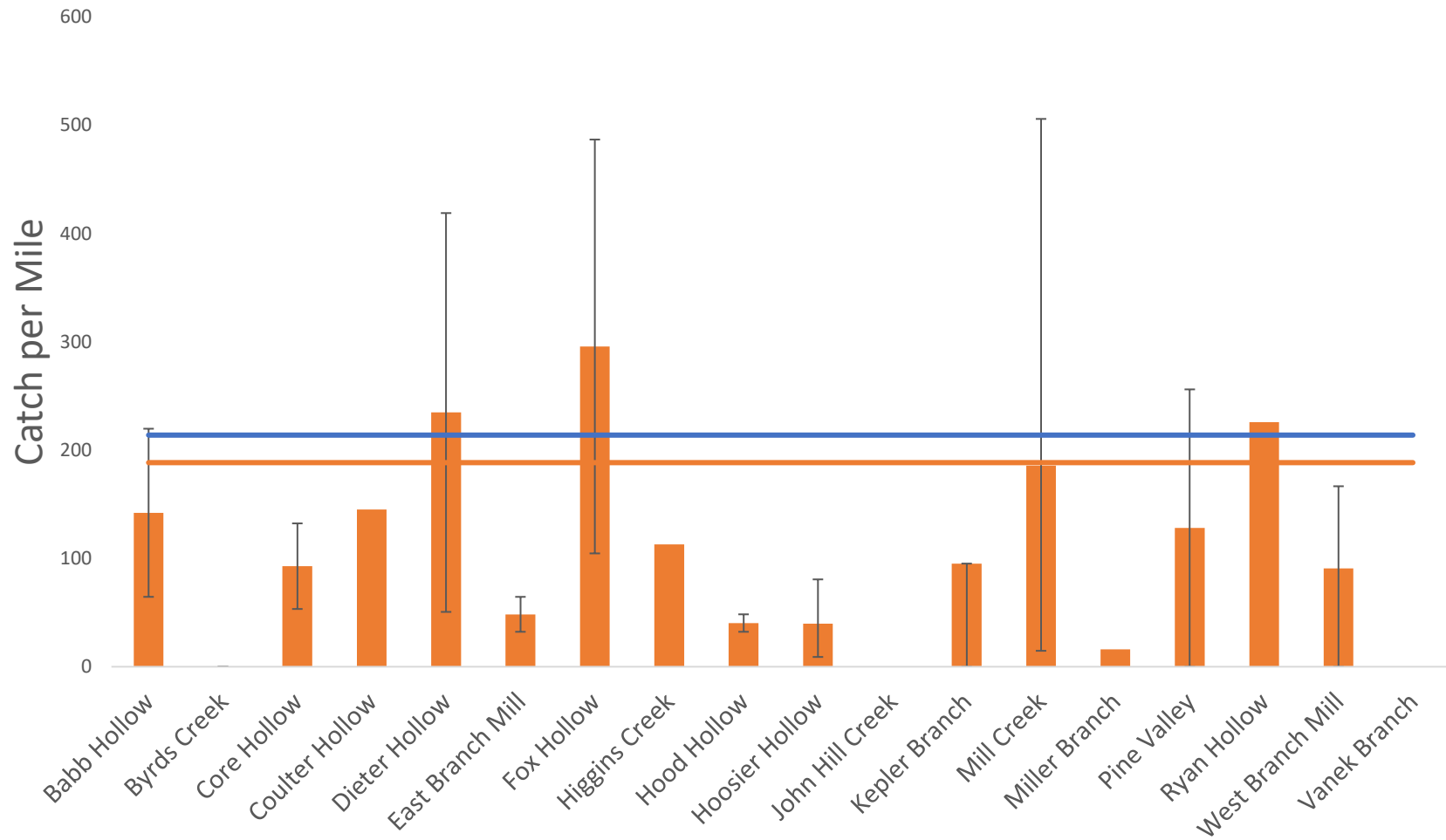


Figure 6. CPUE of yearling Brown Trout in the Mill Creek Watershed. Blue line refers to the Driftless Area median (213.9) while the Orange line refers to the statewide median (188.5).

CPUE of Yearling Brook Trout (4-6.9")

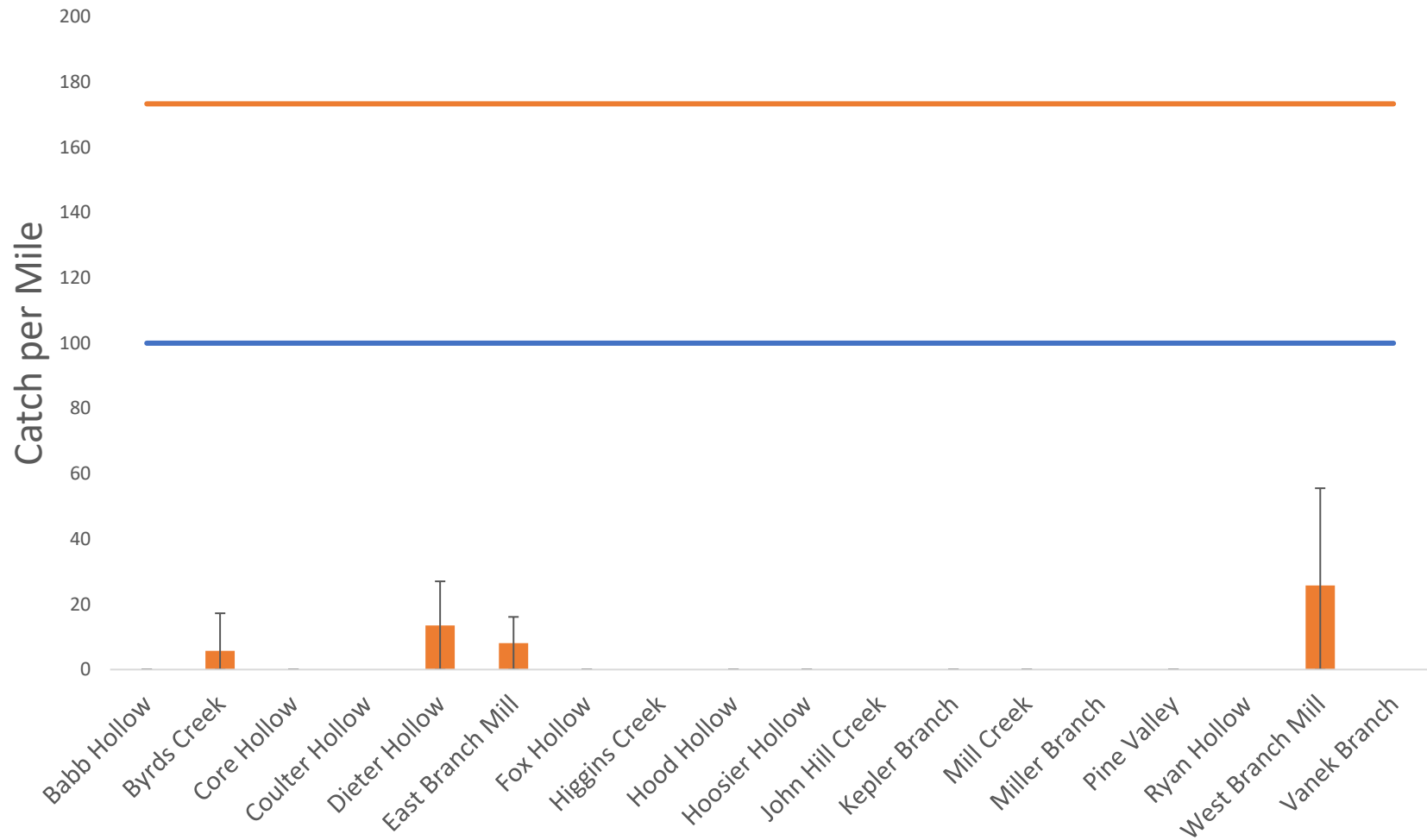


Figure 7. CPUE of yearling Brook Trout in the Mill Creek Watershed. Blue line refers to the Driftless Area median (100) while the Orange line refers to the statewide median (173.3).

CPUE of Adult Brown Trout ($\geq 8''$)

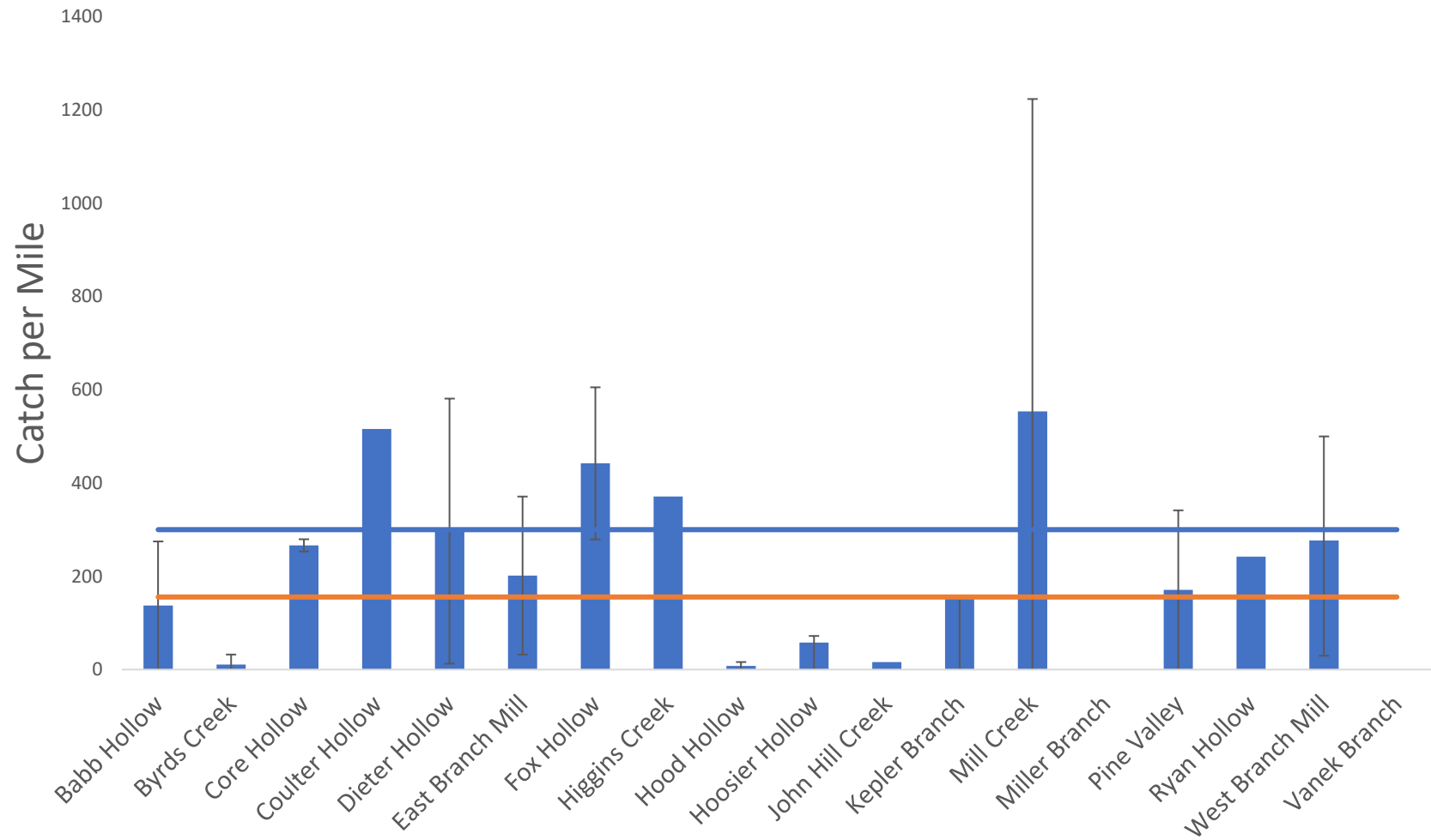


Figure 8. CPUE of adult Brown Trout in the Mill Creek Watershed. Blue line refers to the Driftless Area median (300) while the Orange line refers to the statewide median (155.6).

CPUE of Adult Brook Trout ($\geq 7''$)

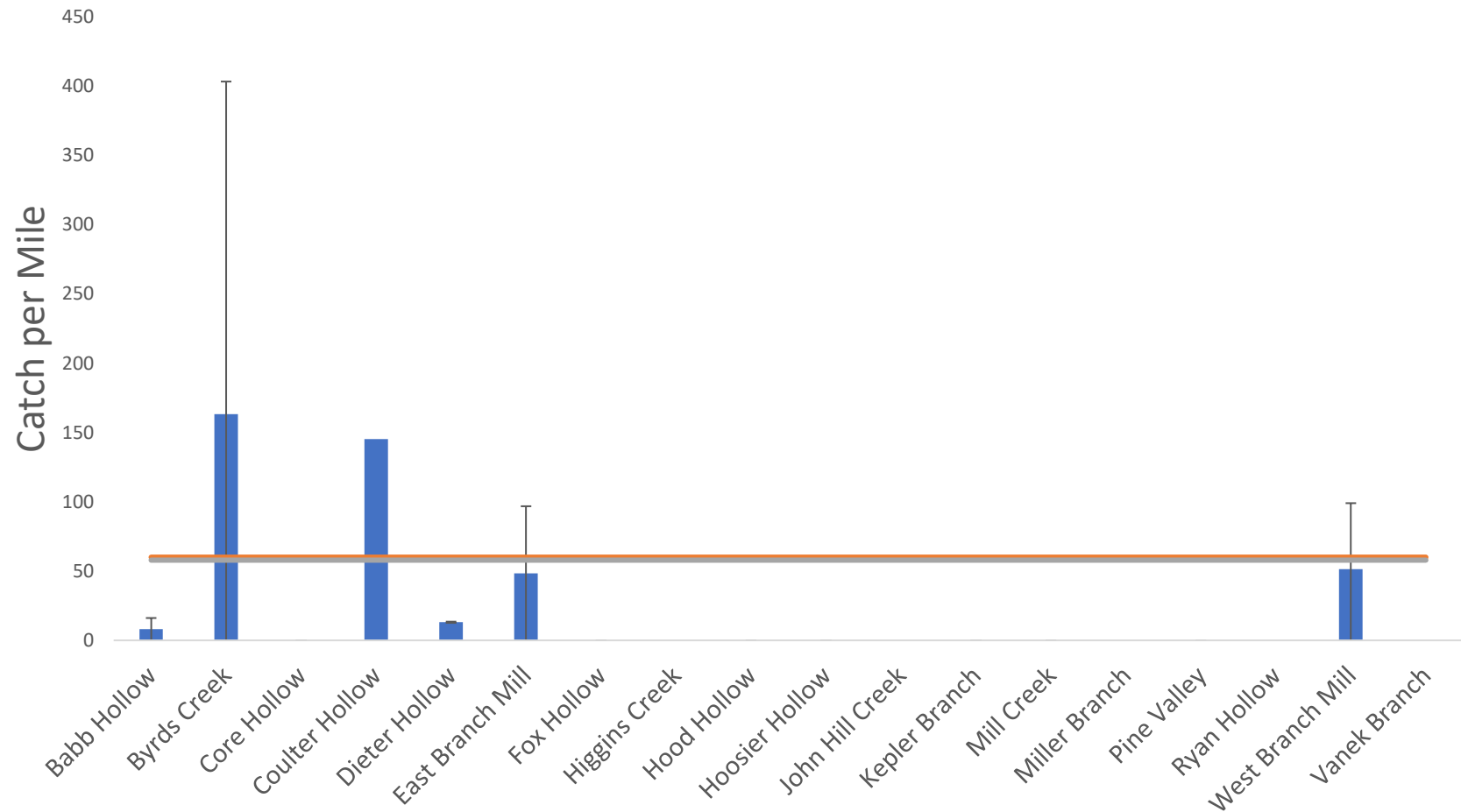


Figure 9. CPUE of adult Brook Trout in the Mill Creek Watershed. Blue line refers to the Driftless Area median (60) while the Orange line refers to the statewide median (57.9).

CPUE of Preferred Brown Trout ($\geq 12''$)

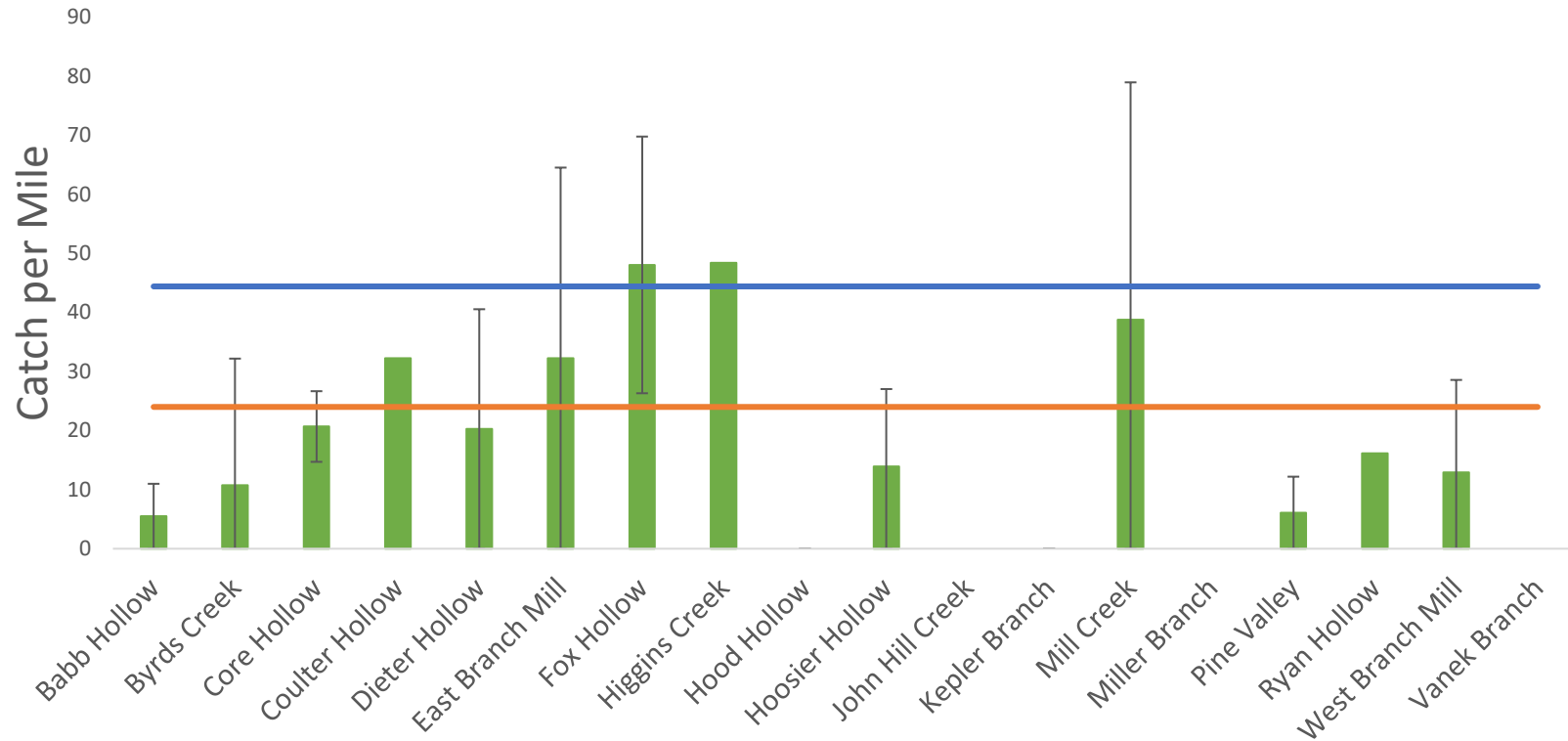


Figure 10. CPUE of preferred size Brown Trout in the Mill Creek watershed. Blue line refers to the Driftless Area median (44.4) while the Orange line refers to the statewide median (24).

CPUE of Preferred Brook Trout ($\geq 10''$)

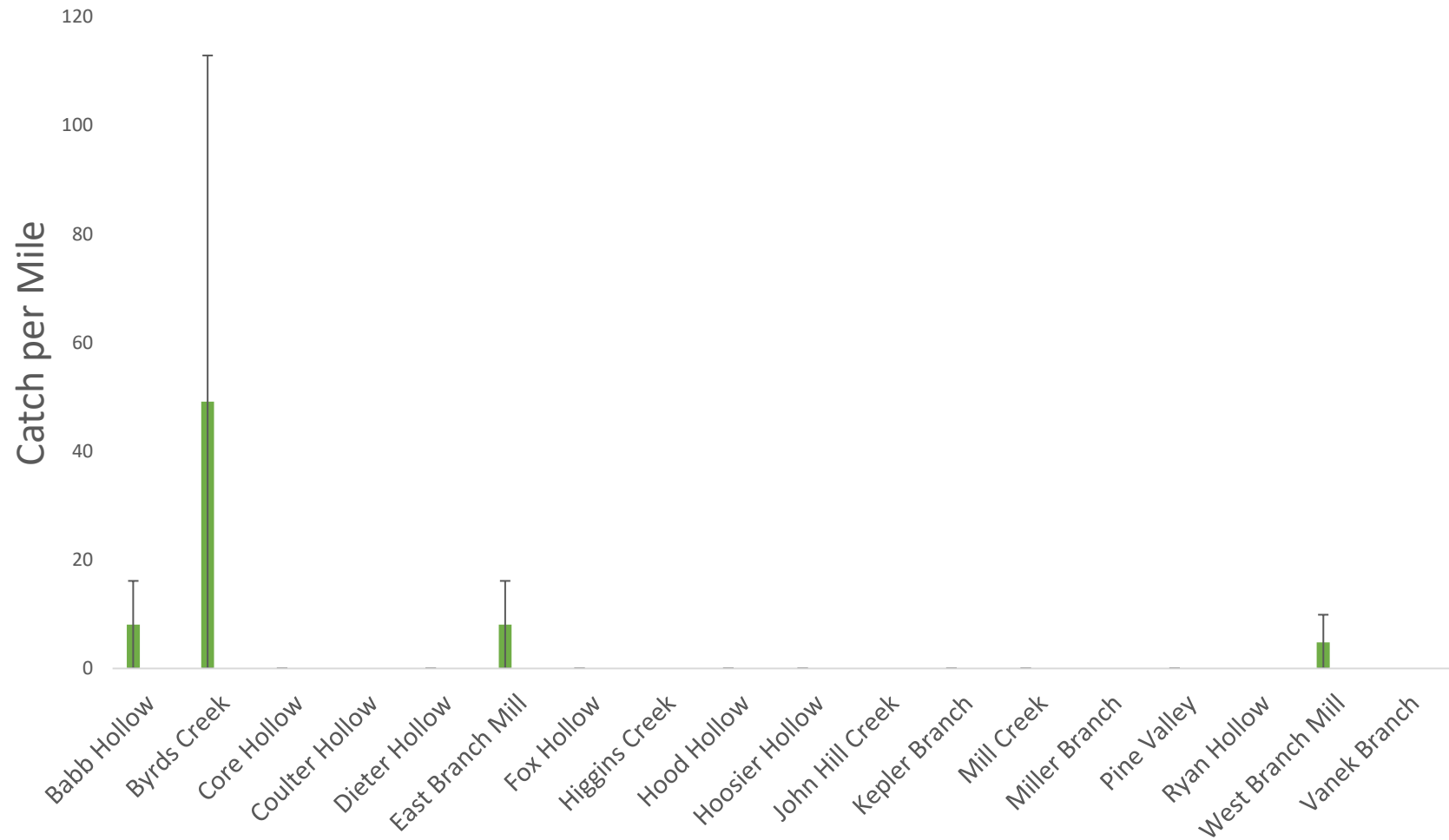


Figure 11. CPUE of preferred size Brook Trout in the Mill Creek Watershed. Both Driftless Area and Statewide median values were zero.

Mill Creek at English Hollow Road

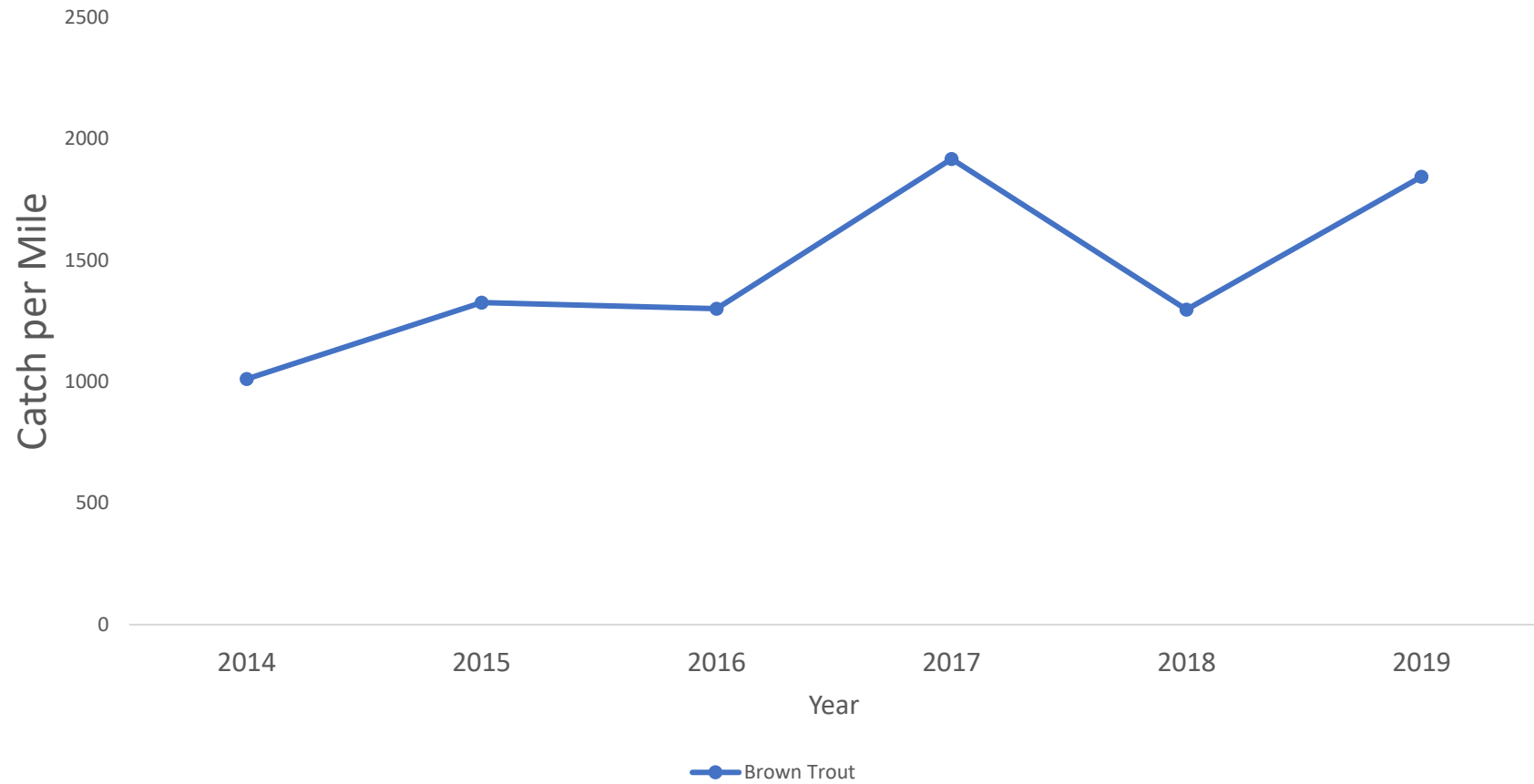


Figure 12. Total CPUE of Brown Trout at Mill Creek English Hollow Road trend site. Increasing trend line is shown in red, although non-significant ($P = 0.12$)

Mill Creek at CTH E

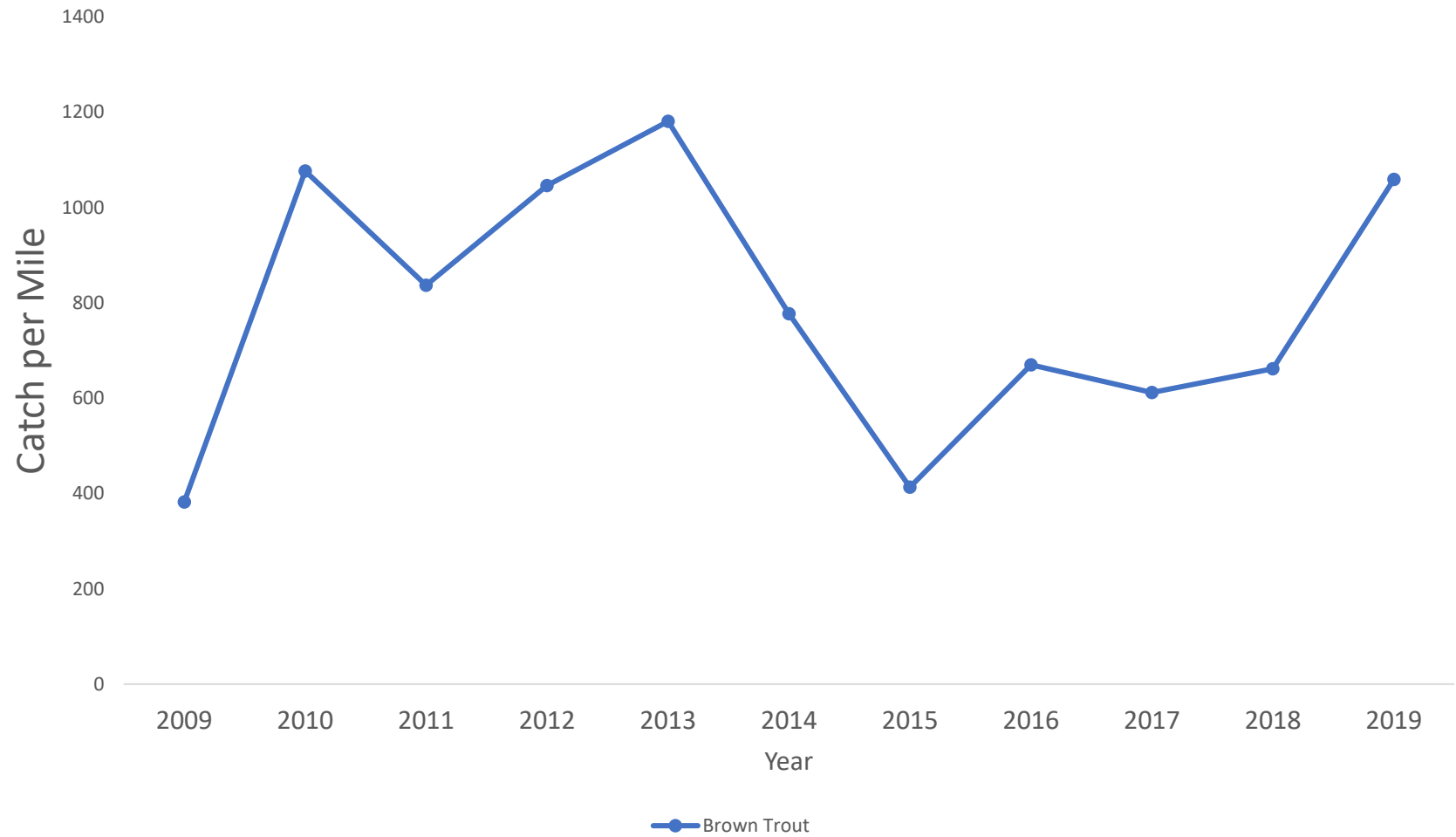


Figure 13. Total CPUE of Brown Trout at Mill Creek CTH E trend site. Slightly decreasing trend line is shown in red, although non-significant ($P = 0.88$)

West Branch Mill Creek at Private Drive

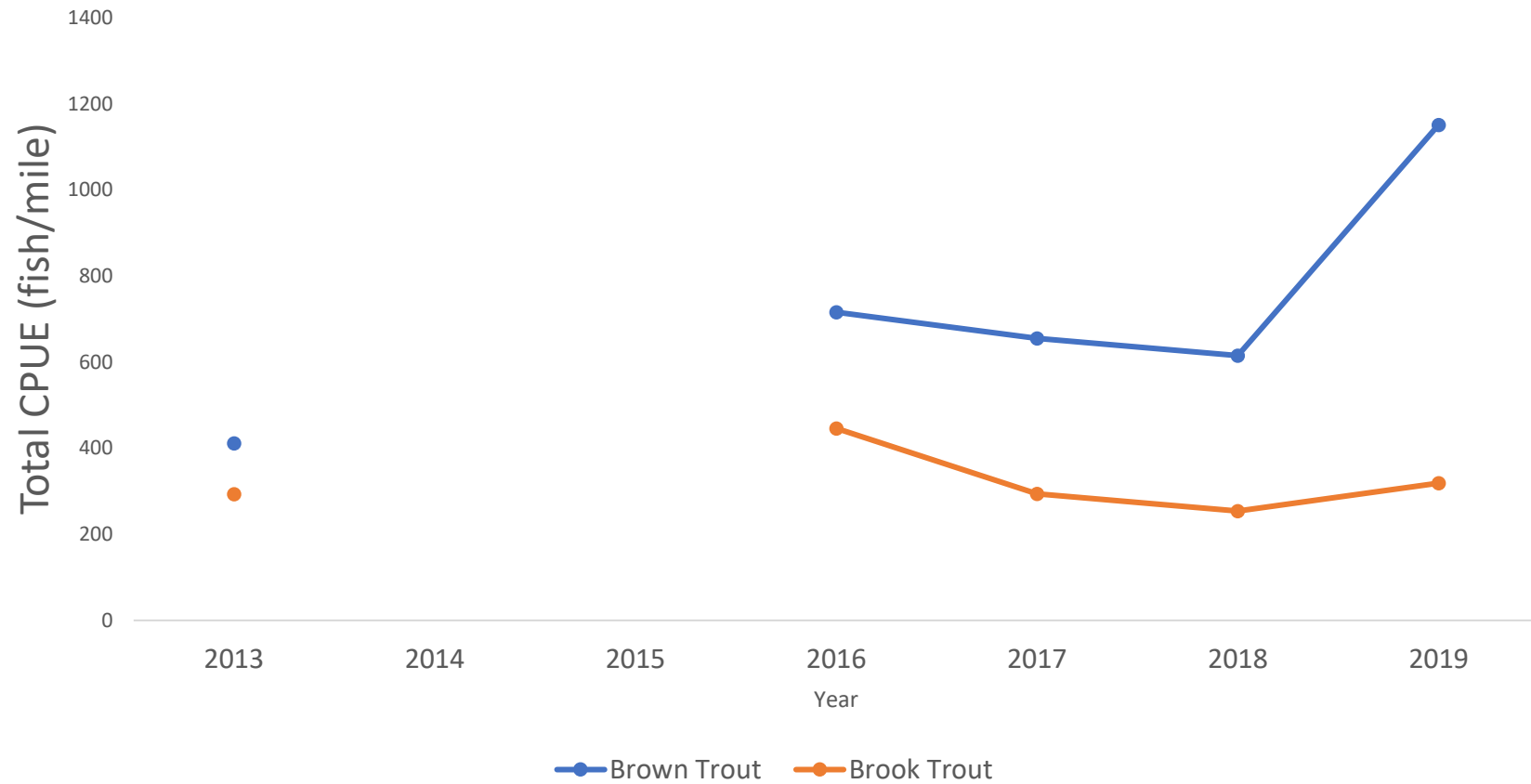


Figure 14. Total CPUE of Brown and Brook Trout at West Branch Mill Creek trend site. Brown Trout show increasing trend while Brook Trout show decreasing trends, although neither are significant.

