Prairie River

Branch and St. Joseph Counties
St. Joseph River Watershed, 2013-2014

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Environment

The Prairie River arises near Kinderhook and flows 54 miles northwesterly to its confluence with the St. Joseph River south of the city of Three Rivers. The Prairie River watershed encompasses 201 square miles and includes portions of Branch and St. Joseph counties in Michigan and Steuben County, Indiana. Agriculture is the predominant land use in the watershed. There are two registered dams (Centreville Dam and Lake Templene Dam) on the main stem. An unknown number of small unregistered dams have been constructed on tributaries to the Prairie River. The portion of the Prairie River from Bowers Road to McKale Road currently is classified as a Type 4 trout stream (Figure 1).

The topography within the watershed is flat to gently rolling. Stream gradient averages 6 ft/mile in Branch County and 3 ft/mile from St. Joseph Road to McKale Road. The surficial geology of this area consists primarily of glacial outwash sand and gravel and postglacial alluvium with scattered end moraines of coarse-textured till. The river flows through a mosaic of soil types, but most of the watershed is covered by sandy loams and loamy sands. In Branch County, the Prairie River is a designated county drain. Many of the tributaries to the main stem also are designated drains and large portions of the river system have been affected by dredging and channelization. Temperature loggers were placed at various locations on the Prairie River during 1997-2003 (Table 1). July mean water temperatures ranged from 65.7 F at Orland Road in 1997 to 69.5 F at Burr Oak Road in 2002.

History

The first fisheries survey on the Prairie River was completed in 1969. Electrofishing near the St. Joseph Road and McKale Road crossings yielded a total of 13 fish species. The only game fish collected during the survey were one adult Largemouth Bass and a few small Yellow Perch. In 1971, an annual Brown Trout stocking program was initiated. For the first decade of this stocking program, yearling Brown Trout generally were released at the Middle Colon Road and McKale Road crossings. Electrofishing surveys were completed at multiple locations from St. Joseph Road to McKale Road during 1972-1976. The cumulative Brown Trout catch for this period was 13 fish. Total lengths for captured Brown Trout varied from 6 inches to 9 inches.

The first electrofishing surveys on the Branch County portion of the Prairie River were conducted in 1977. Twenty-one fish species were collected during this effort, including the Creek Chubsucker which is listed as endangered in Michigan. Ten Brown Trout (total length = 7-14 inches) were captured. These fish had moved upstream from their stocking locations in St. Joseph County.

Beginning in spring 1983, yearling Brown Trout were stocked annually at several sites in Branch and St. Joseph counties (Table 2). During the summer of 1983, electrofishing surveys were conducted at six sites on the Prairie River from Bowers Road to US-12. The cumulative catch from Bowers Road to Bawden Road (four sites) was 104 Brown Trout. Three Brown Trout were captured near the Prairie

River Road crossing, and zero Brown Trout were collected near the US-12 crossing. Most of the Brown Trout were yearlings that presumably were stocked in 1983. Two young-of-year (YOY) fish and five age 2 fish also were captured, indicating that some natural reproduction was occurring in this system.

Electrofishing was completed near the Cranson Road and Orland Road crossings in 1988. Two yearling Brown Trout were collected at Cranson Road and zero were captured at Orland Road. Water levels were low, and biologists speculated that trout had moved downstream to find deeper pools.

As part of county drain maintenance, the Prairie River was dredged and large woody structure was removed from Orland Road to approximately 0.5 miles downstream of St. Joseph Road during the early 1990s. These activities reduced the abundance of fish cover in the stream, altered flow regimes, and reduced shading resulting in increased summer water temperatures. In 1992, electrofishing was conducted at five sites from St. Joseph Road to McKale Road. Eight Brown Trout were collected, including four wild YOY fish. Due to the habitat alterations and poor trout catch during the survey, Brown Trout stocking was discontinued after 1992.

No Brown Trout were captured during electrofishing surveys conducted near the Block Road, Bowers Road, and St. Joseph Road crossings in 1993 (Kosek 1994). However, sampling completed in 2000 yielded very different results. Brown Trout population estimates were obtained for a 725 ft station at Orland Road and an 800 ft station at Bowers Road using the two-pass depletion method. The Brown Trout population estimates were 175 fish (473 fish/acre) at the Orland Road station and 247 fish (669 fish/acre) at the Bowers Road station. These estimates indicated that Brown Trout population density in the Prairie River was near the middle of the range for trout streams in southwestern Michigan. YOY fish composed 72% of the catch at Orland Road and 92% of the catch at Bowers Road. Only one fish larger than 10 inches was captured at Bowers Road, whereas 11 fish > 10 inches were collected at Orland Road. No fish older than age 2 were captured, indicating poor survival or emigration of larger fish. The Michigan Department of Environmental Quality (MDEQ) conducted additional sampling at two sites on the Prairie River in 2005. Seven Brown Trout were captured at the Bowers Road station and zero trout were collected at the McKale Road station (Walterhouse 2007).

Electrofishing was completed on an 800 ft station near the Orland Road crossing in 2011 as part of MDNR's Status and Trends Program. The total Brown Trout catch at this station was 228 fish (607 fish/acre; Gunderman 2013). Five year classes were present and 7% of the fish collected were of legal size (i.e., > 10 inches). Mean lengths-at-age for Prairie River Brown Trout were above statewide averages.

No creel survey data are available for the Prairie River. Anecdotal reports suggest that trout fishing pressure is light to moderate. Multiple factors likely have limited fishing effort on the Prairie River; (1) public land is scarce along the stream; (2) most of the stream runs through agricultural fields, so this stream does not have the same aesthetics as a trout stream that flows through forested watersheds; (3) the Prairie River and most other streams in Michigan have never been legally declared as navigable (i.e., public) or non-navigable. MDNR always has treated the Prairie River as if it were a navigable stream. However, the lack of a clear declaration of navigability from the courts and the potential for conflicts with riparian landowners may dissuade some anglers from fishing the Prairie River. Local anglers reported good fishing for Brown Trout through 2011.

Irrigation commonly is used to enhance agricultural production within the Prairie River watershed. In analyses of past surveys, fisheries managers expressed concerns about the effects of surface water withdrawals on discharge patterns and Brown Trout production in the river. Since July 9, 2009, Part 327 of Public Act 451 requires all large-quantity withdrawals (defined as 70 gallons per minute [100,000 gallons per day] or greater) to be registered with MDEQ. A water withdrawal assessment tool (WWAT) was created to facilitate estimation of the ecological effects of proposed withdrawals (Hamilton and Seelbach 2011). If a proposed withdrawal is predicted to have adverse effects on the fish community, the applicant is directed to pursue alternative options (e.g., digging a deeper well, finding a different location for a well, or acquiring water from other farmers within the sub-watershed that are not using all of their permitted withdrawal capacity). The Prairie River watershed provides an excellent location to test the logistics of implementing the registration process and assess performance of the WWAT in protecting fish communities under a variety of environmental conditions.

Current Status

A severe drought occurred in 2012 and Fisheries Division received reports of extremely low water levels in the Prairie River. To evaluate the effects of the drought on the Brown Trout population, electrofishing was conducted at the Orland Road sampling station in late July 2012. The sampling length (800 ft) and location were the same as in 2011. Brown Trout were captured during a single electrofishing run with a stream shocker (250 V DC, two probes) while moving in an upstream direction. Total length was recorded for all Brown Trout captured. No data were collected for non-game fish species. Stream discharge was measured using the protocol described by Wills et al. (2005).

Additional electrofishing was completed near the Bowers Road crossing on September 12, 2012. The station began 900 ft downstream of the Bowers Road culvert and extended upstream to the culvert. The methods were the same as utilized during the Orland Road sampling. At the Bowers Road site, all non-game fish were counted but total lengths were not recorded for these species. Scale samples were not collected at either site in 2012.

The same electrofishing methods were used to capture fish at the Orland Road and Bowers Road stations on the Prairie River in July 2013 and September 2014. Total lengths were recorded for all fish captured. Fish habitat and riparian bank conditions within each sampling station were assessed using the methods outlined by Wills et al. (2005). During each year, scale samples were collected from 10 Brown Trout per inch group (4 inches or larger) at each site for age determination. Brown Trout smaller than 4 inches were considered to be YOYs.

Weights were not directly measured during any sampling year. Rather, weights for all fish species were calculated using the length-weight regression coefficients compiled by Schneider et al. (2000b). Weighted average length and weighted age composition for Brown Trout were calculated using the formulas provided by Schneider (2000a).

Fish species captured during the Prairie River surveys were divided into three thermal categories based on field studies and laboratory temperature preferenda and critical thermal maxima as described by Lyons et al. (2009). Warmwater species had temperature preferenda (if known) greater than or equal to 71.6 F, thermal maxima (if known) of greater than or equal to 91.4 F, and were classified as warmwater in all or nearly all field studies. Coldwater species had temperature preferenda less than or equal to 68.0 F, thermal maxima less than or equal to 87.8 F, and were designated coldwater in all or nearly all field studies. "Species classified as transitional either had intermediate values for laboratory preferenda and tolerances, or met the warmwater criteria for some attributes and the coldwater criteria for others." [Lyons et al. 2009]

Temperature loggers (Onset Hobo Temp Pro v2) were deployed at 19 locations within the Prairie River watershed on March 14, 2012 (Figure 2; Table 3). The loggers were programmed to record water temperatures every hour. At most sites, loggers were retrieved and replaced with new loggers in December 2012 and 2013. The loggers in the County No. 10 Drain (site 14) and the Stewart Lake Drain (site 18) could not be retrieved in December 2013 due to ice formation and were left in place through the 2014 sampling season. Loggers were retrieved from the Kinderhook No. 2 Drain (site 1), the County No. 25 Drain (site 8), and Bethel & Bronson No. 4 and 1 Drain (site 9) in December 2013 but were not replaced until April 22, 2014. No temperature loggers were redeployed in the Bronson No. 12 Drain (site 10) after December 2012 as this stream was determined to be intermittent. All loggers were removed from the water on November 19, 2014.

July mean water temperatures (JMTs) were calculated for each logger deployment site and compared to the thermal classifications in the WWAT. Mean weekly temperature ranges during the month of July were calculated to assess temperature fluctuations at each site. (The range for each week [i.e., July 1-7, July 8-14, July 15-21, and July 22-28] was determined by subtracting the lowest temperature for the week from the highest temperature. The mean weekly temperature range was the average of these values.) Zorn et al. (2009) generated graphs of Brown Trout abundance (number/acre) in Michigan streams based on JMTs and mean weekly temperature ranges. Data from the present study were plotted on these graphs to evaluate habitat suitability for Brown Trout in the Prairie River and tributary streams. Mean water temperatures during the hottest week of July also were calculated and compared to the incipient lethal temperature for Brown Trout. Air temperature data from the National Weather Service station in Lansing were used to select the hottest seven day period for each sampling year.

BOWERS ROAD FISH DATA

Thirty-seven Brown Trout were captured at the Bowers Road sampling station in 2012. The total length range for Brown Trout was 3-15 inches (Figure 3). Only three YOY fish were collected. Twelve other fish species were observed during the survey (Table 4). Creek chubs and rainbow darters were the most abundant species in the sampling station. Coldwater and transitional fish species made up 68% of the catch by number.

Ten Brown Trout were captured at the Bowers Road station in 2013. The total length range for these fish was 7-16 inches. Eight of the Brown Trout collected were of legal size (> 10 inches; Figure 3). Age 2 fish composed the bulk of the catch, and no YOY fish were captured at this site (Figure 4). The mean length for age 2 Brown Trout was 2.6 inches larger than the state average (Figure 5).

Twelve additional fish species were captured during the 2013 fish community survey at Bowers Road (Table 5). Rainbow Darters and Creek Chubs were the most abundant species in the catch. Coldwater and transitional fish species made up 62% of the sample by number and 90% of the sample by weight.

Only five Brown Trout were collected during the 2014 survey at Bowers Road. The catch included four YOY trout (total length = 3.8-4.9 inches) and one age 2 fish with a total length of 12.8 inches. Mean growth indices could not be calculated due to the small sample size, but the available data suggest above average growth.

Creek Chubs and Blacknose Dace were the most abundant species at the Bowers Road sampling station in 2014 (Table 6). Coldwater and transitional species made up 88% of the catch by number and 82% of the catch by weight. Brown Trout declined from 45% of the fish biomass in 2013 to 7% of the biomass in 2014.

ORLAND ROAD FISH DATA

Only three Brown Trout were captured at the Orland Road sampling station in 2012. Based on the total lengths of the fish, the catch appeared to consist of one YOY (3 inches), one yearling (6 inches), and one age 2 fish (10 inches). Data were not collected for non-game species, but abundance of these fish seemed to be substantially lower in 2012 than in 2011.

In 2013, 37 Brown Trout were collected at the Orland Road station. The total length range for these fish was 2-13 inches, and 27% of the Brown Trout were of legal size (Figure 6). YOY fish made up 59% of the Brown Trout catch (Figure 7). The catch was higher for age 2 fish than for yearlings. Mean lengths for yearlings and age 2 fish were approximately 2.5 inches above statewide averages (Figure 5).

Ten additional fish species were captured during the 2013 fish community survey at Orland Road (Table 7). Blacknose Dace and Rainbow Darters were the most abundant species in the catch. Coldwater and transitional fish species made up 56% of the sample by number and 78% of the sample by weight.

During the 2014 survey, 137 Brown Trout were captured at the Orland Road sampling station. The total length range was 2-15 inches and only three fish exceeded the minimum size limit of 10 inches (Figure 6). YOY fish (n = 120) made up 88% of the catch (Figure 7). No fish from the 2012 year class were collected. Mean lengths at age were 0.4 inches above the statewide average for YOYs and 2.7 inches above average for yearling Brown Trout (Figure 8).

Apart from the large increase in YOY trout abundance, the species composition of the fish community at the Orland Road station was similar in 2013 and 2014. Ten non-game species were captured in 2014 (Table 8). Coldwater and transitional species made up 76% of the catch by number and 90% of the total fish biomass in the sample.

HABITAT AND TEMPERATURE MONITORING

Stream discharge at Orland Road was only 4.3 cfs in 2012, compared to 36.3 cfs in 2013. At both stations, stream discharge measurements and mean water depths were lower during the 2014 survey than during the 2013 survey (Table 9). The stream banks were less stable at Bowers Road than at Orland Road. Bank stability ratings, relative abundance of loose (i.e., non-embedded) gravel, and total area of coarse woody habitat at Bowers Road declined from 2013 to 2014. Conversely, the total area of coarse woody habitat at Orland Road increased by 500% from 2013 to 2014. Bank stability at Orland Road also has been improving since 2011.

There was wide variation in summer air temperatures and precipitation totals during 2012-2014 (Table 10). Air temperatures were above normal and precipitation totals were below normal in 2012. In 2013, air temperatures were near normal. Precipitation was below normal for the month of July but above average for the entire summer. The summer of 2014 was abnormally cool (especially in July) with above average precipitation.

Given the differences in weather patterns between sampling years, it is not surprising that JMTs within the Prairie River watershed generally were lower during 2013 and 2014 than in 2012 (Tables 11-13). For example, only one site (Bowers Road) on the Prairie River had a JMT < 67 F in 2012. By contrast, every site on the main stem except Walker Road had JMTs < 67 F in 2013-2014.

In 2012, nine sites had JMTs within the range expected for warm streams (i.e., > 69.8 F). Only the Walker Road site on the Prairie River and the Cowles Road site on the Stewart Lake Drain had JMTs > 69.8 F in 2013, and no sites had JMTs > 69.8 F in 2014. During 2013 and again in 2014, 14 sites had JMTs within the range expected for cold or cold transitional streams (Table 14).

Based on the 2012 temperature data, all sites on the main stem would be expected to have Brown Trout population densities of < 50 fish/acre (Figure 9). Conditions were more favorable for Brown Trout in 2013 and 2014 (Figures 10-11). The highest predicted population density for the main stem was 150-200 Brown Trout/acre at Prairie River Road in 2014.

As noted for the main stem, water temperatures in tributary streams were more suitable for Brown Trout during 2013-2014 than in 2012 (Figures 12-14). Only three sites had predicted Brown Trout population densities > 100 fish/acre in 2012, whereas several sites had predicted densities > 300 fish/acre in 2014. The Lanes, County No. 25, Sutter & Pinney, and Burr Oak County Line drains appeared to have the best thermal conditions for Brown Trout.

Analysis and Discussion

The Prairie River has been heavily modified to facilitate agricultural operations. Dredging, channelization, draining of wetlands, cutting of riparian vegetation, and log removal affect fish populations through four primary mechanisms. (1) The abundance of coarse woody material declines, reducing holding cover for fish and attachment sites for aquatic invertebrates. (2) Sediment inputs to the stream increase due to a combination of bank erosion (from steep, poorly vegetated banks) and runoff from agricultural fields. This sediment covers spawning gravel and reduces habitat heterogeneity in the stream bottom and thus production of macroinvertebrates. Sedimentation also increases turbidity, which can decrease Brown Trout foraging efficiency (Stuart-Smith et al. 2004). (3) The removal of trees along the stream bank reduces shading which, in turn, increases summer water temperatures. Thus, habitat suitability is reduced for trout and other coldwater fish species. (4) The hydrology of the system is altered. Instead of being retained by wetlands or riparian vegetation, water reaches the stream quickly during snowmelt or storm events. Channels are incised, disconnecting the stream from its floodplain and increasing current velocities during high flow periods. This situation is problematic for trout management, as high current velocities during the incubation or fry emergence periods have been shown to reduce natural recruitment of Brown Trout (Nuhfer et al. 1994; Spina 2001).

Human alterations to the watershed also have made the Prairie River ecosystem less resilient to droughts such as the one experienced in 2012. Droughts affect fish populations in multiple ways. As water levels decline, the quantity of available habitat decreases. Lobon-Cervia (2007) found that mean stream depth was an important determinant of the carrying capacity for riverine fish populations, and Stoneman and Jones (2000) demonstrated that the quantity of pool habitat influences trout biomass in southern Ontario streams.

As observed by Elliott (2000) and the present study, summer water temperatures also tend to be higher under drought conditions, which has important consequences for the Brown Trout fishery in the Prairie River. The ultimate lethal temperature for Brown Trout is 85.8 F (Elliott 1981). At this temperature, Brown Trout will perish in approximately 10 minutes. In 2012, this threshold was exceeded on multiple occasions in the Prairie River at Prairie River Road and in four tributary streams (sites 3, 10, 13, and 18). There was only one instance of water temperatures rising above this threshold during 2013-2014. The logger in the Weaver Drain recorded a temperature of 88.2 F at 11:00 on September 5, 2014. Temperatures recorded immediately before and after this reading were >10 degrees lower, so it appears that the logger temporarily malfunctioned.

The incipient lethal temperature for Brown Trout is 76.5 F (Elliott 1981; Elliott 2000). This is the maximum temperature that Brown Trout can tolerate for a 7 day period. During July 1-7, 2012, mean water temperatures exceeded this threshold in the Blosser and County No. 59 drains and in the Prairie River at the Prairie River Road and McKale Road crossings (Table 11). Mean water temperatures during the hottest weeks in 2013 and 2014 were below the incipient lethal temperature at all monitoring locations.

Brown Trout growth occurs when water temperatures are between 39 F and 67 F (Elliott 1993), and McMichael and Kaya (1991) observed that Brown Trout catch per angler hour decreased when water temperatures exceeded 66 F. Similarly, Brown Trout in Jocassee Reservoir exhibited a preference for water 68 F or cooler (Barwick et al. 2004) and Zorn et al. (2009) found that Michigan streams with JMTs > 68 F rarely supported sizeable Brown Trout populations. Only one Prairie River site (Bowers Road) and four tributaries (sites 4, 5, 8, and 12) had JMTs < 68 F in 2012. Thermal conditions were more favorable for trout in 2013-2014 when only the Stewart Lake Drain and the Walker Road site on the main stem had JMTs of 68 F or higher.

The summer of 2012 clearly was a difficult period for Brown Trout in the Prairie River, as evidenced by the drastic decline in Brown Trout abundance at Orland Road from 2011 to 2012. Discharge has been measured at the United States Geological Survey gauge site on the Prairie River near M-66 (several miles downstream of McKale Road) since October 1962. During June 2012, the monthly mean flow at the gauge site was only 13.5 cfs, whereas the long-term average for June was 65 cfs. Daily mean discharge dropped below 5 cfs during July 11-18, 2012 before rain events caused flows to rebound somewhat in late July. The low water levels and elevated water temperatures were the result of scant precipitation, above average air temperatures, and surface water withdrawals for irrigation. Low water levels in 2012 also exacerbated conflicts between irrigators, anglers, and riparian landowners.

Cooler water temperatures in 2013-2014, combined with higher flows and an increase in available coarse woody habitat (which appears to have resulted from natural movement of logs from upstream rather than any human intervention), have facilitated recovery of the Brown Trout population at Orland Road. Young-of-year Brown Trout catches increased from 1 fish in 2012 to 22 fish in 2013 and 120 fish in 2014. The 2014 YOY catch was similar to the 2011 (i.e., pre-drought) YOY catch of 137 fish. The yearling catch also rose from 1 fish in 2013 to 14 fish in 2014, but was still substantially below the 2011 catch of 63 yearlings. The absence of age 2 fish in 2014 is reflective of the near total year class failure in 2012.

The positive trend in Brown Trout abundance observed at Orland Road was not evident at the Bowers Road sampling station during 2013-2014. This was unexpected given that the Brown Trout catch was higher at Bowers Road than at Orland Road in 2012. Multiple factors could have been responsible for the observed pattern. (1) The Bowers Road station was the only site on the main stem with a JMT below 68 F in 2012. Thus, the 2012 catch may have consisted of fish that had migrated upstream to find cool water. Water temperatures were suitable for trout from Bowers Road downstream to McKale Road during 2013-2014 and fish were able to disperse throughout the system. (2) The availability of coarse woody habitat declined at the Bowers Road station from 2013 to 2014. This decline was not due to drain maintenance activities or land use changes along the sampling reach. Rather, the change was precipitated by natural downstream transport of logs out of the station and stranding of logs along the banks due to low discharge at the time of the 2014 survey. (The low water levels also contributed to the lower bank stability ratings in 2014 because more bare soil was exposed as water levels receded.) The undersized culvert at Bowers Road hinders downstream movement of logs into the sampling station. (3) Qualitative observations suggest that macroinvertebrate (i.e., fish food) density is lower at Bowers Road than at Orland Road. In 2014, the cobble substrates that provide hiding places for macroinvertebrates made up 83% of the Orland Road station as compared to 37% at the Bowers Road station.

The percentage of the Bowers Road sampling station covered by loose gravel appeared to decline substantially from 2013 to 2014. These results must be interpreted with caution. Estimated percentages of sand and silt did not increase from 2013 to 2014, indicating that existing gravel deposits had not been inundated with finer sediments. The total percentages of the sampling area covered by gravel and small cobble were nearly identical in 2013 and 2014. The dominant substrate at a given point was determined with visual methods. Thus, stones with a diameter of approximately 2.5 inches could be classified as gravel or small cobble. It is possible that some of the "loose gravel" from 2013 was recorded as "small cobble" in 2014.

One of the recent management goals for the Prairie River was to collect additional information on the status and distribution of a state endangered fish species known as the Creek Chubsucker (Gunderman 2013). A Creek Chubsucker was captured in the Prairie River in 1977. However, no Creek Chubsuckers were collected during the 2011-2014 electrofishing surveys on the river.

THERMAL CLASSIFICATION

The electrofishing and temperature logger data from 2011-2014 facilitate an evaluation of the existing thermal classifications in the WWAT. As previously noted, there was wide variation in JMTs between sampling years due to climatic conditions. For the purposes of this analysis, the most useful data were obtained in 2013 when air temperatures were similar to long-term averages (Table 10). The main stem and tributaries within sub-watershed A currently are designated as warm streams. However, the JMTs at the lowermost site (#11 - Prairie River Road) were within the range specified for cold transitional streams in 2013 and 2014. Lyons et al. (2009) reported that cold transitional streams have fish communities dominated by coldwater and transitional fish species. Coldwater and transitional fish species made up 78-90% of the fish biomass during the 2013-2014 electrofishing surveys at the Bowers Road and Orland Road sampling stations. Thus, the evidence indicates that sub-watershed A should be reclassified as a cold transitional stream.

The County No. 10 Drain in sub-watershed B is classified as a warm stream. The temperature logger deployed in this drain during 2013-2014 became buried in sediment and did not provide accurate water temperature measurements. Additional data must be collected to evaluate the thermal classification for sub-watershed B.

Sub-watershed C extends along the Prairie River from the confluence with County No. 10 Drain to the outlet from Lake Templene. The main stem and all tributaries within this sub-watershed are designated as cool streams. During 2013-2014, the three temperature logger sites (Prairie River at St. Joseph Road, Middle-Colon Road, and McKale Road) in the upper part of sub-watershed C all had JMTs indicative of a cold transitional stream. Recent fish community data for this portion of the river are not available. This stretch is challenging to survey as much of it is too deep to wade and too narrow or choked with log jams to allow the use of an electrofishing boat. Downstream of McKale Road the river widens, flows through a large wetland complex, and enters Prairie River Lake. Based on the water temperature data collected during 2012-2014 and recent fisheries surveys conducted in Prairie River Lake (Gunderman 2011) and Lake Templene (Gunderman 2014), sub-watershed C should be divided into three sub-watersheds. The upper section should extend from the confluence with the County No. 10 Drain to the confluence with the Stewart Lake Drain and be classified as cold transitional. The middle section should extend from the confluence with the Stewart Lake Drain to the upstream end of Prairie River Lake and be designated as cool. The lower section should extend from Prairie River Lake downstream through Lake Templene and be classified as warm.

The Burr Oak County Line Drain in sub-watershed D currently is designated as a cool stream. The JMTs at the Burr Oak Road crossing on this stream were 61.0 F in 2013 and 59.1 F in 2014. These data indicate that the Burr Oak County Line Drain should be classified as a cold stream.

The Stewart Lake Drain in sub-watershed E currently is designated as a cool stream. The JMT at this site was 70.2 F in 2013 and 68.6 F in 2014. In 2012, water temperatures in the Stewart Lake Drain exceeded the ultimate lethal temperature for Brown Trout on multiple occasions during July 4-7. The mean water temperature during July 1-7, 2012 was only 0.1 F below the incipient lethal temperature for Brown Trout. Even during the cold summer of 2014 this stream provided poor habitat for Brown Trout and other coldwater species (Figure 14). No electrofishing surveys have been conducted on this stream. Based on the temperature logger data, the Stewart Lake Drain should be reclassified as a warm stream.

Management Direction

The Prairie River has supported a self-sustaining Brown Trout fishery since 1992. As the only trout stream in Branch County, it is a unique resource that should be protected. Habitat degradation is the main factor limiting trout production in this system. Six management goals have been developed for the Prairie River. Goal 1: Promote use of irrigation technologies that reduce water usage and improve irrigation efficiency. Goal 2: Reduce erosion and sedimentation. Goal 3: Support MDEQ's and the

Michigan Department of Agriculture and Rural Development's (MDARD) efforts to identify unregistered water withdrawals. Goal 4: Change the thermal classifications for sub-watersheds to match actual thermal conditions and existing fish communities. Goal 5: Increase fish cover within the Prairie River and tributary streams. Goal 6: Monitor the Brown Trout population in this system.

The United States Department of Agriculture's Regional Conservation Partnership Program (RCPP) recently granted MDARD and more than 30 partner organizations $6.8 million to implement various conservation practices within the Michigan and Indiana portions of the St. Joseph River watershed during 2015-2019. The Prairie River basin has been identified as a priority sub-watershed for conservation actions. For example, RCPP funding will be used to help farmers utilize new technologies and strategies for improving the efficiency of irrigation systems, thereby reducing water withdrawals from the Prairie River. This funding also will be used to reduce erosion and sedimentation through the installation of buffer strips and livestock exclusion fencing, wetland restoration, and increased utilization of conservation tillage and cover crops. Fisheries Division will continue to assist MDARD and MDEQ by identifying potential project sites (e.g., areas with eroding stream banks or livestock access), reporting observations of surface water withdrawals, and predicting the effects of proposed projects on fish and other aquatic organisms.

As outlined in the previous section, the water temperature and fish community data collected during 2011-2014 do not support the existing thermal classifications for four sub-watersheds within the Prairie River basin. At present, there is no defined process for changing thermal classifications within the WWAT. Fisheries Division will work with MDEQ and MDARD to develop procedures for reviewing potential reclassifications. After such a process is established, Fisheries Division's recommendations regarding the Prairie River reclassifications can be considered. Fisheries Division also deployed temperature loggers at five locations (sites 11, 14, 16, 17, and 19; Table 3) within the Prairie River watershed in 2015 to gather additional water temperature data.

Logs have been cleared from many stream reaches to facilitate rapid downstream movement of water. The removal of logs directly affects trout by reducing habitat complexity and abundance of holding cover and affects trout indirectly by reducing abundance of macroinvertebrates. Fisheries Division will work with the county drain commissioners to develop options for retaining fish cover while meeting the needs of the adjacent landowners.

Additional monitoring is prescribed to assess the Brown Trout population in the Prairie River. Initial population responses suggest that recovery to pre-drought abundance will occur much more rapidly at Orland Road than at Bowers Road. Electrofishing surveys and habitat sampling will be conducted at both sampling stations in 2015 and possibly 2016.

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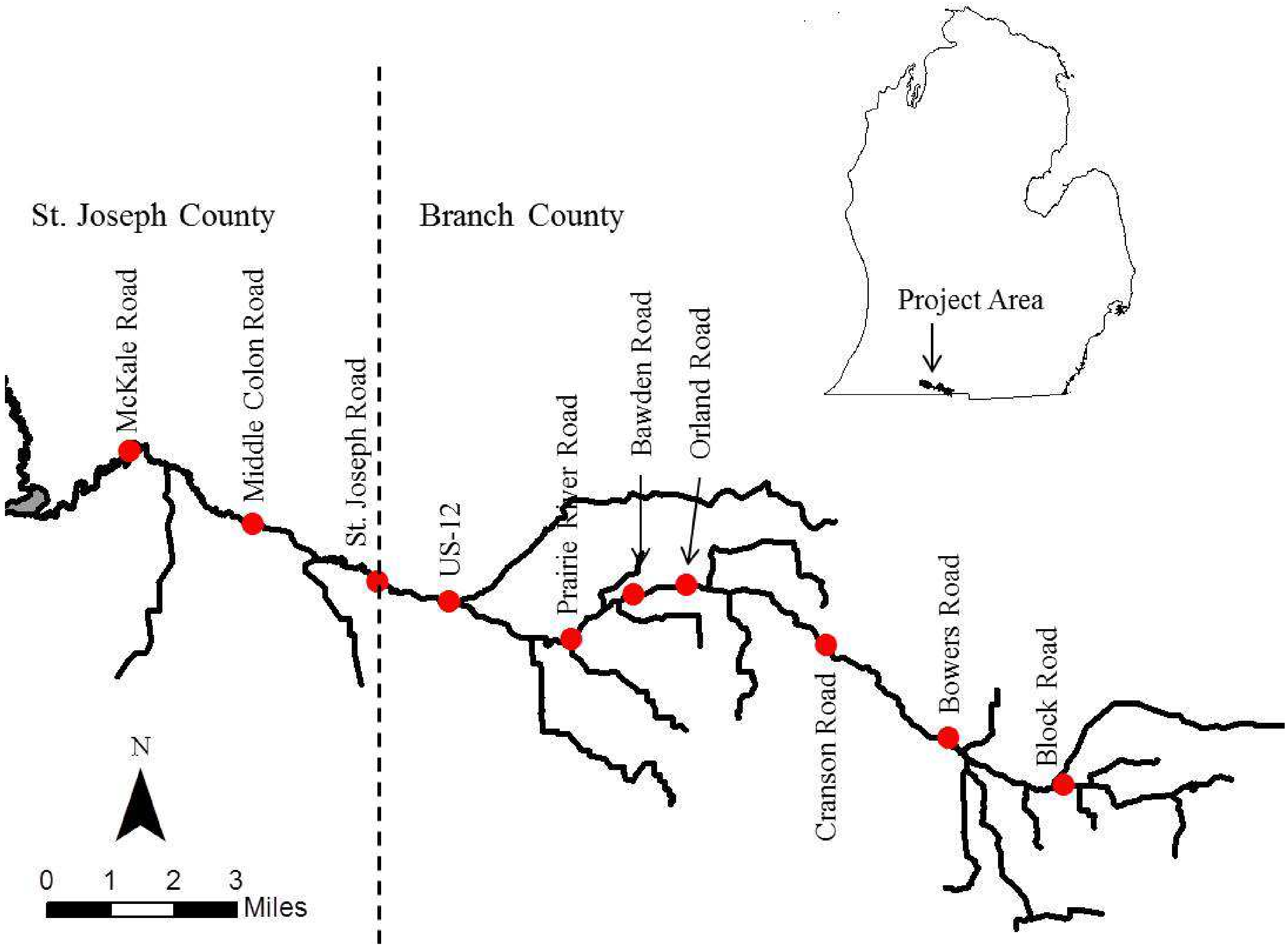

Figure 1.–Select road crossings on the Prairie River in St. Joseph and Branch counties, Michigan.

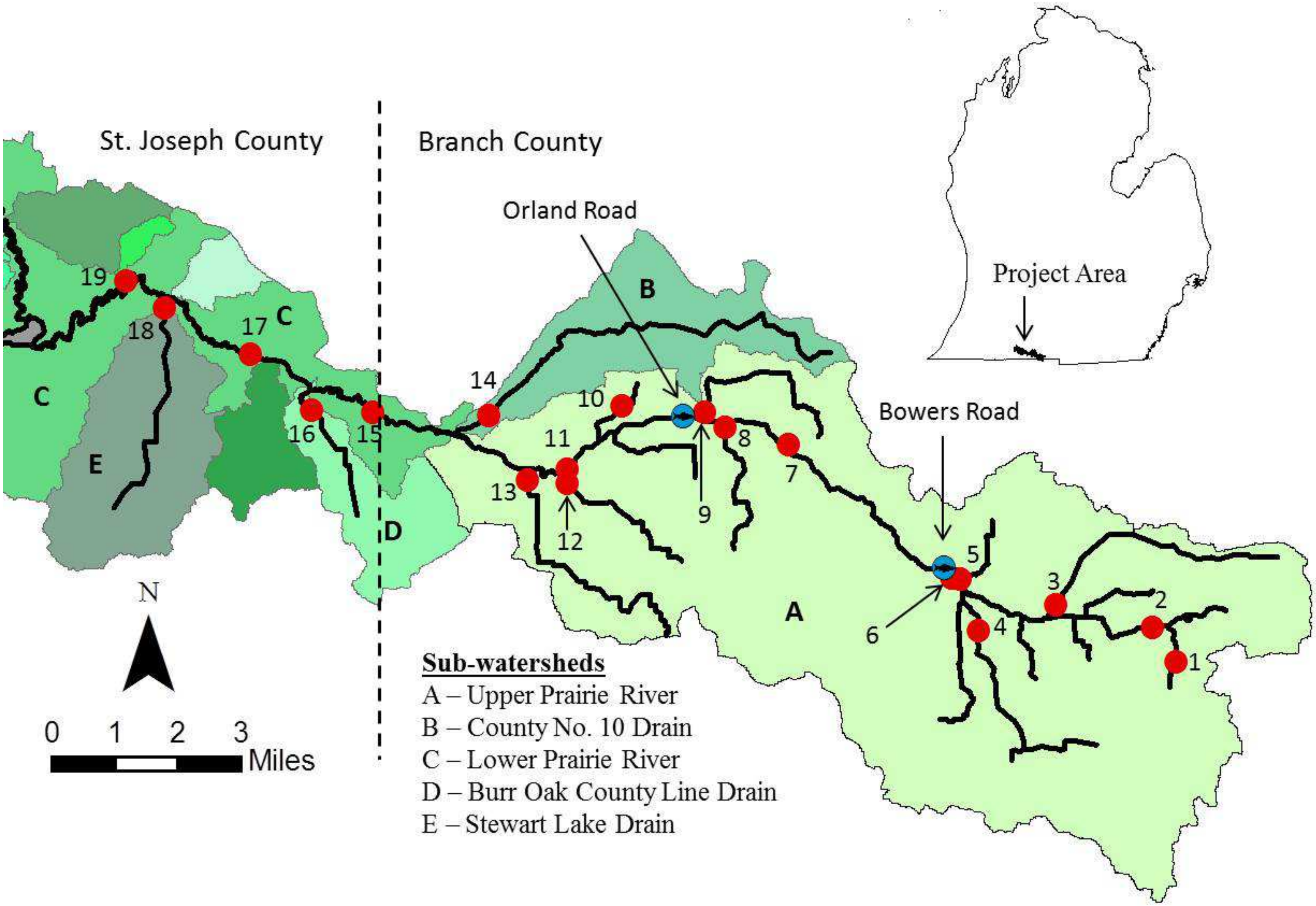

Figure 2.–Sampling locations and select sub-watersheds (letters) within the Prairie River watershed. Dots with fish indicate locations where electrofishing was conducted during 2012-2014. Solid dots indicate sites where temperature loggers were deployed during March 2012-November 2014. (See Table 3 for descriptions of temperature logger deployment sites.)

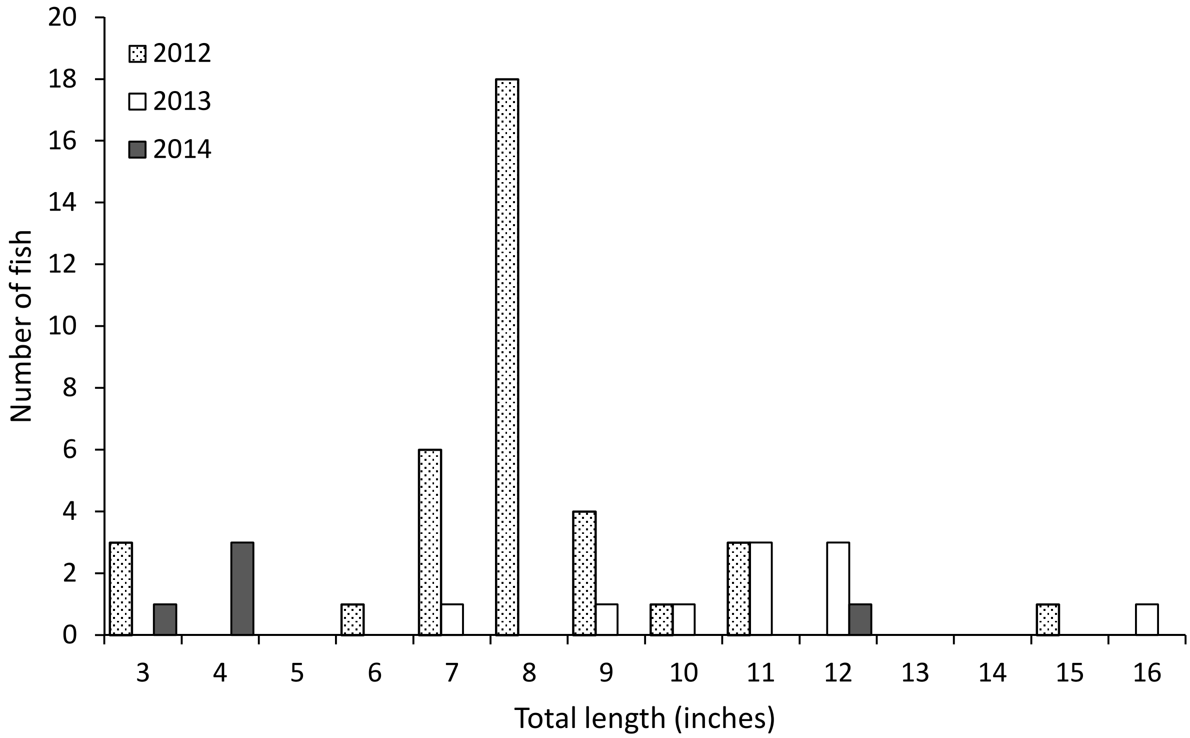

Figure 3.–Length frequency distributions for Brown Trout captured at the Bowers Road sampling station on the Prairie River in July 2012, July 2013, and September 2014.

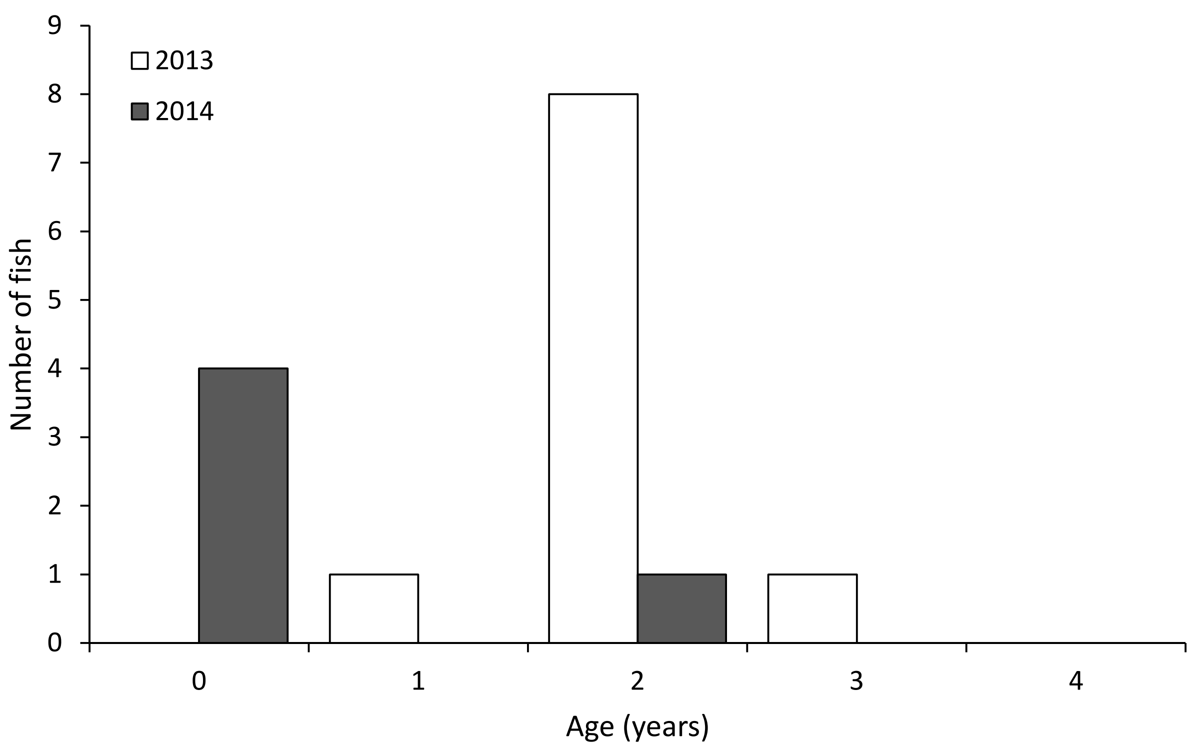

Figure 4.–Age frequency distributions for Brown Trout captured at the Bowers Road sampling station on the Prairie River in July 2013 and September 2014.

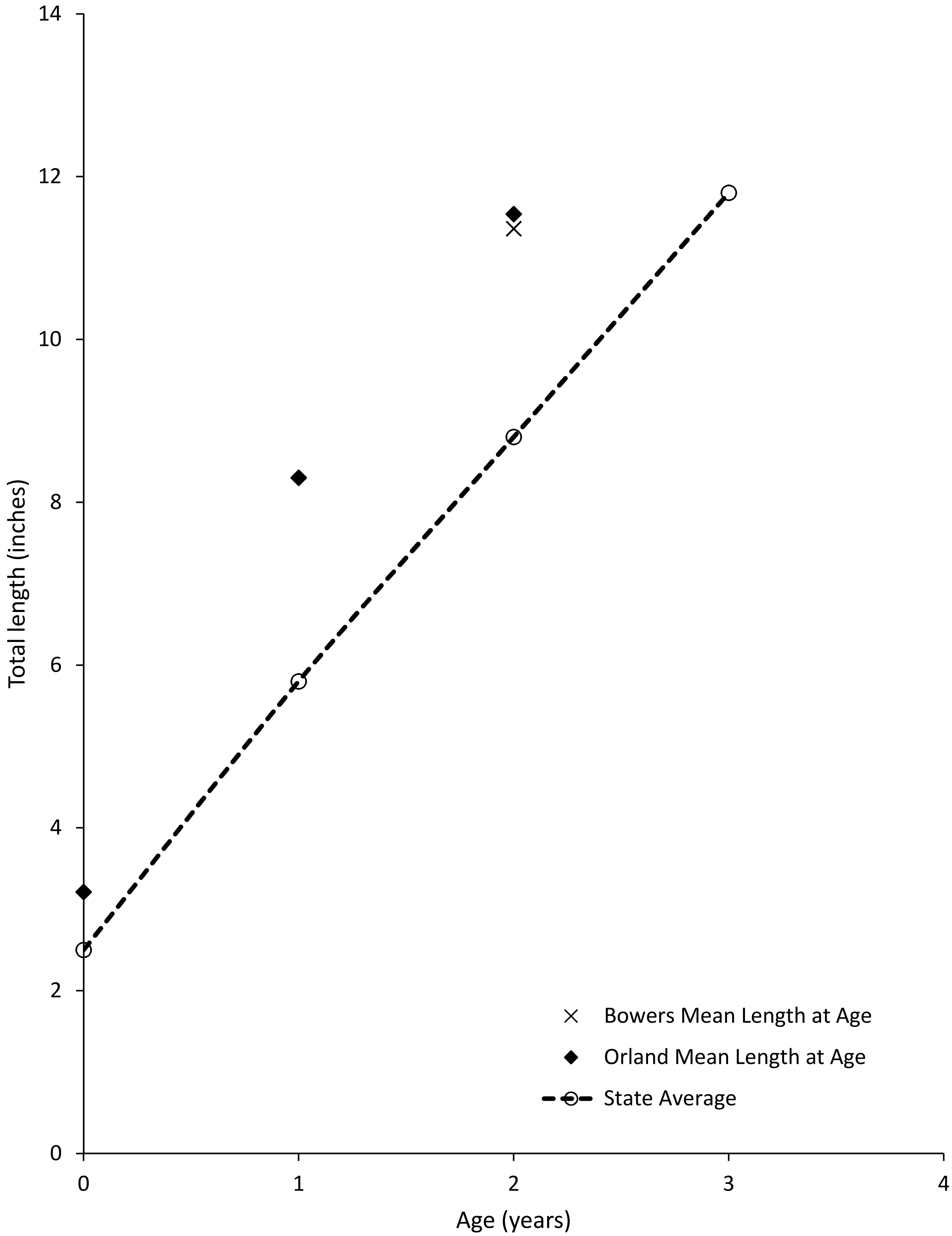

Figure 5.–Growth of Brown Trout in the Prairie River, as determined from scale samples collected at the Bowers Road and Orland Road sampling stations during July 23-24, 2013. State average lengths for June-July are from Schneider et al. (2000a).

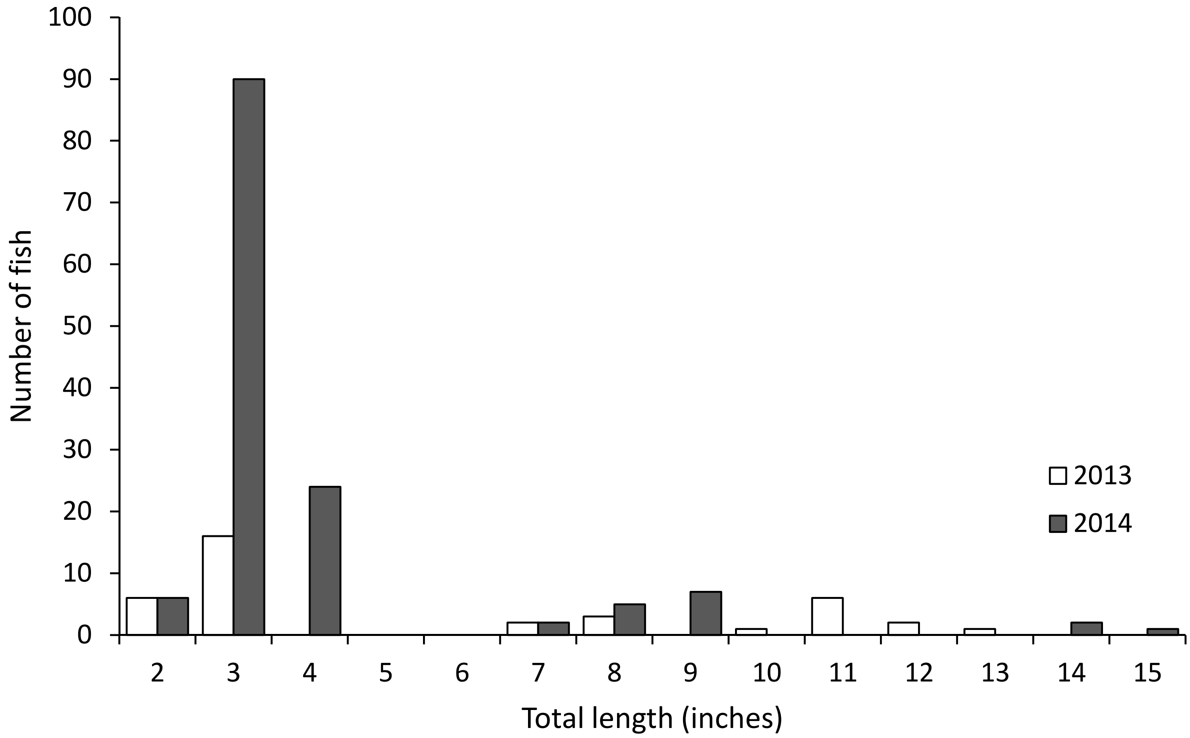

Figure 6.–Length frequency distributions for Brown Trout captured at the Orland Road sampling station on the Prairie River in July 2013 and September 2014.

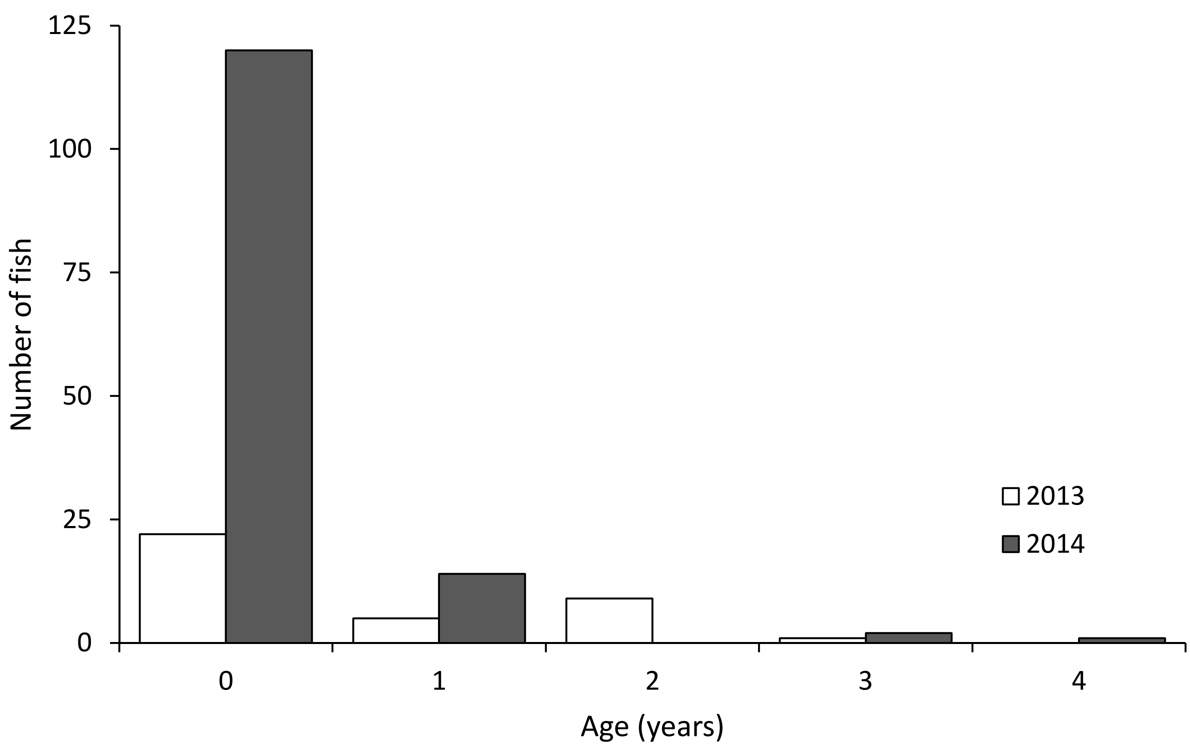

Figure 7.–Age frequency distributions for Brown Trout captured at the Orland Road sampling station on the Prairie River in July 2013 and September 2014.

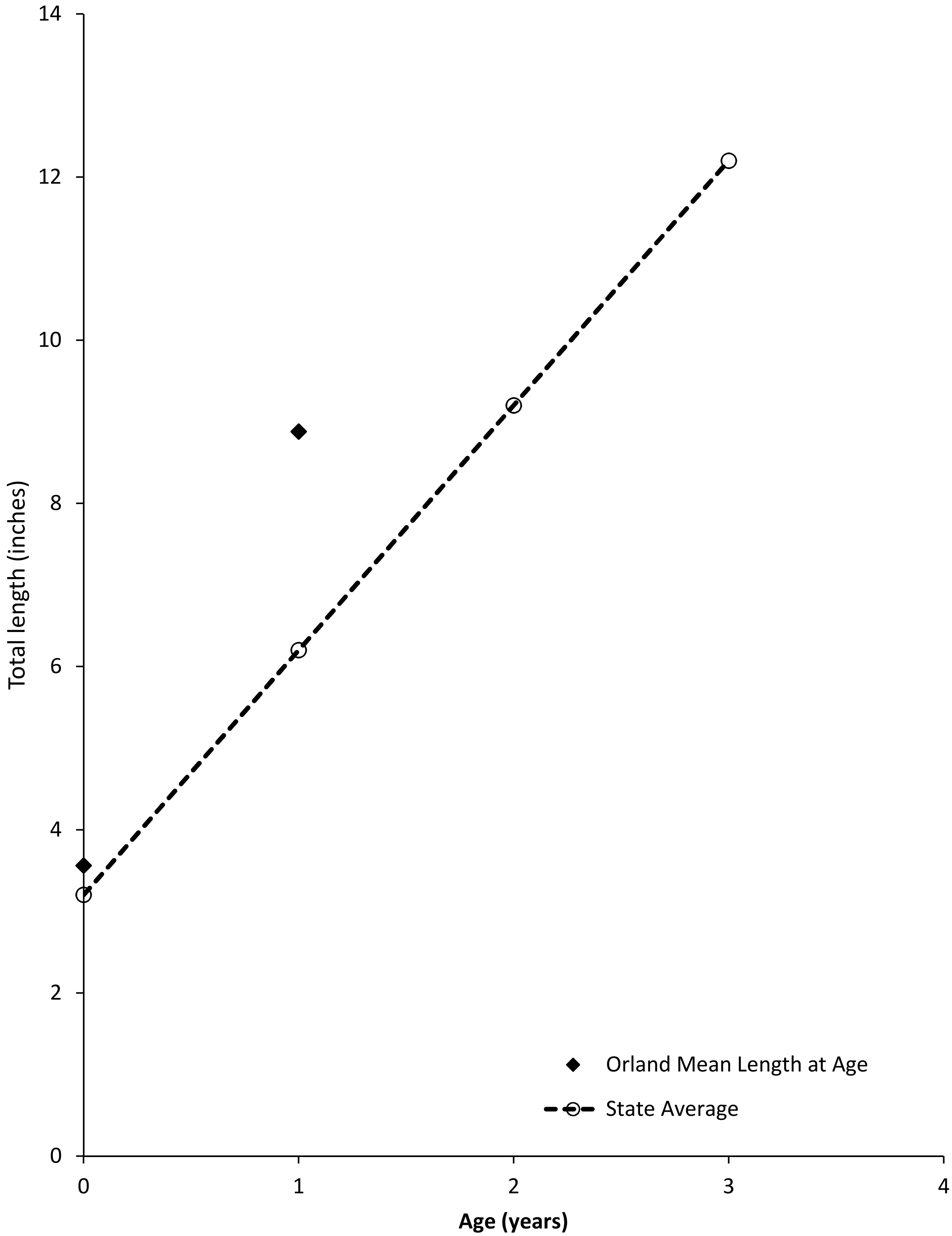

Figure 8.–Growth of Brown Trout in the Prairie River, as determined from scale samples collected at the Orland Road sampling station on September 29, 2014. State average lengths for August-September are from Schneider et al. (2000a).

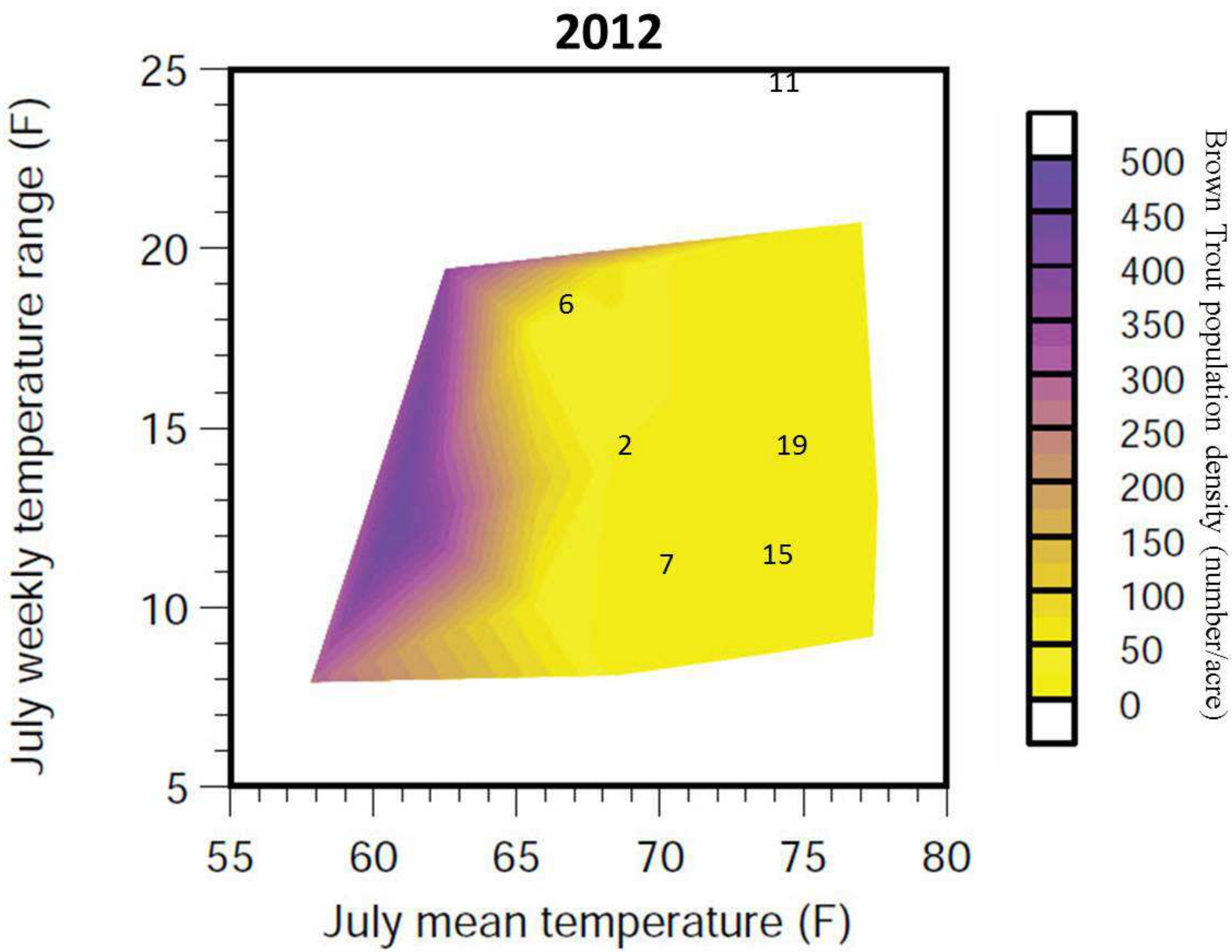

Figure 9.–Relationship between July mean water temperature, weekly temperature range, and numerical density (number/acre) of Brown Trout in Michigan streams (Zorn et al. 2009). Numbers plotted on the graph represent temperature logger deployment sites on the Prairie River during July 2012. (See Table 3 for site locations.)

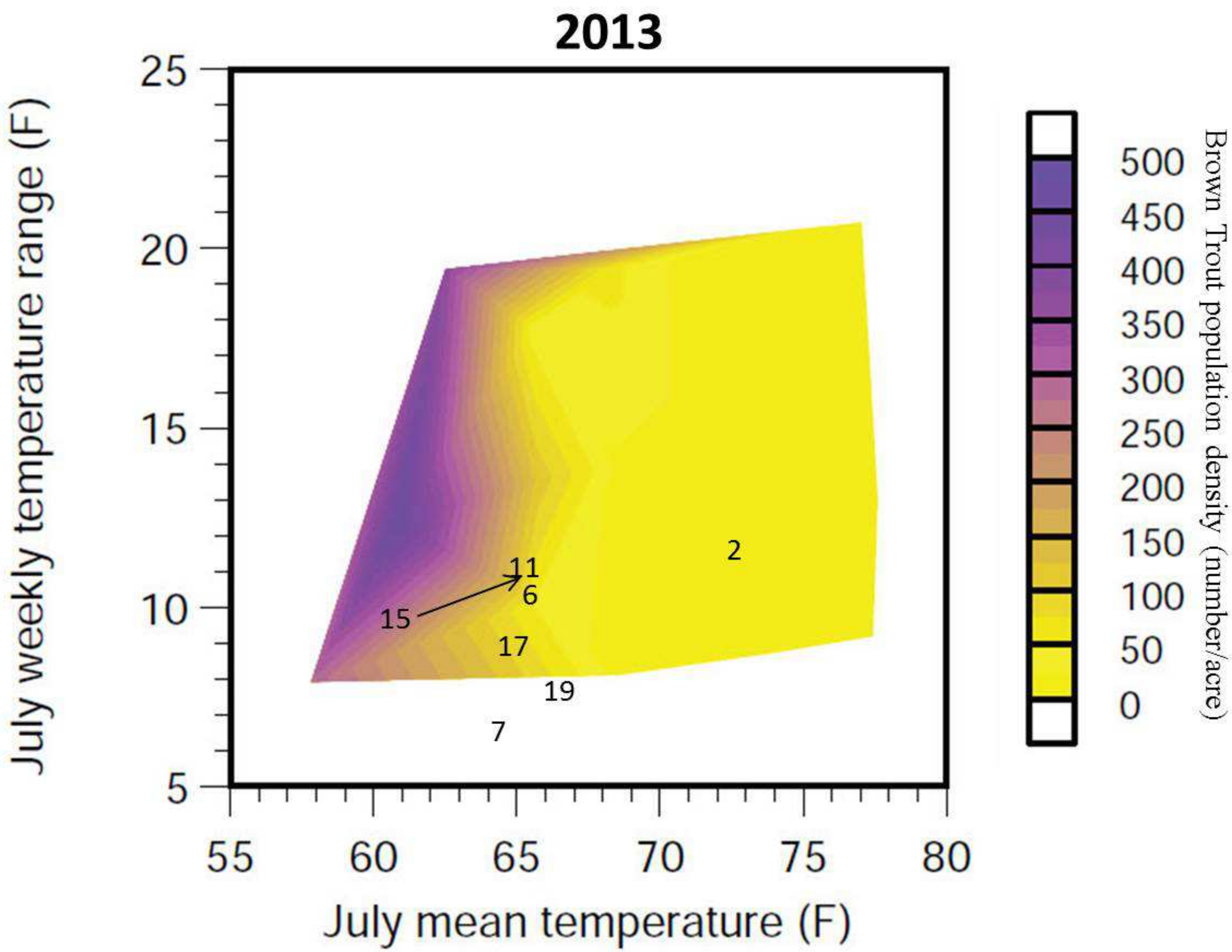

Figure 10.–Relationship between July mean water temperature, weekly temperature range, and numerical density (number/acre) of Brown Trout in Michigan streams (Zorn et al. 2009). Numbers plotted on the graph represent temperature logger deployment sites on the Prairie River during July 2013. (See Table 3 for site locations.)

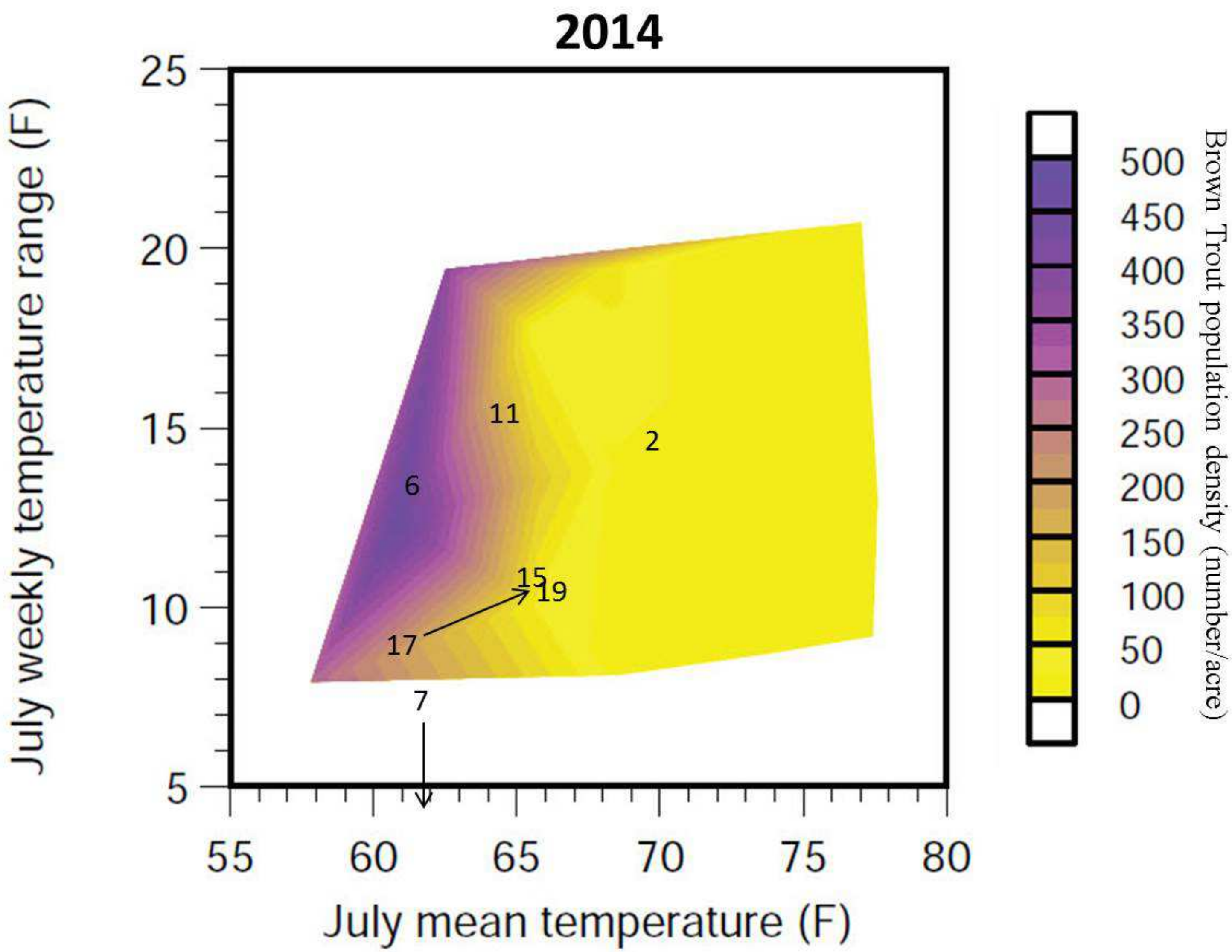

Figure 11.–Relationship between July mean water temperature, weekly temperature range, and numerical density (number/acre) of Brown Trout in Michigan streams (Zorn et al. 2009). Numbers plotted on the graph represent temperature logger deployment sites on the Prairie River during July 2014. (See Table 3 for site locations.)

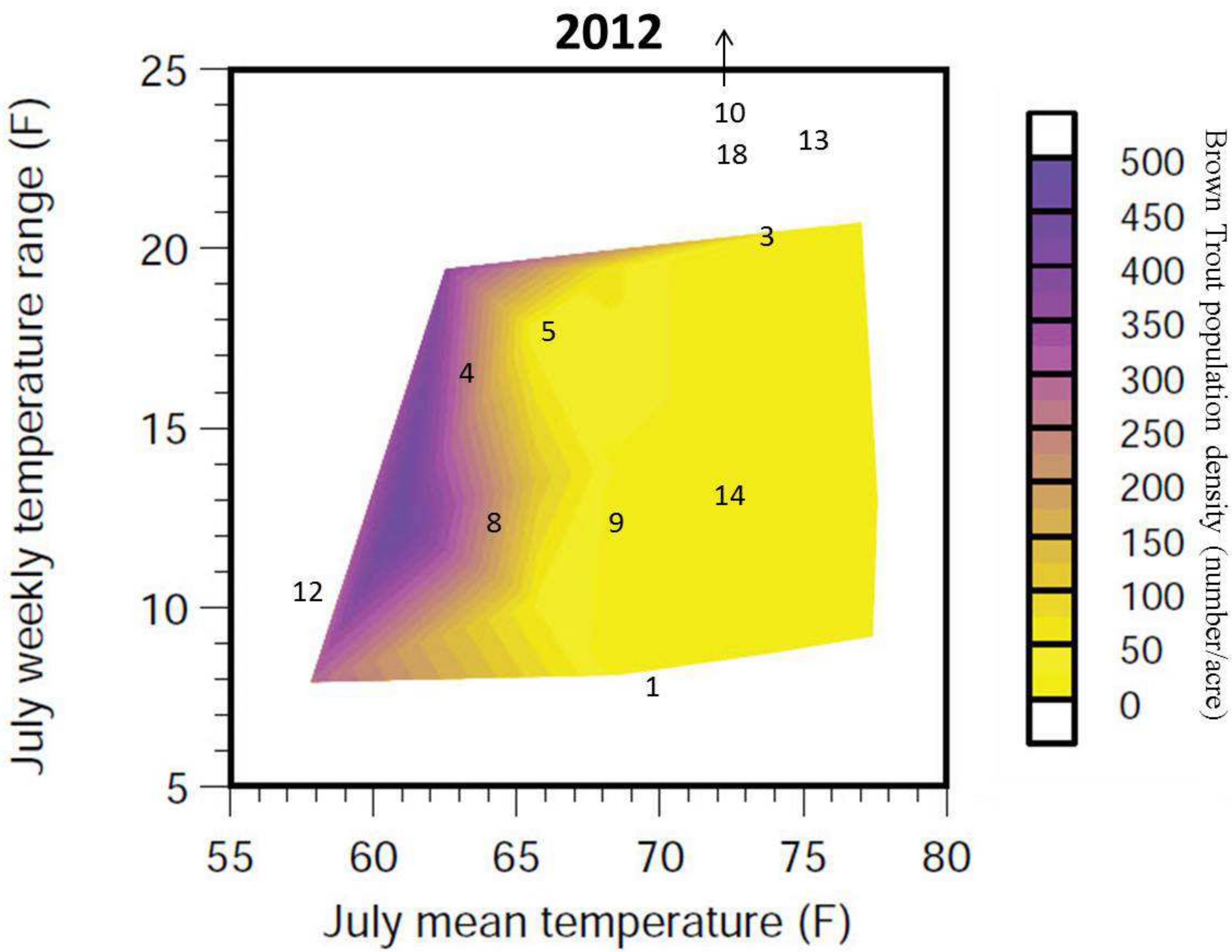

Figure 12.–Relationship between July mean water temperature, weekly temperature range, and numerical density (number/acre) of Brown Trout in Michigan streams (Zorn et al. 2009). Numbers plotted on the graph represent temperature logger deployment sites on tributaries to the Prairie River during July 2012. (See Table 3 for site locations.)

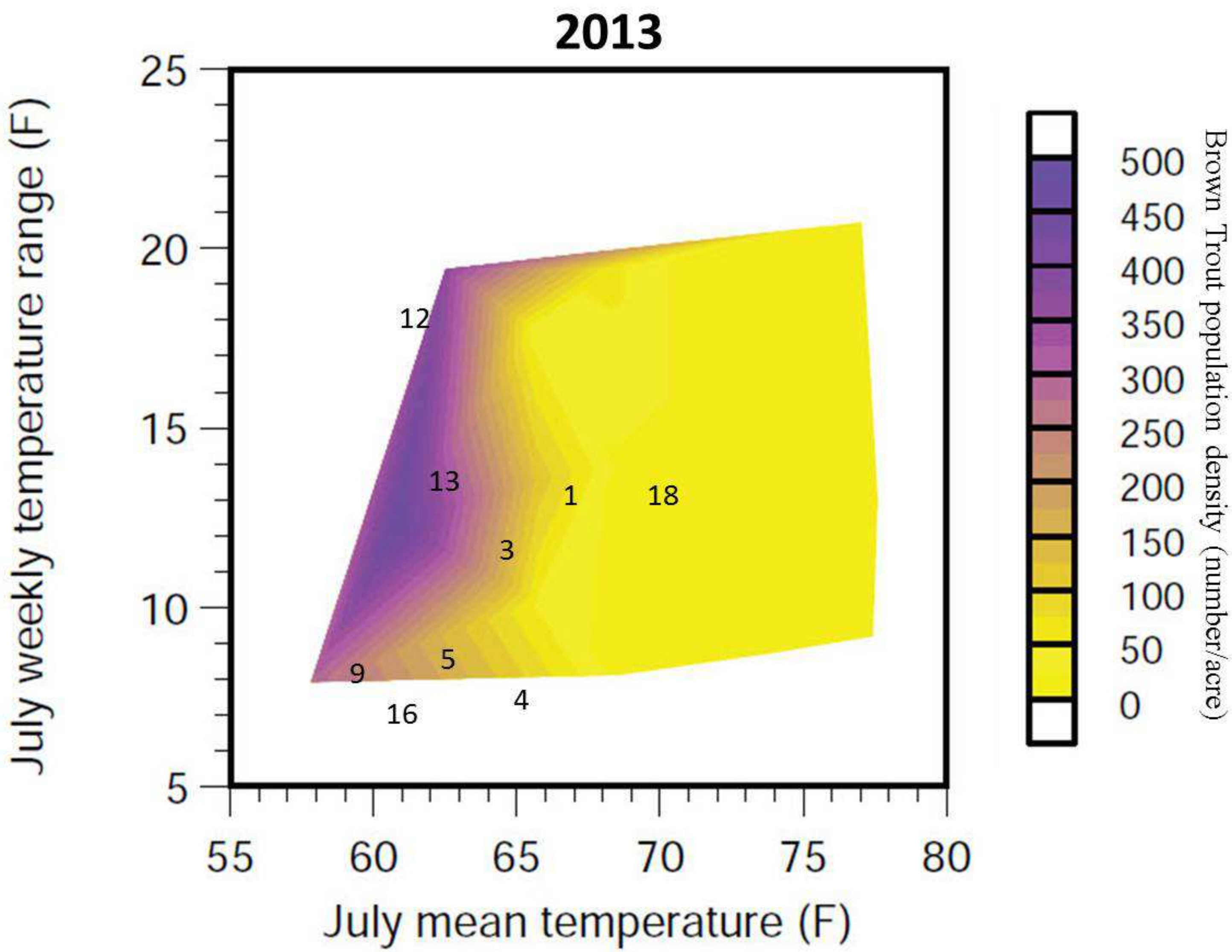

Figure 13.–Relationship between July mean water temperature, weekly temperature range, and numerical density (number/acre) of Brown Trout in Michigan streams (Zorn et al. 2009). Numbers plotted on the graph represent temperature logger deployment sites on tributaries to the Prairie River during July 2013. (See Table 3 for site locations.)

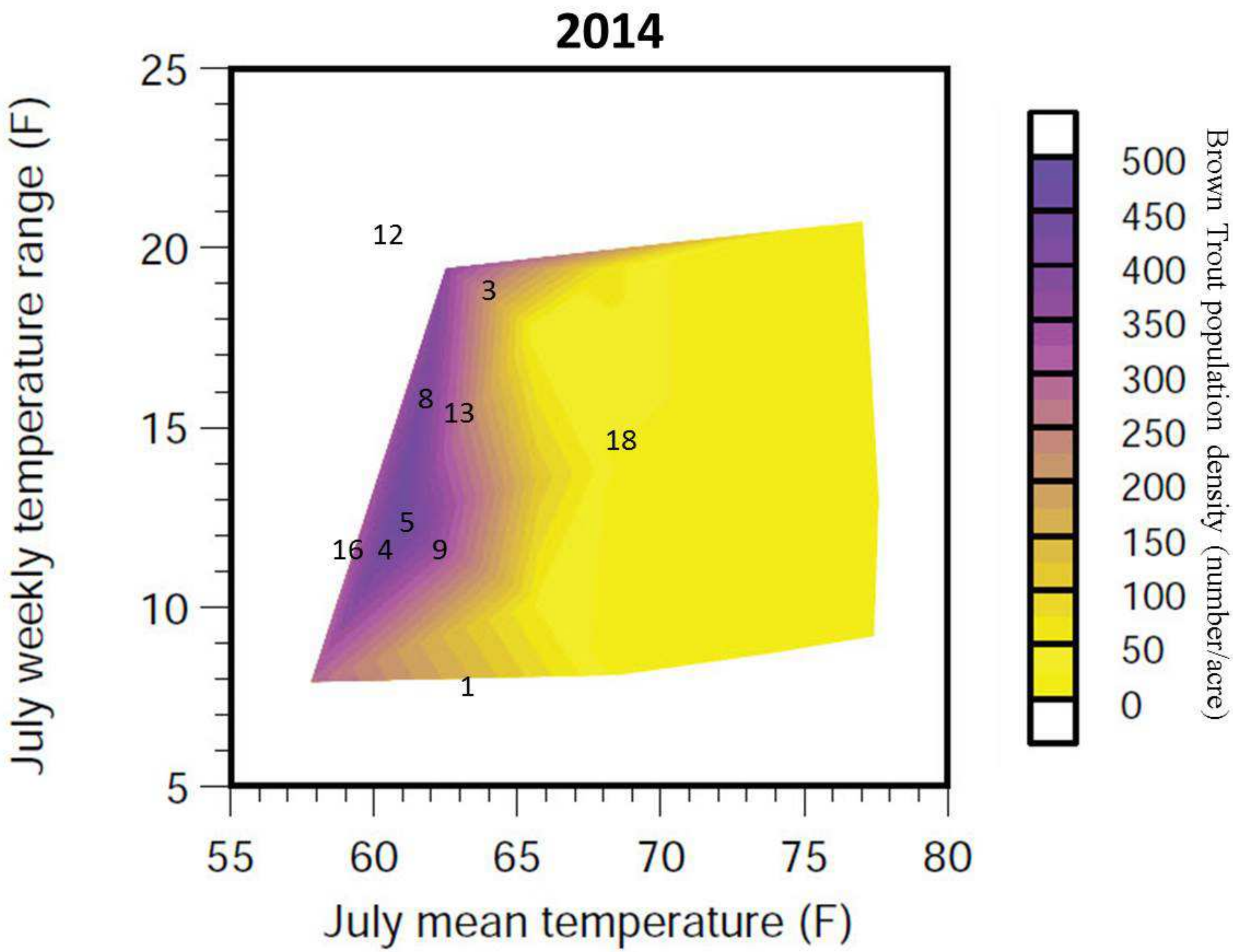

Figure 14.–Relationship between July mean water temperature, weekly temperature range, and numerical density (number/acre) of Brown Trout in Michigan streams (Zorn et al. 2009). Numbers plotted on the graph represent temperature logger deployment sites on tributaries to the Prairie River during July 2014. (See Table 3 for site locations.)

Table 1.–July mean water temperatures and mean weekly temperature ranges in July at various locations on the Prairie River, 1997-2003. Water temperatures were recorded with Onset StowAway® loggers. Water temperatures were recorded every hour in 2003 and once every 2 hours during 1997-2002. All temperatures are in degrees Fahrenheit.

Site	Year	July mean temperature	Mean weekly temperature range in July
Orland Road	1997	65.7	14.0
Prairie River Road	1997	66.4	16.0
Burr Oak Road	1998	68.9	10.3
Burr Oak Road	2002	69.5	5.6
St. Joseph Road	2003	69.3	10.0

Table 2.–Brown Trout stocking in the Prairie River, 1979-1992. Unless otherwise indicated, all fish were stocked as yearlings.

Year	County	Site	Number	Average length (inches)
1979	St. Joseph	Middle Colon Road	2,100	6.24
1980	St. Joseph	McKale Road*	12,000	2.84
1982	St. Joseph	Middle Colon Road	1,800	4.68
		Needham Road	1,300	4.68
		McKale Road	2,200	4.68
1983	Branch	Bowers Road	800	6.36
		Snow Prairie Road	1,000	6.36
		Cranson Road	1,200	6.36
		Rierson Road	1,200	6.36
		Orland Road	1,000	6.40
		Bawden Road	1,200	6.40
	St. Joseph	Middle Colon Road	1,350	6.40
		Needham Road	1,000	6.40
		McKale Road	2,910	6.40
1984	Branch	Bowers Road	800	5.92
		Snow Prairie Road	1,000	5.84
		Cranson Road	1,200	5.84
		Rierson Road	1,200	5.92
		Orland Road	1,000	5.84
		Prairie River Road	1,000	5.84
	St. Joseph	Middle Colon Road	2,000	5.84
		Needham Road	1,500	5.84
		McKale Road	2,500	6.84
1985	Branch	Bowers Road	520	6.40
		Snow Prairie Road	680	6.28
		Cranson Road	1,010	7.44
		Rierson Road	1,010	6.40
		Orland Road	680	6.28
		Bawden Road	1,010	6.36
		Prairie River Road	810	6.36
	St. Joseph	Middle Colon Road	1,530	6.36
		Needham Road	1,030	6.36
		McKale Road	1,530	6.36
1986	Branch	Bowers Road	580	6.48
		Snow Prairie Road	850	6.96
		Cranson Road	1,050	6.96
		Rierson Road	1,050	6.48
		Orland Road	850	6.96
		Bawden Road	1,050	6.96
		Prairie River Road	850	6.96
	St. Joseph	Middle Colon Road	1,500	5.68

Table 2.–Continued.

Year	County	Site	Number	Average length (inches)
		Needham Road	1,000	5.68
		McKale Road	1,500	5.68
1987	Branch	Bowers Road	620	5.92
		Snow Prairie Road	880	5.72
		Cranson Road	1,080	5.72
		Rierson Road	1,080	5.92
		Orland Road	880	5.72
		Bawden Road	1,080	5.72
		Prairie River Road	880	5.72
	St. Joseph	Middle Colon Road	1,700	6.44
		Needham Road	1,200	6.44
		McKale Road	1,700	6.44
1988	Branch	Bowers Road	800	5.56
		Snow Prairie Road	1,000	5.56
		Cranson Road	1,200	5.56
		Rierson Road	1,200	5.56
		Orland Road	1,000	5.56
		Bawden Road	1,200	5.56
		Prairie River Road	1,000	5.56
	St. Joseph	Middle Colon Road	2,030	5.36
		Needham Road	1,530	5.36
		McKale Road	2,030	5.36
1989	Branch	Bowers Road	800	5.92
		Snow Prairie Road	1,000	5.92
		Cranson Road	1,200	5.92
		Rierson Road	1,200	5.92
		Orland Road	1,000	5.92
		Bawden Road	1,200	5.92
		Prairie River Road	1,000	5.92
	St. Joseph	Middle Colon Road	2,000	6.36
		Needham Road	1,500	6.36
		McKale Road	2,000	6.36
1990	Branch	Bowers Road	800	5.08
		Snow Prairie Road	1,000	5.32
		Cranson Road	1,200	5.32
		Rierson Road	1,200	5.08
		Orland Road	1,000	5.32
		Bawden Road	1,200	5.32
		Prairie River Road	1,000	5.32
	St. Joseph	Middle Colon Road	2,000	5.32
		Needham Road	1,500	5.32
		McKale Road	2,000	5.32

Table 2.–Continued.

Year	County	Site	Number	Average length (inches)
1991	Branch	Bowers Road	783	5.92
		Snow Prairie Road	981	5.92
		Cranson Road	1,179	5.92
		Rierson Road	1,179	5.92
		Orland Road	990	5.92
		Bawden Road	1,190	5.92
		Prairie River Road	990	5.92
	St. Joseph	Middle Colon Road	2,075	5.84
		Needham Road	1,554	5.84
		McKale Road	2,076	5.84
1992	Branch	Cranson Road	1,189	6.08
		Rierson Road	1,190	6.08
		Orland Road	989	6.08
		Prairie River Road	989	6.08
	St. Joseph	Middle Colon Road	1,960	6.08
		Needham Road	1,460	6.08
		McKale Road	1,960	6.08

* Fish stocked as spring fingerlings

Table 3.–Temperature logger deployment sites in the Prairie River watershed, March 2012 through November 2014.

Site #	Stream	Nearest road crossing	Sub-watershed
1	Kinderhook No. 2 Drain	Southern Road	A
2	Prairie River	Walker Road	A
3	County No. 59 Drain	Block Road	A
4	Lanes Drain	Booth Road	A
5	Weaver Drain	Rubley Road	A
6	Prairie River	Bowers Road	A
7	Prairie River	Parham Road	A
8	County No. 25 Drain	Cemetery Road (adjacent)	A
9	Bethel & Bronson No. 4 & 1 Drain	Kosmerick Road	A
10	Bronson No. 12 Drain*	Bawden Road	A
11	Prairie River	Prairie River Road	A
12	Sutter & Pinney Drain	Prairie River Road	A
13	Blosser Drain	Douglas Road	A
14	County No. 10 Drain	Carpenter Road	B
15	Prairie River	St. Joseph Road	C
16	Burr Oak County Line Drain	Burr Oak Road	D
17	Prairie River	Middle Colon Road	C
18	Stewart Lake Drain	Cowles Road	E
19	Prairie River	McKale Road	C

* Temperature logger deployed from March-December 2012. Logger was not redeployed as the stream was determined to be intermittent.

Table 4.–Numbers and thermal classifications for fish species collected at the Bowers Road electrofishing station on the Prairie River on September 12, 2012. Thermal classifications from Lyons et al. (2009).

Species	Number	Percent by number	Thermal classification
Creek chub	496	43.3	Transitional
Rainbow darter	346	30.2	Warmwater
Johnny darter	123	10.7	Transitional
White sucker	90	7.9	Transitional
Brown trout	37	3.2	Coldwater
Blacknose dace	28	2.4	Transitional
Grass pickerel	10	0.9	Warmwater
Bluegill	5	0.4	Warmwater
Green sunfish	5	0.4	Warmwater
Yellow bullhead	2	0.2	Warmwater
Northern hog sucker	1	0.1	Transitional
Pirate perch	1	0.1	Warmwater
Central mudminnow	1	0.1	Transitional
Total	1,145		

Table 5.–Numbers, calculated weights, total lengths, and thermal classifications for fish species collected at the Bowers Road electrofishing station on the Prairie River on July 23, 2013. Thermal classifications from Lyons et al. (2009).

Species	Number	Percent by number	Weight (lb)	Percent by weight	Total length range (inches)	Thermal classification
Rainbow Darter	118	28.6	0.2	1.5	1-2	Warmwater
Creek Chub	108	26.2	2.9	21.3	1-7	Transitional
Johnny Darter	58	14.0	0.2	1.2	1-2	Transitional
Blacknose Dace	55	13.3	0.3	2.3	1-3	Transitional
Bluegill	22	5.3	0.9	6.6	2-6	Warmwater
White Sucker	14	3.4	2.6	19.0	1-13	Transitional
Central Mudminnow	12	2.9	0.1	0.5	1-3	Transitional
Brown Trout	10	2.4	6.2	44.9	7-16	Coldwater
Green Sunfish	7	1.7	0.2	1.1	1-3	Warmwater
Grass Pickerel	5	1.2	0.1	0.9	2-6	Warmwater
Largemouth Bass	2	0.5	0.0	0.1	1-2	Warmwater
Yellow Bullhead	1	0.2	0.1	0.6	5	Warmwater
Warmouth	1	0.2	0.0	0.1	2	Warmwater
Total	413		13.7			

Table 6.–Numbers, calculated weights, total lengths, and thermal classifications for fish species collected at the Bowers Road electrofishing station on the Prairie River on September 29, 2014. Thermal classifications from Lyons et al. (2009).

Species	Number	Percent by number	Weight (lb)	Percent by weight	Total length range (inches)	Thermal classification
Creek Chub	543	55.5	2.1	18.4	1-8	Transitional
Blacknose Dace	182	18.6	0.6	5.2	1-3	Transitional
Rainbow Darter	94	9.6	0.1	1.0	1-2	Warmwater
White Sucker	73	7.5	5.5	47.9	1-14	Transitional
Johnny Darter	49	5.0	0.1	1.0	1-2	Transitional
Yellow Bullhead	20	2.0	1.8	15.8	3-8	Warmwater
Central Mudminnow	6	0.6	0.1	0.8	2-3	Transitional
Brown Trout	5	0.5	0.8	7.1	3-12	Coldwater
Grass Pickerel	2	0.2	0.1	0.4	4-5	Warmwater
N. Hog Sucker	1	0.1	0.2	1.4	7	Transitional
Chestnut Lamprey	1	0.1	0.1	0.5	9	Warmwater
Green Sunfish	1	0.1	0.1	0.5	4	Warmwater
Bluntnose Minnow	1	0.1	0.0	0.1	2	Warmwater
N. Brook Lamprey	1	0.1	0.0	0.0	---	Transitional
	979		11.4			

Table 7.–Numbers, calculated weights, total lengths, and thermal classifications for fish species collected at the Orland Road electrofishing station on the Prairie River on July 24, 2013. Thermal classifications from Lyons et al. (2009).

Species	Number	Percent by number	Weight (lb)	Percent by weight	Total length range (inches)	Thermal classification
Blacknose Dace	118	24.7	1.3	8.3	2-3	Transitional
Rainbow Darter	111	23.2	0.2	1.1	1-2	Warmwater
Hornyhead Chub	93	19.5	3.2	20.5	2-6	Warmwater
Creek Chub	56	11.7	2.0	12.8	1-7	Transitional
Brown Trout	37	7.7	7.1	46.3	2-13	Coldwater
White Sucker	28	5.9	0.9	5.5	1-6	Transitional
N. Hog Sucker	14	2.9	0.6	3.7	2-8	Transitional
Johnny Darter	8	1.7	0.0	0.2	1-2	Transitional
Am. Brook Lamprey	7	1.5	0.1	0.8	4.7	Transitional
Green Sunfish	3	0.6	0.1	0.7	2-4	Warmwater
Grass Pickerel	3	0.6	0.0	0.2	2-4	Warmwater
	478		15.4			

Table 8.–Numbers, calculated weights, total lengths, and thermal classifications for fish species collected at the Orland Road electrofishing station on the Prairie River on September 29, 2014. Thermal classifications from Lyons et al. (2009).

Species	Number	Percent by number	Weight (lb)	Percent by weight	Total length range (inches)	Thermal classification
Brown Trout	137	22.6	9.1	36.7	2-15	Coldwater
Blacknose Dace	127	20.9	0.6	2.3	1-3	Transitional
Creek Chub	111	18.3	2.0	8.0	1-9	Transitional
Rainbow Darter	75	12.4	0.2	0.7	1-2	Warmwater
Hornyhead Chub	59	9.7	1.8	7.2	3-6	Warmwater
White Sucker	47	7.7	9.4	37.9	1-16	Transitional
Johnny Darter	18	3.0	0.1	0.3	1-2	Transitional
Grass Pickerel	12	2.0	0.5	2.0	3-7	Warmwater
Central Mudminnow	11	1.8	0.1	0.4	1-3	Transitional
N. Hog Sucker	7	1.2	1.2	4.6	1-11	Transitional
Am. Brook Lamprey	3	0.5	0.0	0.0	---	Transitional
	607		24.9			

Table 9.–Aquatic habitat parameters for the Bowers Road and Orland Road sampling stations on the Prairie River, July 2012, July 2013, and September 2014. Habitat surveys were conducted according to the protocols described by Wills et al. (2005).

Site	Year	Mean wetted width (ft)	Mean depth (ft)	Discharge (cfs)	Bank stability (% rated as poor or very poor)	Loose gravel (% of measurements)	Single logs with diameter > 6 inches (lineal ft)	Log jams, brush deposits, and stumps (ft^2)
Orland	2012	---	---	4.3	---	---	---	---
Bowers	2013	21.6	1.36	23.4	54	38.5	30	764
Orland	2013	22.7	1.46	36.3	35	9.2	18	117
Bowers	2014	19.1	0.97	6.4	75	5.7	54	207
Orland	2014	21.7	1.21	11.0	23	6.2	42	783

Table 10.–Air temperatures and precipitation totals recorded at the National Weather Service station in Lansing. Numbers in parentheses indicate departure from normal values.

Year	July mean air temperature (^oF)	Total July precipitation (inches)	Mean air temperature for June-August (^oF)	Total precipitation (inches) for June-August
2012	77.8 (+6.3)	1.75 (-1.09)	72.6 (+3.0)	7.49 (-2.03)
2013	71.6 (+0.1)	1.75 (-1.09)	69.4 (-0.2)	14.92 (+5.40)
2014	67.1 (-4.4)	4.86 (+2.02)	68.5 (-1.1)	16.01 (+6.49)

Table 11.–July mean water temperatures, mean weekly temperature ranges in July, and mean water temperatures during the hottest week (July 1-7) at various sites within the Prairie River watershed in 2012. All temperatures are in degrees Fahrenheit.

Site #	Stream	Nearest road crossing	July mean water temperature	Mean weekly temperature range in July	Mean water temperature during hottest week
1	Kinderhook No. 2 Drain	Southern Road	69.8	7.7	70.8
2	Prairie River	Walker Road	68.8	14.5	70.1
3	County No. 59 Drain	Block Road	73.9	20.3	76.9
4	Lanes Drain	Booth Road	63.3	16.4	64.3
5	Weaver Drain	Rubley Road	66.2	17.7	67.7
6	Prairie River	Bowers Road	66.8	18.4	68.3
7	Prairie River	Parham Road	70.2	11.2	71.9
8	County No. 25 Drain	Cemetery Road (adjacent)	64.3	12.6	66.8
9	Bethel & Bronson No. 4 & 1 Drain	Kosmerick Road	68.5	12.3	71.2
10	Bronson No. 12 Drain	Bawden Road	72.2	29.3	75.1
11	Prairie River	Prairie River Road	74.3	24.8	76.6
12	Sutter & Pinney Drain	Prairie River Road	57.9	10.5	56.0
13	Blosser Drain	Douglas Road	75.5	23.0	78.0
14	County No. 10 Drain	Carpenter Road	72.3	13.2	67.7
15	Prairie River	St. Joseph Road	74.1	11.3	76.3
16	Burr Oak County Line Drain*	Burr Oak Road	---	---	---
17	Prairie River*	Middle Colon Road	---	---	---
18	Stewart Lake Drain	Cowles Road	72.6	22.7	76.4
19	Prairie River	McKale Road	74.4	14.5	77.6

* Temperature loggers were stolen or washed downstream

Table 12.–July mean water temperatures, mean weekly temperature ranges in July, and mean water temperatures during the hottest week (July 14-20) at various sites within the Prairie River watershed in 2013. All temperatures are in degrees Fahrenheit.

Site #	Stream	Nearest road crossing	July mean water temperature	Mean weekly temperature range in July	Mean water temperature during hottest week
1	Kinderhook No. 2 Drain	Southern Road	67.0	13.1	70.6
2	Prairie River	Walker Road	72.8	11.8	78.3
3	County No. 59 Drain	Block Road	64.9	11.5	69.6
4	Lanes Drain	Booth Road	65.3	7.4	68.5
5	Weaver Drain	Rubley Road	62.7	8.7	65.7
6	Prairie River	Bowers Road	65.2	10.3	68.7
7	Prairie River	Parham Road	64.2	6.6	67.5
8	County No. 25 Drain[1]	Cemetery Road (adjacent)	---	---	---
9	Bethel & Bronson No. 4 & 1 Drain	Kosmerick Road	59.6	8.0	66.2
10	Bronson No. 12 Drain[2]	Bawden Road	---	---	---
11	Prairie River	Prairie River Road	65.2	11.0	69.8
12	Sutter & Pinney Drain	Prairie River Road	61.4	18.0	65.0
13	Blosser Drain	Douglas Road	62.8	13.5	66.6
14	County No. 10 Drain[3]	Carpenter Road	---	---	---
15	Prairie River	St. Joseph Road	65.0	10.8	69.5
16	Burr Oak County Line Drain	Burr Oak Road	61.0	7.0	63.8
17	Prairie River	Middle Colon Road	65.0	8.8	69.5
18	Stewart Lake Drain	Cowles Road	70.2	13.2	76.4
19	Prairie River	McKale Road	66.5	7.6	71.2

[1] Temperature logger was stolen or washed downstream
[2] No temperature logger was deployed at this location in 2013
[3] Temperature logger became buried in sediment

Table 13.–July mean water temperatures, mean weekly temperature ranges in July, and mean water temperatures during the hottest week (July 21-27) at various sites within the Prairie River watershed in 2014. All temperatures are in degrees Fahrenheit.

Site #	Stream	Nearest road crossing	July mean water temperature	Mean weekly temperature range in July	Mean water temperature during hottest week
1	Kinderhook No. 2 Drain	Southern Road	63.3	7.8	65.8
2	Prairie River	Walker Road	69.8	14.9	70.0
3	County No. 59 Drain	Block Road	64.1	18.9	65.6
4	Lanes Drain	Booth Road	60.4	11.7	59.3
5	Weaver Drain	Rubley Road	61.1	12.4	61.2
6	Prairie River	Bowers Road	62.4	13.2	62.2
7	Prairie River	Parham Road	61.7	4.2	61.8
8	County No. 25 Drain	Cemetery Road (adjacent)	62.0	16.0	62.6
9	Bethel & Bronson No. 4 & 1 Drain	Kosmerick Road	62.3	11.6	64.1
10	Bronson No. 12 Drain[1]	Bawden Road	---	---	---
11	Prairie River	Prairie River Road	64.8	15.6	66.2
12	Sutter & Pinney Drain	Prairie River Road	60.2	20.4	61.4
13	Blosser Drain	Douglas Road	63.1	15.3	64.8
14	County No. 10 Drain[2]	Carpenter Road	---	---	---
15	Prairie River	St. Joseph Road	65.5	10.8	67.0
16	Burr Oak County Line Drain	Burr Oak Road	59.1	11.6	59.7
17	Prairie River	Middle Colon Road	65.4	10.5	66.8
18	Stewart Lake Drain	Cowles Road	68.6	14.5	69.8
19	Prairie River	McKale Road	66.1	10.6	67.4

[1] No temperature logger was deployed at this location in 2014

[2] Temperature logger became buried in sediment

Table 14.–Current thermal classifications in Michigan's Water Withdrawal Assessment Tool and thermal classifications based on water temperature data collected within the Prairie River watershed during 2012-2014. For the 2012-2014 data, streams were classified as cold if the July mean water temperature (JMT) was < 63.5 °F, cold transitional (CT) if JMT was between 63.5 °F and 67.1 °F, cool if JMT was between 67.1 °F and 69.8 °F, and warm if JMT was > 69.8 °F.

				Thermal classification		
Site #	Stream	Nearest road crossing	Current	2012	2013	2014
1	Kinderhook No. 2 Drain	Southern Road	Warm	Cool	CT	Cold
2	Prairie River	Walker Road	Warm	Cool	Warm	Cool
3	County No. 59 Drain	Block Road	Warm	Warm	CT	CT
4	Lanes Drain	Booth Road	Warm	Cold	CT	Cold
5	Weaver Drain	Rubley Road	Warm	CT	Cold	Cold
6	Prairie River	Bowers Road	Warm	CT	CT	Cold
7	Prairie River	Parham Road	Warm	Warm	CT	Cold
8	County No. 25 Drain	Cemetery Road (adjacent)	Warm	CT	---	Cold
9	Bethel & Bronson No. 4 & 1 Drain	Kosmerick Road	Warm	Cool	Cold	Cold
10	Bronson No. 12 Drain	Bawden Road	Warm	Warm	---	---
11	Prairie River	Prairie River Road	Warm	Warm	CT	CT
12	Sutter & Pinney Drain	Prairie River Road	Warm	Cold	Cold	Cold
13	Blosser Drain	Douglas Road	Warm	Warm	Cold	Cold
14	County No. 10 Drain	Carpenter Road	Warm	Warm	---	---
15	Prairie River	St. Joseph Road	Cool	Warm	CT	CT
16	Burr Oak County Line Drain	Burr Oak Road	Cool	---	Cold	Cold
17	Prairie River	Middle Colon Road	Cool	---	CT	CT
18	Stewart Lake Drain	Cowles Road	Cool	Warm	Warm	Cool
19	Prairie River	McKale Road	Cool	Warm	CT	CT