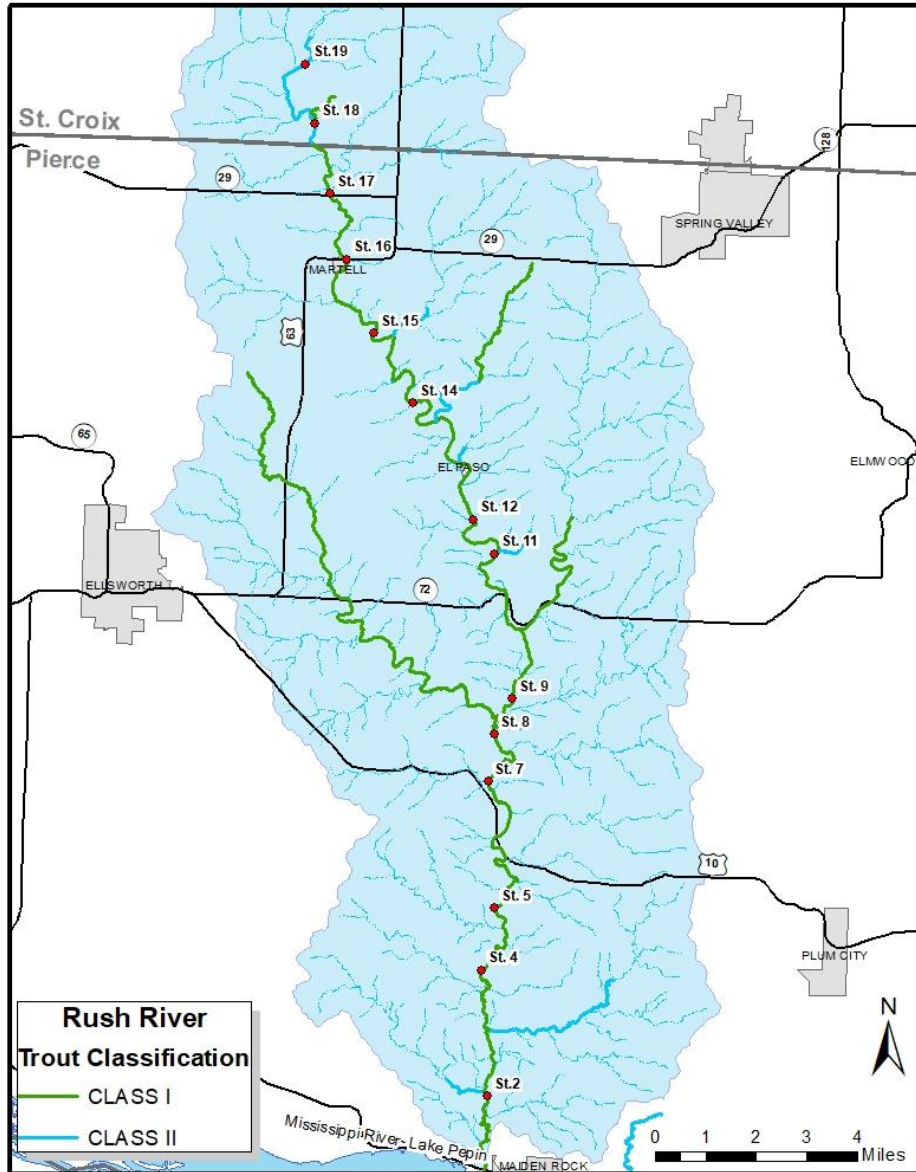


WISCONSIN DEPARTMENT OF NATURAL RESOURCES

Fisheries Survey Report for Rush River, Pierce and St. Croix County, Wisconsin 2021

WATERBODY IDENTIFICATION CODE 2440300



KASEY YALLALY
DNR Fisheries Biologist
Baldwin, Wisconsin
January 2022

Introduction

The Rush River watershed encompasses approximately 290 sq. miles in St. Croix and Pierce counties. There are 31.8 miles of Class I trout water and 6.1 miles of Class II trout water. The headwaters are located just west of the City of Baldwin and flow south into Pierce County, where it flows through wooded and agricultural lands surrounded by ridges and coulees. The river drains into the Mississippi River at Lake Pepin. The upper St. Croix County portion contains a warm water forage fishery. Spring activity increases towards the town of Centerville, where spring water improves thermals and supports a Class II trout population. The river transitions into Class I status as it enters Pierce County. Lost Creek and Cave Creek are two of the major Class I tributaries, with several other Class I and Class II tributaries entering throughout Pierce County that still contain naturally reproducing Brook Trout populations. The Rush River is considered one of the best Brown Trout streams in Wisconsin, with trophy trout potential and high densities of trout. In-stream habitat is excellent in Pierce County down to Highway 10 with high gradients, excellent gravel substrates and good pool and riffle sequences. Downstream of Highway 10, the river becomes more degraded with a high sand load, wide channel and poorer thermal regimes. The length of the river experiences high bank erosion rates, especially after the extreme flood event in June 2020.

The Rush River is fed by many springs and coldwater tributaries, including three Class I tributaries named Lost Creek, Cave Creek and Unnamed Creek 35-9. The Class II tributaries include Morgan Coulee, Crystal Springs Coulee, Brushy Creek, Gilman Creek, Coulee Creek and several unnamed streams.

Methods

A total of 14 stations were sampled on the Rush River from upstream of the town of Centerville in St. Croix County downstream to Maiden Rock, Wisconsin. Stations were chosen based on the amount of previous survey work, the sampling history for each station and ease of access to the river. Sampling was conducted between June 15^t and Sept. 15 using one or two barge stream shockers, each with three electrodes depending on the mean stream width at the station. A miniboom electrofishing boat was used at Station 9 to sample a pool in addition to the stream barges. The length of stations was determined by multiplying the mean stream width by 35. Stations were located at 385th St. (Station 2) near Maiden Rock, the intersection of County Rd A and 385th St. (Station 5), 400th St. (Station 7), 450th St. (Station 8, Vino in the Valley), 465th Ave (Station 9), 570th Ave (Station 11), end of 425th Ave. (Station 12), 690th Ave. (Station 14, Stonehammer), 730th Ave. (Station 15, Wonderland Rd), Hwy 63 (Station 16), Hwy 29 (Station 17), County Rd Y (Station 18), and 18th Ave. (Station 19). Sampling was attempted at Station 4 but was abandoned midway through the station due to unsamplable depths and flooding. Data from this station was not used in the analysis. Only gamefish were sampled in each station due to a lack of staffing time. All trout were identified to species and measured to the nearest 10th of an inch.

Results

The Rush River supports a high-quality, high-density Brown Trout population fully supported by natural reproduction. Stocking was discontinued in 2007 because of increased natural

reproduction within the watershed. Natural reproduction and adult survival remain strong today, and densities are some of the highest within the state.

Brook Trout densities are relatively low throughout the river but are found in the highest densities in the upper and mid reaches or in proximity to small coldwater tributaries. Brown Trout densities were exceptional in 2021 while Brook Trout numbers were low and generally average compared to previous sampling events (Figures 1 & 2). Total Brown Trout densities throughout the river ranged from 200 per mile at Station 2 to 7039 per mile at Station 15 (Figure 3). For the purposes of this report, the river will be divided into three sections because of the wide range in trout densities, habitat and thermal regimes of the river. The upper river will contain the Class II section in St. Croix county and will encompass Stations 18 and 19. The middle section will contain the river from the St. Croix county line down to Highway 10 and will include Stations 7-17. The lower section will contain Highway 10 downstream to Highway 35 and include Stations 2 and 5.

Upper River-Centerville to St. Croix County Line

The upper section of the river, from the headwaters downstream to the St. Croix County line, is currently classified as Class II trout water. This classification is correct based on the survey results from the 2021 sampling. Both Brown and Brook Trout were present in this section and Brown Trout densities ranged from 272-386 total trout per mile, which ranges from the 53rd to the 62nd percentiles compared to other Driftless Area Class II streams (Figure 3). Natural reproduction was documented in Station 18 but not in Station 19. Catch rates for juvenile Brown Trout were 81 per mile at Station 18, which resulted in the 50th percentile for similar streams (Figure 4). Total adult Brown Trout per mile ranged from 272 to 306 adults per mile in these stations, which resulted in the 55th to 60th percentiles for similar streams (Figure 4). Size structure was fairly poor for these stations, especially compared to the lower sections of the river with adults larger than or equal to 12 inches at low densities of 12 to 27 per mile (40-50th percentiles for Class II Driftless Area streams; Figure 5).

Middle River- St. Croix County Line to Highway 10

The middle section of the river from the St. Croix County line downstream to Highway 10 contained the highest densities of trout compared to the rest of the river. This section is entirely Class I trout water. This classification is correct based on survey results. Total Brown Trout catch rates ranged from 1336 per mile at Station 17 to 7039 per mile at Station 15 (Figure 3). These catch rates range from the 80th to upper 95th percentiles compared to other Class I Driftless Area streams. Catch rates for all stations in this section of the river were above average over the past 20 years of surveys. Stations 9 and 17 were the only stations that exhibited below average catch rates compared to previous surveys of those stations. High amounts of natural reproduction were documented at every station and catch rates of juvenile Brown Trout ranged from 612 per mile at Station 16 to 2925 per mile at Station 15, ranging from the 87th to upper 95th percentiles for Class I streams in the Driftless region (Figure 4). Adult Brown Trout densities were also moderate to very high and catch rates ranged from 476 adults/mile at Station 17 to 4646 adults/mile at Station 14 (Figure 4). These catch rates ranged from the 50th to upper 95th percentiles for Class I Driftless region streams. In terms of size structure, catch rates of Brown Trout larger than 12 inches ranged from 63 per mile at Station 17 to 600 per mile at Station 11, resulting in a range from the 60th to upper 95th percentiles for similar streams in the region (Figure 5). However, Stations 7 and 9 contained

the highest percentages of adults larger than 12 inches at 22% and 33%, respectively (Figure 5). These stations also resulted in relatively low to moderate densities compared to other stations sampled.

Continuous trend site data from 2000 to 2021 at Stations 8, 14 and 17 allowed for the analysis of the relative abundance of Preferred (12 inches +) and Memorable (15 inches +) size Brown Trout (Figure 6 & 7). According to the 21 years of sampling at Station 8 (Vino in the Valley), a declining trend of fish larger than Preferred size is apparent with average catch rates from 2000-2008 at 866/mile and average catch rates from 2009-present at 392/mile (Figure 6). No apparent trend was present for Preferred or Memorable size fish at Station 14 no trend for Memorable size fish at Station 8 (Figure 6 & 7). Station 14 did experience a sharp increase in Memorable size trout in 2015, immediately followed by a sharp decline with densities remaining at average levels since then (Figure 7). Station 17 (Highway 29) experienced extreme declines in densities of trout in 2013-2014 and a large increase in 2015, which was mostly due to extremely high natural reproduction that year (Figure 10). Contrastingly, 2015-2017 resulted in the lowest densities of Preferred size trout at that station.

Lower River-Highway 10 to Highway 35

The lower section of the river from Highway 10 downstream to Highway 35 contained low densities of trout with a relatively high size structure and low to moderate levels of natural reproduction. Total catch rates of Brown Trout ranged from 200 to 1814 per mile, which is in the 25th and 87th percentiles for Class I streams in the Driftless region. Juvenile Brown Trout catch rates ranged from 61 to 424 (45th and 83rd percentiles) per mile. Densities of Brown Trout larger than 12 inches were low to high between the sites, with 23 and 155 per mile (37th and 87th percentiles). The percentage of adult Brown Trout larger than 12 inches within these stations resulted in 16% and 11% within the two stations.

Densities of Brook Trout throughout the river were low compared to Brown Trout densities but were relatively average for all stations sampled. Four stations exhibited Brook Trout catch rates as below average for that station compared to the past 20 years of surveys. These stations included Stations 2 and 5 in the lower river and 14 and 17 in the middle river. In the middle river, Stations 8 and 11 contained Brook Trout in abundances similar to the average within these stations for the past 20 years. Stations 9 and 15 contained Brook Trout at above average densities for that station compared to the previous 20 years of sampling. Brook Trout catch rates ranged from 25 per mile in Station 2 to 892 per mile in Station 15. These catch rates fell into the 15th to the 85th percentile for Brook Trout catch rates in Class I Driftless region streams.

Discussion

The Brown Trout population in the Rush River is a high-density population completely sustained by high rates of natural reproduction with high adult survival. Several stations exhibited catch rates higher than in any previous surveys conducted at those stations. These stations were in the middle section of the river located at 730th Ave (Wonderland Rd) downstream to 570th Ave. The middle section of the river from the St. Croix County line downstream to Highway 10 generally contains the highest quality habitat and substrates throughout the river, coupled with the best thermal regimes due to many coldwater tributaries and spring inputs. Because of these characteristics, this section of the river

commonly contains Brown Trout densities at or above the 95th percentile of Class I streams in the Driftless region and for streams across the state. The majority of catch rates of adult fish in several stations were largely composed of fish from the age-1 and age-2 year classes indicating good natural reproduction and recruitment from the past couple of years. 2020 and 2021, in particular, resulted in excellent year classes of trout. Young-of-year (YOY) were found in very high densities in 2021. This is likely due to very stable weather patterns in the spring season of those years during the egg incubation and hatching periods, leading to high hatch rates and survival of fry.

Additionally, the size structure of Brown Trout within several stations was improved from previous surveys. Densities of adult fish larger than 12 inches were highest in stations with lower overall densities. These areas were located in the downstream-most stations of the middle section (Stations 7 and 9) near 465th Ave and 400th St. The higher relative abundance of large fish at these sites is likely due to the lower densities of total Brown Trout present. Like many other fish species, trout are highly impacted by density-dependent factors, leading to higher growth rates and larger maximum sizes in areas of lower trout densities.

Additionally, the decline in Preferred (12+ inches) size trout at Station 8 (Vino in the Valley) may be due to the sustained increases in overall trout densities at this station (Figures 6 & 8). Following a spike in the number of Preferred size Brown Trout in 2006 at 1213 fish +12in/mile, densities have steadily declined and have remained in relatively low numbers since then. From 2000-2008, the average density of Preferred size Brown Trout was double the average density from 2009-2021. However, Station 8 consistently contains higher densities of Memorable size trout relative to Station 14. This may be due to the overall larger stream size because of the location within the watershed and the likely higher forage base with lower amounts of natural reproduction of trout. Densities of both Preferred size and Memorable size (15+ inches) at Station 14 (Stonehammer) and Station 17 (Highway 29) fluctuated throughout the years and appeared to be negatively related to total trout and YOY densities. When total trout densities were highest from 2015-2017, densities of Preferred size trout were lowest (Figures 6 & 9). This may indicate a lower carrying capacity for trout at Station 8 relative to Station 14, which may limit growth rates and result in fewer trout reaching large sizes. Historically, Station 17 has contained the highest average densities of Memorable size Brown Trout relative to Stations 8 and 14 (Figure 7). More recently, however, a decline in large fish has occurred at this station. Deep pool habitat has more recently filled in at this site. There has been an increase in filamentous algae and aquatic macrophytes, which may result in greater cover habitat for forage species. The single sharp increase in Memorable size trout at Station 14 in 2015 may have been due to the relatively low total trout densities and low rates of natural reproduction during the previous two years (2013-2014). This likely resulted in more resources available to already present trout and subsequently increased growth rates. A lag of 4-5 years between the years of strong natural reproduction and the increase in Preferred size fish was apparent at Stations 14 and 17.

The upper section of the Rush River within St. Croix County is currently correctly classified as a Class II stream. Natural reproduction at these sites was low to moderate, and adult densities were also low. The upstream-most site sampled was Station 19, where no Brown Trout reproduction was documented. However, there were moderate densities of Brook Trout YOY at this station, indicating good natural reproduction of Brook Trout here in conjunction with several springs in and around the station. This reach of the river is highly impacted by non-point runoff sources and poor thermal regimes directly upstream of Station 19. The

habitat upstream of Station 19 is largely composed of large slow-moving pools and runs with low gradients and very little spring influence. Beaver activity was high in the past but looks to have slowed in recent years with old dams still present and potentially impacting water quality. While the dams in this reach may influence thermal regimes, these structures may aid in slowing the downstream impacts of high runoff events coupled with high nutrient loads and non-point pollution influence further downstream. While only trout were sampled within all stations, species diversity was anecdotally much higher in this upper section due to the warmer temperature regimes as well. Two relatively small fish kills were investigated within this section of the river during the survey period. Reasons for the fish kills were unable to be documented because of late notification of dead fish and adverse weather following the observance of dead fish.

The lower section of the Rush River downstream of Highway 10 to Highway 35 is vastly different from the upstream sections in terms of habitat and thermal regimes. Mean stream widths are much wider with further input of additional tributaries and springs. Because of the greater width of the river, canopy cover plays less of a role, and summer temperatures are generally higher than in upstream sections. The gradient is also much lower, and the substrate is generally dominated by sand with large woody debris as the main form of instream habitat. The forage base is also much more abundant and diverse here, with higher numbers of cool/warmwater species present. Trout densities were lowest here compared to the other sections of the river upstream. However, densities of large fish (>12 inches) were good. Natural reproduction was adequate at Station 5 and low at Station 2. Habitat was much more degraded and less conducive for reproduction near Station 2, with a poorer thermal regime compared to Station 5. This section of the river was heavily impacted by the major flood event in June 2020. Bank erosion is extreme in most of this section leading to high amounts of instream sedimentation. Row crop agriculture is also prevalent, with farming occurring on the stream banks, further destabilizing banks.

Brook Trout were in low abundance throughout the river but were in average or above average densities compared to the past 20 years of surveys at each site within the middle section of the river. In the upper and lower sections of the river, densities were generally below average relative to previous surveys. Brook Trout were in highest abundance at Stations 7, 15 and 19. These stations were in close proximity to high-quality tributaries, including Lost Creek and Gilman Creek, which may explain the higher abundances of Brook Trout. Previous sampling of other small tributaries on the lower Rush River indicates that Brook Trout almost exclusively use these small spring-fed tributaries for spawning and nursery habitats and then migrate out of these streams and into the mainstem Rush River as young adults.

Overall, the Rush River exhibited impressive trout densities and size structure of Brown Trout during the 2021 survey. Densities were improved and higher than the most recent survey in 2019, and rates of natural reproduction were average or above average for most sites. The middle section from the St. Croix county line downstream to Highway 10 was the most productive section of the river because of its outstanding habitat and thermal regimes.

Future management should focus on improving water quality and habitat in the upper section of the river by reducing non-point pollution sources and nutrient loading. Bank stabilization is greatly needed in areas of the middle and lower sections of the river and is likely to increase with the increased frequency and intensity of large flood events. Obtaining

streambank easements throughout the river should be prioritized to further provide public fishing access and streambank protection. Lastly, in 2021 an angler creel census survey was conducted on the Rush River during the trout harvest season. This information will be used in conjunction with this survey information and stakeholder input to determine future angling and management changes appropriate for the Rush River.

Figures & Tables

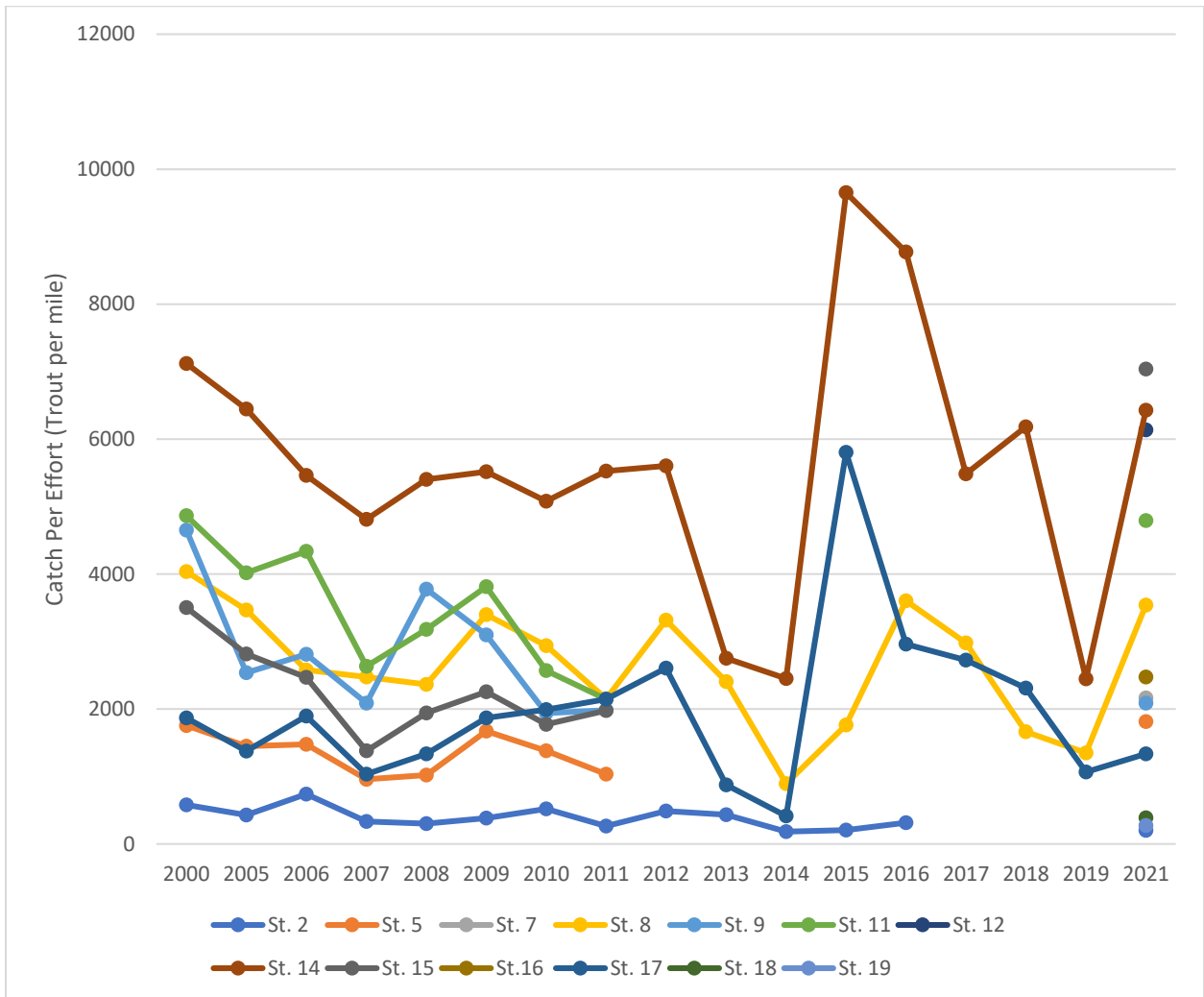


Figure 1. Catch rates of Brown Trout in 13 stations of the Rush River from 2000 to 2021.

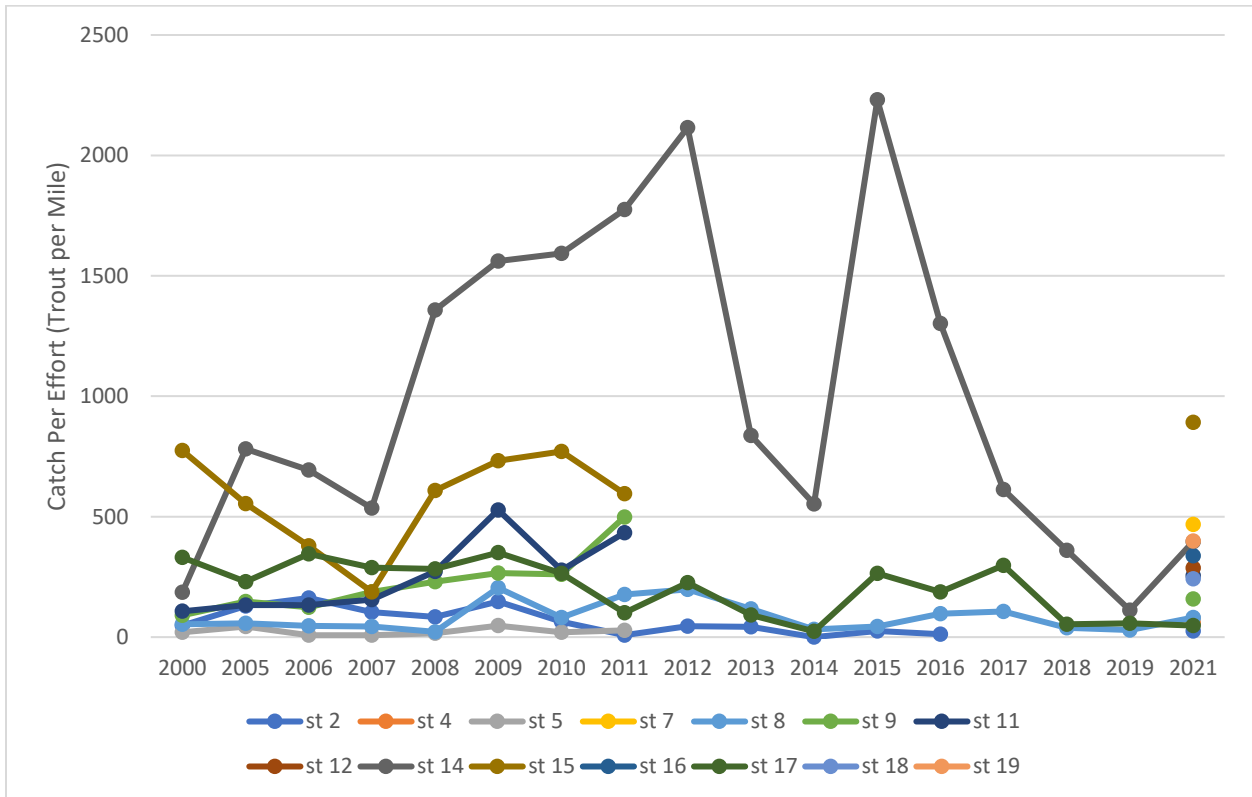


Figure 2. Catch rates of Brook Trout in 13 stations of the Rush River from 2000 to 2021.

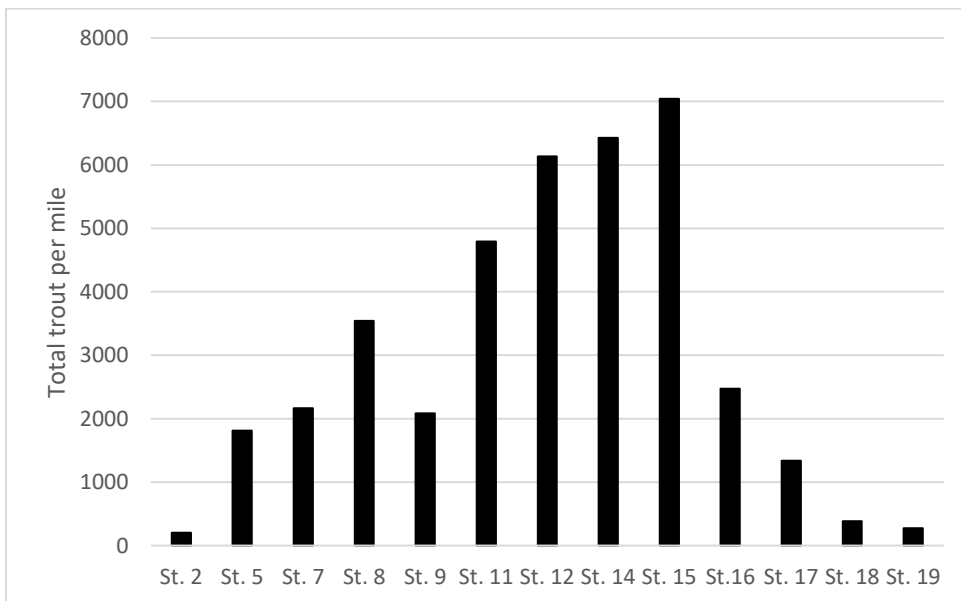


Figure 3. Catch rates of Brown Trout in 13 stations on the Rush River, summer 2021.

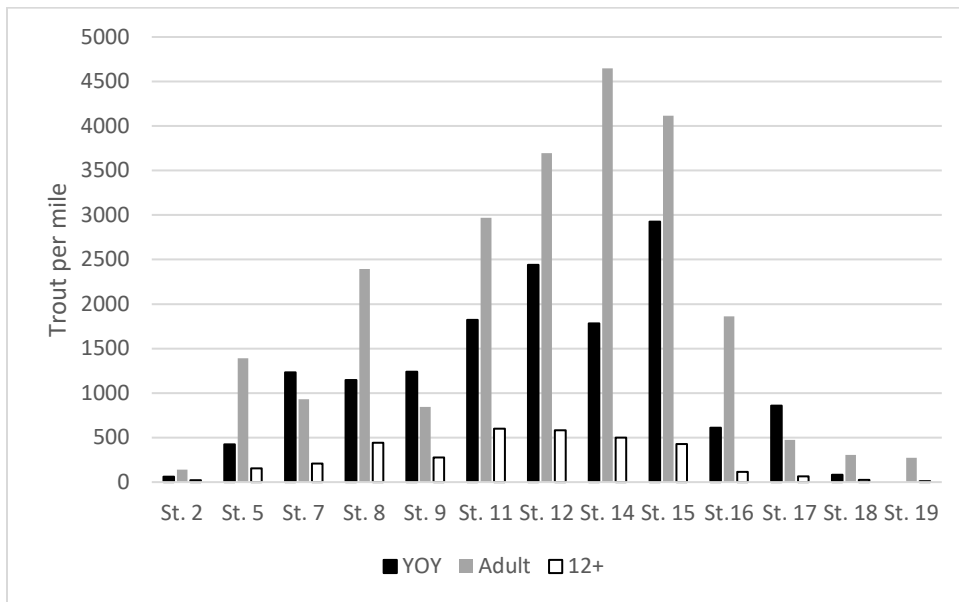


Figure 4. Catch rates of young of year (YOY), adult (>5.5 inches) and Brown Trout larger than 12 inches in 13 stations on the Rush River, summer 2021.

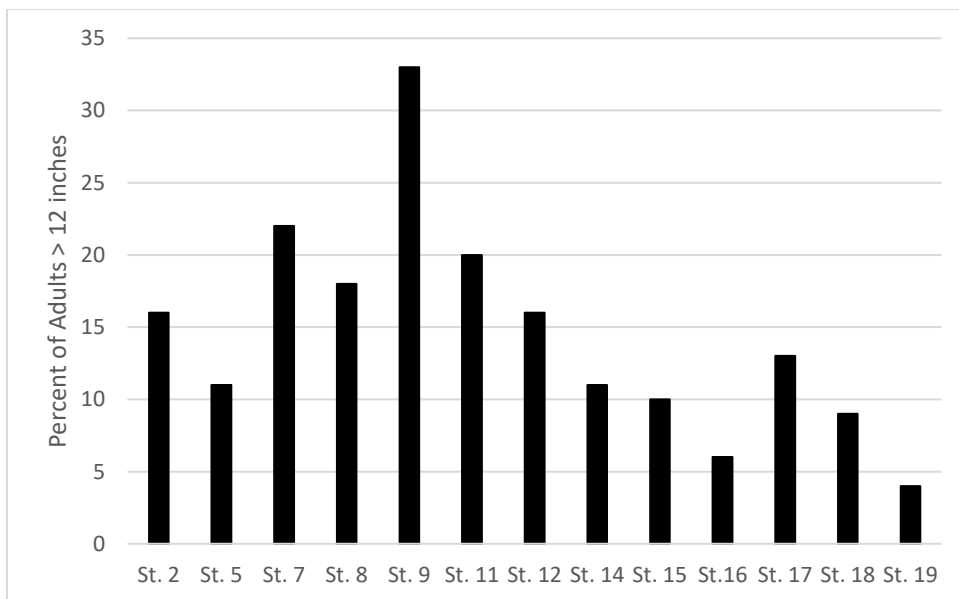


Figure 5. Percent of adult Brown Trout larger than 12 inches in 13 stations on the Rush River, summer 2021.

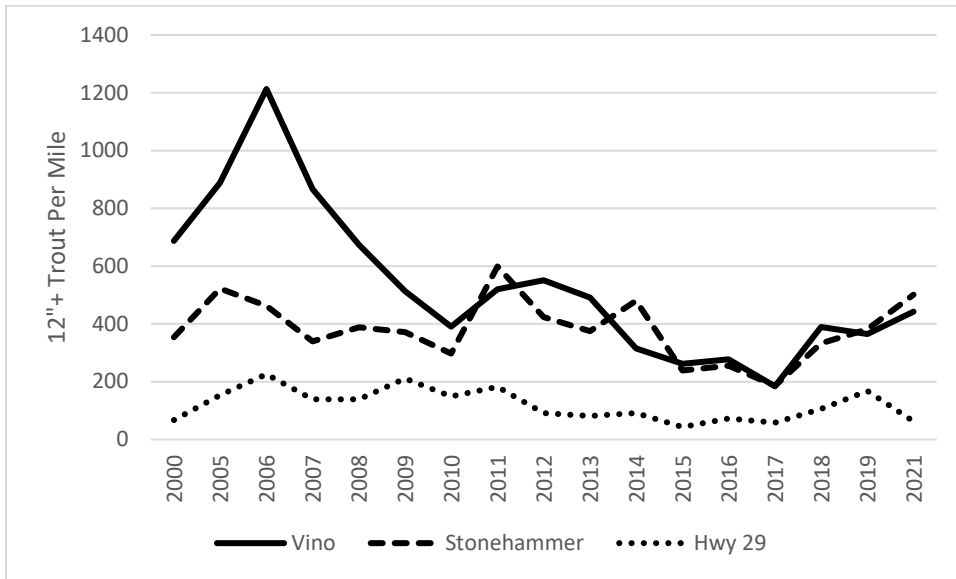


Figure 6. Catch rates of Preferred size (12 inches +) Brown Trout at Station 8 (Vino in the Valley), Station 14 (Stonehammer) and Station 17 (Highway 29) on the Rush River from 2000-2021.

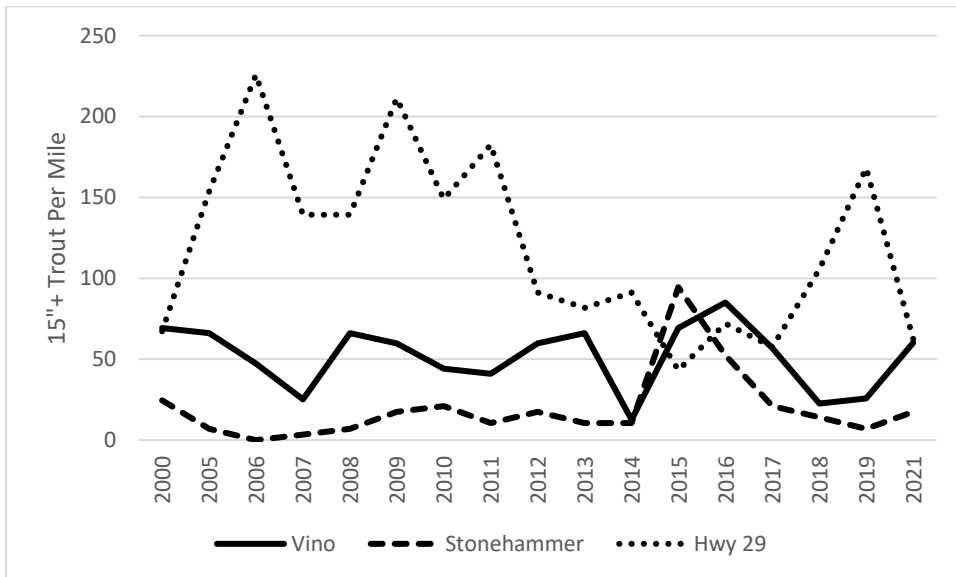


Figure 7. Catch rates of Memorable size (15 inches +) Brown Trout at Station 8 (Vino in the Valley), Station 14 (Stonehammer) and Station 17 (Highway 29) on the Rush River from 2000-2021.

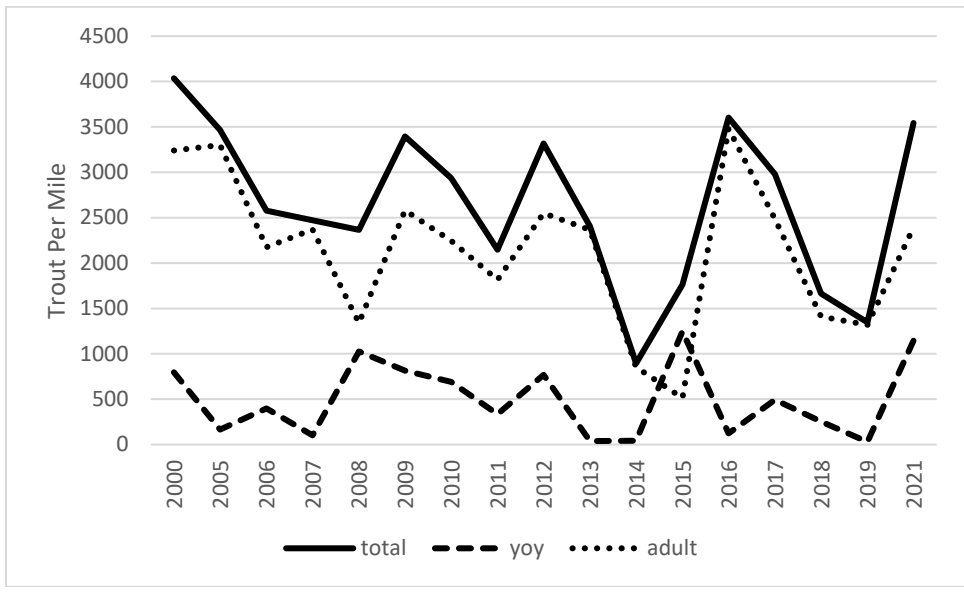


Figure 8. Catch rates of total trout, young-of-year (YOY) and adult (5.5+ inches) Brown Trout at Station 8 (Vino in the Valley) on the Rush River from 2000-2021.

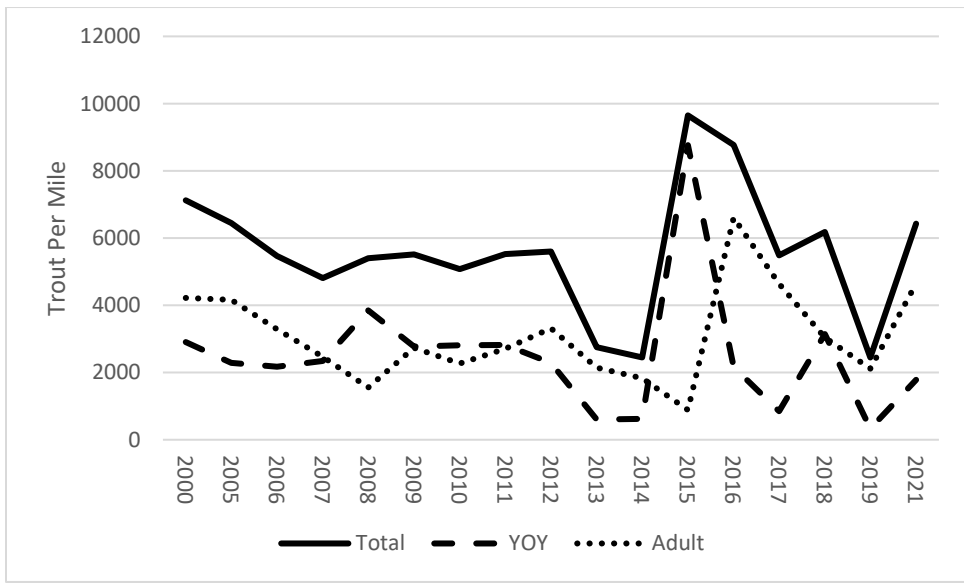


Figure 9. Catch rates of total trout, young-of-year (YOY) and adult (5.5+ inches) Brown Trout at Station 14 (Stonehammer) on the Rush River from 2000-2021.

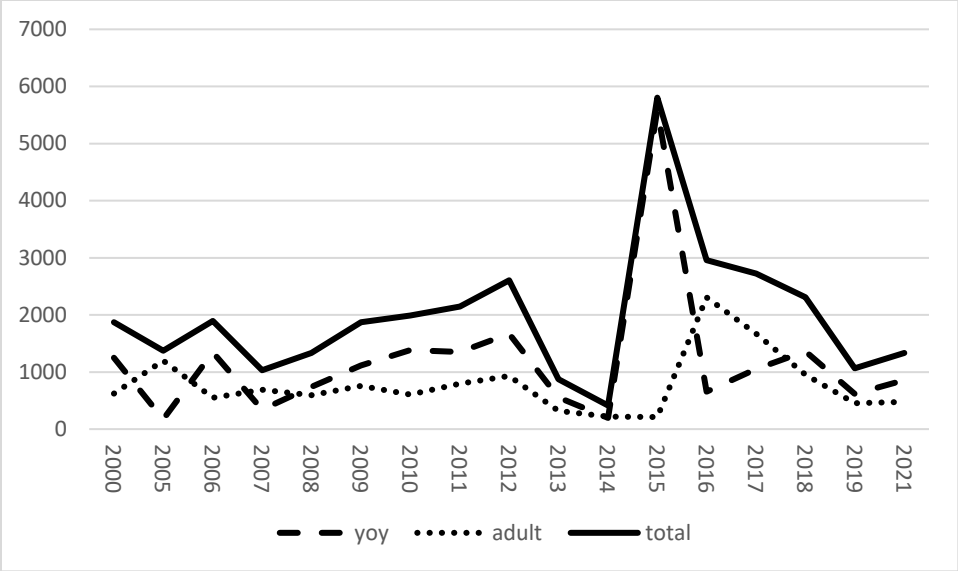


Figure 10. Catch rates of total trout, young-of-year (YOY) and adult (5.5+ inches) Brown Trout at Station 17 (Highway 29) on the Rush River from 2000-2021.

Table 1. Catch rates of Brown Trout (total fish per mile) in 13 stations of the Rush River from 2000 to 2021.

YEAR	ST. 2		ST. 5		ST. 7		ST. 8		ST. 9		ST. 11		ST. 12		ST. 14		ST. 15		ST. 16		ST. 17		ST. 18		ST. 19		
	Juv.	Adult	Juv.	Adult	Juv.	Adult	Juv.	Adult	Juv.	Adult	Juv.	Adult	Juv.	Adult	Juv.	Adult	Juv.	Adult	Juv.	Adult	Juv.	Adult	Juv.	Adult	Juv.	Adult	
2000	89	490	677	1077	.	.	797	3239	1618	3033	410	4453	.	.	2903	4219	1249	2253	.	.	1249	620	.	.	.	.
2001
2002
2003
2004
2005	43	386	75	1375	.	.	167	3298	203	2335	434	3585	.	.	2283	4163	637	2180	.	.	173	1201	.	.	.	.
2006	450	290	388	1089	.	.	400	2177	1225	1585	1845	2490	.	.	2171	3291	784	1686	.	.	1345	548	.	.	.	.
2007	51	282	135	824	.	.	104	2369	85	2002	328	2307	.	.	2342	2468	363	1017	.	.	341	692	.	.	.	.
2008	137	165	598	424	.	.	1027	1339	2767	1010	1745	1434	.	.	3845	1558	1122	819	.	.	740	596	.	.	.	.
2009	112	269	788	883	.	.	816	2580	1234	1866	1523	2290	.	.	2777	2738	931	1326	.	.	1114	754	.	.	.	.
2010	297	221	768	614	.	.	690	2246	762	1176	739	1829	.	.	2815	2265	647	1125	.	.	1384	605	.	.	.	.
2011	52	211	1034	705	.	.	334	1815	804	1176	578	1567	.	.	2819	2707	969	1010	.	.	1350	798	.	.	.	.
2012	58	429	.	.	.	.	769	2549	.	.	.	.	.	.	2290	3312	.	.	.	.	1672	932	.	.	.	.
2013	56	378	.	.	.	.	38	2366	.	.	.	.	.	.	606	2146	.	.	.	.	557	317	.	.	.	.
2014	10	173	.	.	.	.	41	854	.	.	.	.	.	.	623	1828	.	.	.	.	197	216	.	.	.	.
2015	158	48	.	.	.	.	1247	514	.	.	.	.	.	.	8764	886	.	.	.	.	5592	211	.	.	.	.
2016	31	284	.	.	.	.	123	3481	.	.	.	.	.	.	2167	6607	.	.	.	.	653	2306	.	.	.	.
2017	.	.	.	.	.	.	492	2486	.	.	.	.	.	.	847	4636	.	.	.	.	1052	1672	.	.	.	.
2018	.	.	.	.	.	.	254	1410	.	.	.	.	.	.	3144	3036	.	.	.	.	1360	951	.	.	.	.
2019	.	.	.	.	.	.	30	1318	.	.	.	.	.	.	333	2115	.	.	.	.	615	452	.	.	.	.
2020
2021	61	140	424	1390	1234	932	1146	2395	1239	846	1823	2968	2440	3694	1782	4646	2925	4114	612	1862	860	476	81	306	0	272	