2011 Pere Marquette River Angler Survey Report

Michigan Department of Natural Resources, Fisheries Division

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July 23, 2015

Introduction

The Pere Marquette River is part of the Lake Michigan watershed and is located in the west, central portion of Michigan's Lower Peninsula (Figure 1). The streams in this watershed support trout and salmon populations that include resident brown trout, as well as, migratory species that have seasonal spawning runs of adults from Lake Michigan and juvenile populations that reside in the river from six months to three years. Migratory species of trout and salmon include brown trout, rainbow trout (steelhead), Chinook salmon and coho salmon. Other species of coldwater and coolwater resident and migratory fish species in the Pere Marquette River watershed, that are commonly caught by anglers, include brook trout, common white suckers, redhorse suckers , smallmouth bass and northern pike.

The Little South Branch Pere Marquette River, Middle Branch Pere Marquette River, and Baldwin River are principal tributaries that provide coldwater fish habitat and support populations of brown trout, rainbow trout (steelhead), coho salmon and Chinook salmon (O'Neal and Wills 2010; O'Neal 2010, 2011, 2013a, 2013b). Another tributary, the Big South Branch Pere Marquette River, is a coolwater stream that supports stocked brown trout and steelhead, and has a moderate self-sustaining Chinook salmon population.

The Michigan Department of Natural Resources (MDNR), Fisheries Division conducted this survey to assess the level of angler-use, fish harvest, and fish catch on the mainstem Pere Marquette River. The survey was also designed to facilitate evaluations of different fishing regulations on the river.

Methods

The angler survey was conducted from April 1 through September 30, 2011 on 63.8 miles of the mainstem Pere Marquette River. The river was divided into two sampling segments (upper and lower) with four survey sites that corresponded to four differing fishing regulations: Site PM396- from M-37 to the Gleason's Landing Public Access Site

(PAS); Site PM397- from Gleason's Landing PAS to the Rainbow Rapids PAS; Site PM398- from the Rainbow Rapids PAS to Reek Road; and Site PM399- from Reek Road to Old US-31 (Figure 1; Table 1).

Two Michigan Department of Natural Resources creel clerks worked 40-hours per month to complete the survey using a progressive roving-access points design with a roving-progressive count method (Lockwood et al. 1999). One weekend day and two or three randomly selected weekdays were sampled each week. No holidays were sampled. Both shore anglers (including those who were wading) and anglers fishing from boats were counted and interviewed.

Two types of data were collected for each site sampled: angler interviews for fish catch and effort information, and counts of shore and boat anglers for effort. Clerks interviewed each individual angler or boat that returned to the access site during the scheduled shift. Date, time and interview site were recorded for all interviews. When the boater did not fish, that was recorded on the form as a non-fishing party and the interview was ended. When fishing occurred, anglers were queried as to their mode of fishing (i.e., boat or shore), where they fished, how long they fished, what they fished for, the numbers (by species) of fish they caught and numbers kept, and the number of fishing trips they made or intended to make that day.

Fishing effort was determined through angler and boat counts made by the creel clerk. One count of boat and shore anglers was made each survey day using either a canoe to drift the river and visually verify anglers, or using counts of cars or boat trailers (as proxies for shore or boat anglers) parked at access sites in sections of the river that couldn't be counted by canoe.

Starting points for counts and interviews along a segment were alternated daily following a randomized count and interview schedule. One ten-hour shift (6:00 am to 4:30 pm) was worked each sampling day; therefore the results of this survey are only applicable to the early morning to late afternoon period. Both sites in the upper segment (PM396 and 397) were sampled one day, and both sites in the lower segment (PM398 and 399) were sampled on the alternating day.

We calculated three measures of fishing effort: angler-hours, angler-trips and angler-days. An angler-trip is one completed fishing excursion. An angler-day is composed of one or more angler-trips during a 24-hour period. Estimates of angler effort, the number of fish harvested (caught and kept by anglers), the number of fish caught and released, and catch rates were made for boat and shore methods at each site, for each month, and all methods and sites combined (Appendices 1 – 15; Michigan Department of Natural Resources, Fisheries Division 2013). Estimates of fish released included fish that were legal (meeting minimum size regulations) and sub-legal fish. Standard mathematical formulas for creel surveys were used to calculate all estimates (Lockwood et al. 1999). Uncertainty estimates for all catch and effort estimates in this report are defined as two

standard deviations of their mean estimates (2 times the square root of the variance for an estimate).

Factors Affecting Study Results

Study design

Due to limited funding, the survey was conducted with one-half the effort that is standard for angler surveys conducted by Fisheries Division. This resulted in a lower intensity of sampling at all sites. Sampling was also restricted to one ten-hour portion of the day, rather than the entire sampling day. This resulted in an underestimate of total angler effort and catch for the daylight period from April through September. Reducing sampling effort also resulted in large standard error values associated with estimates. The reduced effort also limited the amount of interviews that could be conducted, especially during periods when angler-use was low throughout the river.

Some night fishing occurs on the river but this was not evaluated. Night fishing typically is not evaluated in Michigan creel surveys.

Fishing access

Developed public fishing access varied between the four sampling sites. PM396 had two boat launches and six shore accesses, PM397 had three boat launches and three shore accesses, PM398 had four boat launches and seven shore accesses, and PM399 had four boat launches and four shore accesses. The amount of access does not directly affect catch rates of fish, but can affect effort and total catch levels. The effects of this variable will be considered in the discussion when appropriate.

Physical characteristics of the river

High channel gradient and cold water temperatures provide the best habitat for trout and salmon in the Pere Marquette River. PM396 had the best habitat for trout and salmon with moderately high gradient (average = 5.6 feet/mile) and the coldest summer water temperatures (Figures 2 and 3; O'Neal 2013b). PM397 and PM398 had moderately good habitat with moderate gradient (average = 3.4 to 3.9 feet/mile) and moderately cold water temperatures. PM399 had poor habitat for trout and salmon due to low channel gradient (average = 1.2 feet/mile) and warm summer water temperatures. Anglers fish in PM399 primarily from fall through spring when spawning migrations of trout, salmon and suckers from Lake Michigan occur.

Seasonal distribution of migratory fish

The seasonal distribution of trout and salmon in the Pere Marquette River is different for each species of fish. Most brown trout tend to remain in the river throughout the year, although there is a small migratory spawning run from Lake Michigan that occurs from about October through December. Seasonal angler-effort and fish catch patterns are strongly influenced by the spring and fall migrations of salmon and rainbow trout in the

Pere Marquette River. Adult rainbow trout migrate from Lake Michigan into the river for spawning primarily from October through May. Juvenile rainbow trout remain in the river from one to three years before migrating to Lake Michigan. The number of rainbow trout of legal size available for harvest is low during the summer months when compared to brown trout. The estimated summer average (24 years) number of legal size (≥ 10 inches) rainbow trout was 2.3 (±0.5) per acre and brown trout was 68.4 (±19.4) per acre at a sampling location within PM396 (O'Neal 2011). Chinook salmon and coho salmon adults migrate from Lake Michigan to the river primarily from August through November. Coho salmon usually migrate into the river later in the fall than Chinook salmon and at a much lower abundance. Juvenile salmon remain in the river up to one year but do not reach the legal harvestable minimum length of 10 inches before migrating to Lake Michigan. Since this study was conducted from April through September, only a portion of the migratory salmon and rainbow trout adult spawning runs were sampled.

Fishing regulations

Fishing regulations are another factor that directly affects the harvest of fish in the mainstem Pere Marquette River. During 2011, fishing regulations were most restrictive at PM396, PM397 had the second most restrictive regulations (first enacted in 2011), followed by PM399 and then PM398 (Table 2).

Results

Fishing effort

Total fishing effort across all sites was estimated at 184,263 angler-hours, 50,921 angler-trips, and 38,191 angler-days (Figure 4; Table 3). There were 1.33 angler-trips per angler-day estimated for the Pere Marquette River in this study.

The largest amount of total effort was expended at PM398 (Rainbow Rapids to Reek Road), followed by PM396 (M-37 to Gleason's Landing), then PM397 (Gleason's Landing to Rainbow Rapids) and then PM399 (Reek Road to Old U.S.-31; Table 3). At all sites, fishing effort was greatest in September (81% of total effort; Figure 5). The number of angler-trips per day was low from May through August, ranging from 33 to 78 for the entire 63.8 miles of river (Appendix 15). Shore and wading fishing accounted for 88% of total effort (Table 3).

Fish harvested

A total of 13,157 fish were harvested (Appendix 15). Trout and salmon accounted for 79% (10,453) of total fish harvest (Table 3). The most abundant species of fish harvested at all sites combined was Chinook salmon (9,862 fish, 75% of total harvest), followed by common white sucker (2,648 fish, 20.1% of total harvest), brown trout (393 fish, 3% of total harvest), rainbow trout (198 fish, 1.5% of total harvest), and Redhorse suckers (0.4% of total fish harvest; Appendix 15). The number of fish harvested per hour of fishing was greatest at PM399, followed by PM398, PM397 and PM396 (Table 3). The

number of trout and salmon harvested, and the number harvested per mile of river, were highest at PM398, followed by PM399, PM397 and PM396 (Figure 6; Table 3). Brown trout and rainbow trout harvests were only documented from PM397 and PM398. Ninety percent of Chinook salmons were harvested from PM398 and PM399 (Table 3).

Fish caught and released

The estimated number of fish caught and released was greatest for Chinook salmon, followed by brown trout, rainbow trout, brook trout, northern pike, smallmouth bass and redhorse suckers (Appendix 15). The number of trout and salmon released, and released per river mile, was greatest at PM396, followed by PM398, PM397 and PM399 (Figure 6; Table 3). Seasonally, the number of trout and salmon released was high in April, greatest in September, and similar during the remaining months.

Total fish catch

The estimated total catch (harvest and release) of Chinook salmon was substantially greater than other trout and salmon species in the Pere Marquette River (Figure 7; Table 3). The total catch of Chinook salmon was low from April through August and highest in September. Rainbow trout total catch exhibited small peaks in April and September. The total catch per hour of fishing for trout and salmon was greatest in PM396, followed by PM398, PM399, and PM397 (Table 3).

Discussion

The total catch and harvest of Chinook salmon was much greater than brown trout and rainbow trout, from April through September 2011. During 2011, 70% of anglers targeted salmon compared to 30% targeting trout, based on angler interviews. Kruger et al. (1983) conducted an angler survey in PM396 and PM397, from April 1982 through March 1983 (Table 1). They found that Chinook salmon accounted for 59% of April through September harvest and 75% of total annual harvest (Figures 8 and 9). They also found that rainbow trout harvest accounted for 27% of April – September harvest and 19% of annual harvest, and brown trout accounted for 14% of April – September harvest and 6% of annual harvest. Chinook salmon harvest in 2011 accounted for a larger portion of total fish harvest (75%) during April through September than occurred in 1982-83.

Rainbow trout accounted for a smaller portion of total fish harvest than brown trout during 2011. Few legal size rainbow trout are available for harvest in the river during the summer period, while legal size brown trout are abundant. Most (73%) of the total rainbow trout catch occurred in April and September, and nearly all of the harvest occurred in April during the adult spawning run. During April 2011, 56% of the rainbow trout caught in PM397 (bag limit = 1) and 44% of the rainbow trout in PM398 (bag limit = 3) were released. This indicates some voluntary catch and release of adult rainbow trout may have occurred at both sites.

The absence of coho salmon in the catch probably resulted from their later fall migration period that occurred outside of the 2011 sample period. Both the 1982-1983 and 2011 surveys indicate Lake Michigan migratory species are the primary fish targeted by anglers in the Pere Marquette River.

During 2011, 81% of total fishing effort at all sites occurred in September and effort was low during other months. Kruger et al (1983) found that the greatest portion of angler-effort was expended during September (51%) for the period from April through September 1982. Other months with significant fishing effort during 1982 were October, March and April (Figure 10). Both the 1982-1983 and 2011 surveys indicate most fishing effort on the Pere Marquette River occurs from September through April and coincides with the Lake Michigan migratory spawning runs of adult trout and salmon, especially Chinook salmon and rainbow trout.

The number of angler-hours per mile expended at PM396 was 2.4 times greater in 2011 than in 1982, from April through September (Table 4). The number of angler-hours/mile expended at PM397 was 2.9 times greater in 2011 compared to 1982 (Table 4). As a result of the partial day (10 hour) sampling in 2011, total angler-effort and catch for the period from April through September was underestimated. Thus, the increase in angler-effort between 1982 and 2011 is greater than indicated in Table 4 because the 1982 estimates included the entire daylight period.

The angler effort estimates from this study indicate the annual value of the Pere Marquette River fishery to the local economy, for the six month period in 2011, was $1.5 million based on a value of $39/angler-day (U.S. Department of the Interior 2011). Angler-use on Michigan streams with migratory trout and salmon spawning runs from Great Lakes waters is very high. The average number of angler-trips per mile on seven of these streams was 3,596 (range of 725/mi to 8,131/mile) for sample periods of eight to twelve months (Table 5). For the period from April through September, the Muskegon River had average angler-trip per mile estimates of 1,162 (range 453 – 2,746) and the Manistee River had average angler-trip per mile estimates of 2,348 (range = 979 – 3,352; Table 5). From April through September, the Pere Marquette River had an average of 798 angler-trips per mile for the entire stream in 2011, with a range of 310 to 2,101 trips per mile in the four study sections (Table 3). This level of effort only included a 10-hour period of each day, so estimated annual angler-use was lower than actual in 2011. The lower segments of all three of these streams had the lowest amount of angler effort (Muskegon River - Site 152, Manistee River – Site 341, Pere Marquette River – Site PM399). This is the result of the higher quality trout and salmon habitat (water temperatures and substrate) that is located in the upper sections these streams.

Inland trout streams in Michigan have an average number of angler-trips per mile of 519, and most are open to fishing about five months a year (Table 6). The importance of

fisheries in Michigan streams with migratory Great Lakes steelhead and salmon runs is demonstrated by the greater levels of angler-use.

Shore and wading fishing accounted for 88% of total fishing effort in 2011. Kruger et al. (1983) found that shore fishing accounted for 99% of angler-effort from April through September and 97% of annual effort. Increasing the amount of public shore access could increase fishing effort on the Pere Marquette River.

The estimated number of total angler-hours per river mile was greatest at PM396 during 2011. Kruger et al. (1983) also found that PM396 had a greater number of angler-hours per mile expended than PM397, from April through September 1982 (Table 4). The higher level of angling effort expended at this site was likely related to the better spawning habitat and public access it contains, but publicity related to PM396 from businesses may also be a factor.

The harvest of trout and salmon was low throughout the river (Table 3). Even at site 398, with the most liberal harvest regulations, only 8.4% of brown trout caught were harvested, and the percentage of caught fish that were harvested was low for rainbow trout at 9.7 %, and moderate for Chinook salmon at 43.1%. As discussed earlier, the low number of rainbow trout harvested may have resulted from the low abundance of legal fish present in the river during the study period. Harvest of trout and salmon at PM396 was low as a result of the fishing regulations similar to no-kill during 2011 (Table 3). PM399 had the second highest total harvest of fish. However, harvest at this site was composed entirely of migratory Chinook salmon, and this is the only site where the harvest of any species exceeded the number of released fish (Table 3).

During 2011, fish harvest and harvest per mile was greater at PM398 than PM397, especially for Chinook salmon, but also for rainbow trout and brown trout. PM397 had more restrictive harvest regulations for brown trout and rainbow trout than PM398. The total catch/hour of brown trout was slightly higher (1.1) at PM397 than PM398, but harvest per hour was 2.1 times greater at PM398 (Table 3). This information indicates the more restrictive fishing regulations at PM397 reduced the harvest of brown trout. The total catch per hour of rainbow trout was slightly higher (1.3) at PM397 than PM398, and harvest per hour was 1.2 times greater. This may indicate that rainbow trout harvest was unaffected by the more restrictive regulation in PM397, but it may also be a function of the low abundance of legal rainbow trout in the river during the study period and differences in habitat.

Chinook salmon harvest regulations were the same at PM397 and PM398 during September when most were harvested (Table 2). The total catch per hour of Chinook salmon was 2.3 times higher at PM398 than at PM397, and harvest per hour was 2.7 times higher at PM398 (Table 3). This may indicate Chinook salmon densities were higher at PM398 than PM397.

Fishing regulations in 1982 were more restrictive at PM396 than at PM397 (Table 2). Kruger et al. (1983) found that PM396 had lower harvest per hour rates for both brown trout and rainbow trout from April through September, that were likely related to more restrictive regulations (Table 4). Annual harvest per hour rates for brown trout and rainbow trout were also higher at PM397 in 1982-83.

Chinook salmon harvest per hour was slightly higher at PM396 than at PM397, from April through September 1982 (Table 4). Annual harvest per hour of Chinook salmon was also higher at PM396 than at PM397, with the greatest harvest occurring in October. The overall higher level of angler-effort, total harvest, and harvest per hour of trout and salmon at PM396 during 1982, was attributed to the much higher concentrations of Chinook salmon on the spawning grounds at this site, and the much higher contribution of Chinook salmon to total harvest, even though fishing regulations were more restrictive than at PM397 (Kruger et al. 1983).

Fishing regulations at both PM396 and PM397 were less restrictive in 1982 when compared to 2011 (Table 2). Harvest per hour rates at PM396 in 2011 were much lower than in 1982 due to the nearly no-kill regulation present in 2011 (Table 4). The number of fish harvested per hour at PM397 averaged 3.6 times higher in 1982 than in 2011 (rainbow trout – 23 times higher, brown trout 15 times higher, Chinook salmon – 1.5 times higher). The lower harvest/hour rates in 2011 were likely the result of more restrictive regulations, but differences in spawning run size and timing for Chinook salmon and rainbow trout between years may also be factors. The harvest per hour rates should be comparable between 1982 and 2011, unless there was a difference in harvest rates between morning and evening periods in 1982.

Fish population characteristics relative to fishing regulations

Trout and salmon fishing regulations in Michigan are generally designed to protect the biological integrity of fish populations and to allow anglers a reasonable amount of fish harvest. Fishing regulations that are more restrictive are employed when it is necessary to protect the biological integrity of the fish population, such as, reducing the harvest of adult spawning fish to insure there is adequate natural reproduction to sustain the population. Restrictive fishing regulations that are not necessary to protect the biologically integrity of trout and salmon populations have also been used to increase or maintain high population abundance or the size structure of the fish population, in exchange for a reduction in fish harvest. In these types of scenarios, anglers would expect to get greater catch rates of fish resulting from higher fish abundance or have the opportunity to catch greater numbers of large fish. These types of social regulations are acceptable within Fisheries Division's 2013 – 2017 Strategic Plan that includes the goal of providing diverse fishing opportunities for Michigan anglers. There should be a reasonable expectation that the fishing regulation change will improve the quality of the fishery or fish community, and not be detrimental (e.g., decreased effort or harvest with no compensatory benefit), similar to the management requirements for fish stocking in Michigan (Dexter and O'Neal 2004).

PM396 has had restrictive fishing regulations since 1970 (Table 7). These regulations gradually became more restrictive over time, with principal changes occurring in 1990 and 2000, when all fish harvest was eliminated. In 2011, regulations were slightly relaxed in PM396 to allow children under 12 years old to keep one fish, from 8-12 inches (Table 2). But this minor modification was little different than the no-kill regulation. Twenty-four years of trout and salmon population estimates were collected at one station located within PM396 during a 38-year period from 1973 through 2010 (O'Neal 2011). This information can be used to help assess the effects of the restrictive fishing regulations on the fish populations.

Total (all species combined) trout and salmon biomass varied during this period but trends were not evident (Figure 11). Densities of age-1 rainbow trout and age-1 brown trout also displayed no trends during the 38 year sampling period (Figure 12). The levels of age-1 fish varied between years, with some years having elevated densities, but overall they were fairly consistent related to the increasing restrictions on fish harvest. Current abundances of age-1 rainbow trout and brown trout were within normal levels found historically at this site. Some brown trout stocking in this river section, prior to 2000, may have contributed to the age-1 estimates. Recently, some anglers on the Pere Marquette River have expressed concern regarding perceived lower numbers of adult rainbow trout during the spawning run. If adult abundance has declined, there is no indication that natural recruitment has declined or caused this decline. Adult rainbow trout abundance may be lower throughout the Lake Michigan basin.

The minimum size limit for harvest of brown trout in PM396 was 10 inches from 1970 through 1989. Beginning in 1990, only one fish larger than 16 inches could be harvested, then in 2000 all brown trout harvest was eliminated (Table 7). The intent of increasing the harvestable size of brown trout and eventually eliminating harvest was to increase population abundance and increase the numbers of large fish in the population. The abundance of ≥ 10 inch brown trout appeared to decline somewhat during the 1980s and then slowly increased to levels nearly equal to those found in the 1970s and early 1980s (Figure 13). There was no positive trend in ≥ 10 inch brown trout over the 38 year sample period. There was also no positive trend in the abundance of brown trout ≥ 16 inches (Figure 13).

The minimum harvest size of brown trout on most Michigan streams with standard fishing regulations is eight inches and fish ≥ 13 inches are considered a quality catch. The densities of ≥ 8 inch and ≥ 13 inch brown trout in the Pere Marquette River also did not display obvious long term positive trends (Figures 14 and 15). The total biomass of brown trout displays a similar pattern (Figure 16). This pattern does not indicate any specific trend given that biomass levels were high in the early years, then decreased after gear restrictions were implemented, and then increased over a 20-year period to levels similar to the 1970s and early 1980s.

Total brown trout biomass, and brown trout ≥ 8 inch and ≥ 13 inch were compared to other high quality coldwater streams in Michigan with standard fishing regulations (Figure 14-16). In comparison to these other streams without restrictive regulations, the Pere Marquette River does not appear to have substantially higher brown trout biomass or better population size structure. The Pere Marquette River was about average when compared to streams with standard regulations.

Total trout and salmon biomass (Figure 11) does not display as much (or any) of a depression in the mid-1980s to mid-1990s as brown trout biomass (Figure 16). This indicates that annual variations in factors like inter-species competition and various habitat components (e.g., water temperatures, flooding, and stream channel structure) are important in regulating trout and salmon populations in the Pere Marquette River. Densities of trout and salmon are very high in the Pere Marquette River and competition between species is likely significant (O'Neal 2011). Annual variations in stream flows (Zorn and Nuhfer 2007) and water temperatures (Zorn et al. 2009) have been shown to affect fish population abundance in Michigan streams. Brown trout biomass in the Little South Branch Pere Marquette River was above average in 2011 (since the 1980s) at three of four sampling sites (O'Neal 2013a). Bigelow Creek also had higher brown trout biomass in 2011-2012 compared to 2005-2007. The higher biomass levels in other streams indicate that regional factors may be important to the relatively high recent population levels of brown trout.

The current fishing restrictions on harvest of migratory rainbow trout, Chinook salmon and coho salmon in the Pere Marquette River are inconsistent with statewide management of Lake Michigan migratory trout and salmon. Fishing regulations for these species in the Pere Marquette River are more restrictive than other streams in the Lake Michigan basin. Current Lake Michigan management of these species has been directed toward reduced population levels as a result of low forage fish levels in Lake Michigan. The Lake Michigan basin-wide allowable harvest of these species has increased and stocking has decreased in recent years.

The long term stability of trout and salmon natural reproduction in the Pere Marquette River watershed is also affected by the tributary streams. Significant natural reproduction of brown trout, rainbow trout, coho salmon and Chinook salmon occurs in the tributary streams including the Middle Branch Pere Marquette River, the Little South Branch Pere Marquette River, the Baldwin River, the Big South Branch Pere Marquette River and numerous smaller tributaries (O'Neal 2010; O'Neal 2013a; O'Neal 2013b). Increasing harvest of trout and salmon in the Pere Marquette River is unlikely to affect overall recruitment of juveniles.

Conclusions and Recommendations

Management of the Pere Marquette River fishery requires consideration of a number of factors including the life history of the ecologically and recreationally important fish that inhabit the system, and the physical habitat characteristics and their variability for the entire Pere Marquette River watershed and Lake Michigan. These considerations guide the management recommendations presented below.

1. Angler-use of the Pere Marquette River is high, like many other Michigan streams with Great Lakes migratory trout and salmon populations. The fishery provides substantial economic benefits to the local economy. Most fishing effort occurs during the fall and spring seasons for migratory Chinook salmon and rainbow trout. Fishing effort during May through August is low. Most fishing occurs from shore rather than boat. Angler access may be limited in some sections of the river.

   Recommendation: A summary of existing access sites and plans for potential additional public access should be developed. New potential access locations should be prioritized and shore fishing access should have the highest priority.

   This recommendation is consistent with Goal 2, Objective 2 of Fisheries Division's Strategic Plan that targets improving public fishing access.

2. The Chinook salmon was by far the most important species of fish caught and harvested by anglers in 2011 and 1982, from April through September. Chinook salmon also dominated the annual harvest of fish during 1982-83, followed by rainbow trout and then brown trout. Very few rainbow and brown trout were harvested during 2011. Nearly all of the rainbow trout were harvested during the April spawning migration. Very few brown trout were harvested and nearly all of these were in the river section with a 10 inch minimum size limit. Very few brown trout were harvested considering their abundance in the river (stocked and naturally reproduced). The highest catch of brown trout was in PM396 where brown trout were not stocked.

   Recommendation: Brown trout stocking in the Pere Marquette River should be evaluated to determine if the management practice is appropriate. Brown trout catch and harvest is very low. Fishing effort is low in all sections of the river during the harvest season for brown trout. Stocked brown trout may be migrating into the upper portion of the river where fish competition is already very high, and this may affect natural reproduction. More information on brown trout densities downstream of PM396 is needed, and Fisheries Division surveys are planned for the near future.

This recommendation is consistent with Goal 1, Objective 2 of Fisheries Division's Strategic Plan that targets protection of naturally sustaining fish populations and appropriate management using stocked fish.

3. Restrictive fishing regulations in the Pere Marquette River have reduced the harvest of trout and salmon, based on comparisons between sites in 2011 and comparisons between 2011 and 1982. The harvest levels of trout and salmon are low to moderate in all sections of the river where harvest is allowed.

   Long term (38 year) fish population data within PM396 indicate increasingly restrictive fishing regulations have not improved overall trout and salmon biomass, natural recruitment of rainbow trout and brown trout, or the size structure and biomass of the brown trout population. Multiple characteristics of the fish population were similar under the current no-kill regulation when compared to the 1970s and early 1980s when there was a five fish harvest limit.

   When compared to other Michigan high quality coldwater streams with standard fishing regulations, brown trout population characteristics in the Pere Marquette River were average. The expected management objective of higher brown trout densities and greater numbers of large fish, in exchange for reduced harvest, has not been achieved with restrictive fishing regulations on the Pere Marquette River.

   The current fishing restrictions on the harvest of migratory rainbow trout, Chinook salmon, and coho salmon in the Pere Marquette River are inconsistent with statewide management of Lake Michigan migratory trout and salmon. Migratory species should be managed similarly throughout the Lake Michigan basin. Mortality rates on spawning salmon are 100% and are also high for rainbow trout.

   Recommendation: Fishing regulations commonly used for streams with Lake Michigan migratory trout and salmon should be implemented throughout the Pere Marquette River.

   PM399 presently has Type-3 fishing regulations that are designed to allow harvest of Great Lakes migratory trout and salmon in stream segments that do not have resident trout and salmon populations. This regulation is appropriate and should be retained.

   PM398 presently has Type-4 fishing regulations that are designed to allow harvest of migratory trout and salmon all year, and protect resident brown and brook trout populations during September through April. This regulation is appropriate and should be retained.

PM396 and PM397 have restrictive fishing regulations for both Lake Michigan migratory trout and salmon and resident brown trout. The Type-4 regulation would be appropriate for these two river sections.

These recommendations are consistent with the following Fisheries Division Strategic Plan Goals:
Goal 1, Objectives 2 - that recommends conserving and managing aquatic species and habitats.
Goal 2, Objective 3 - that recommends increasing participation and interest in fishing among all demographic groups.
Goal 3, Objective 3 - that recommends increasing angler recruitment and retention.
Goal 4, Objective 3 - that recommends the evaluation of fisheries management actions.

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Brian Gunderman, Editor
Todd Wills, Editor

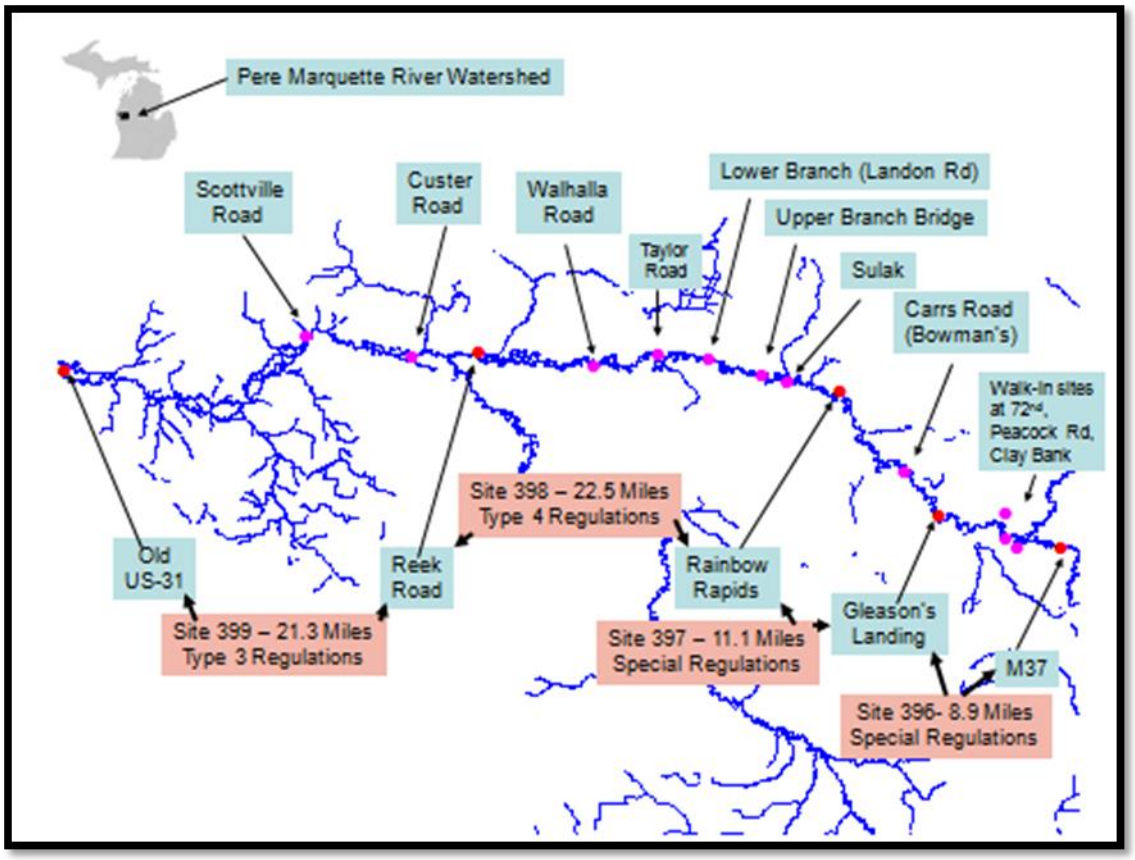

Figure 1. Angler survey sampling sites used on the Pere Marquette River, from April − September 2011.

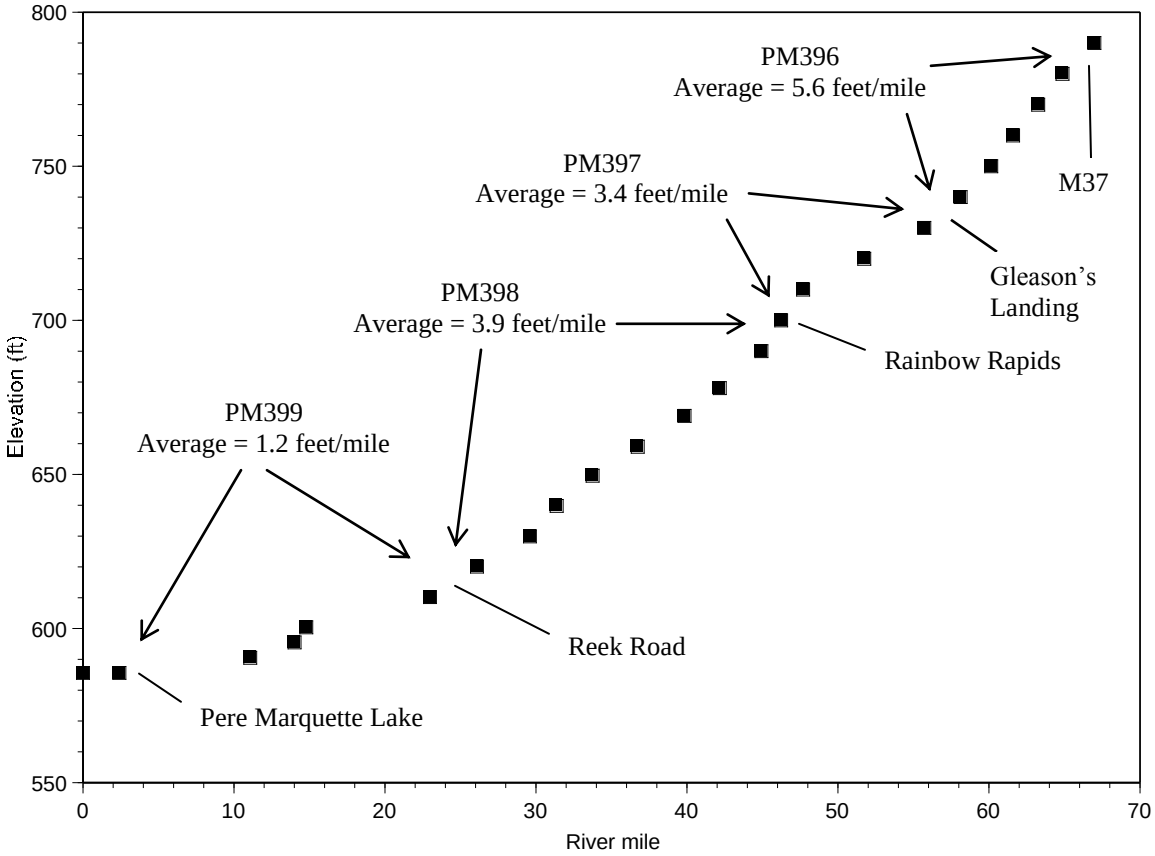

Figure 2. Gradient profile of the Pere Marquette River. Data from O'Neal (2013b).

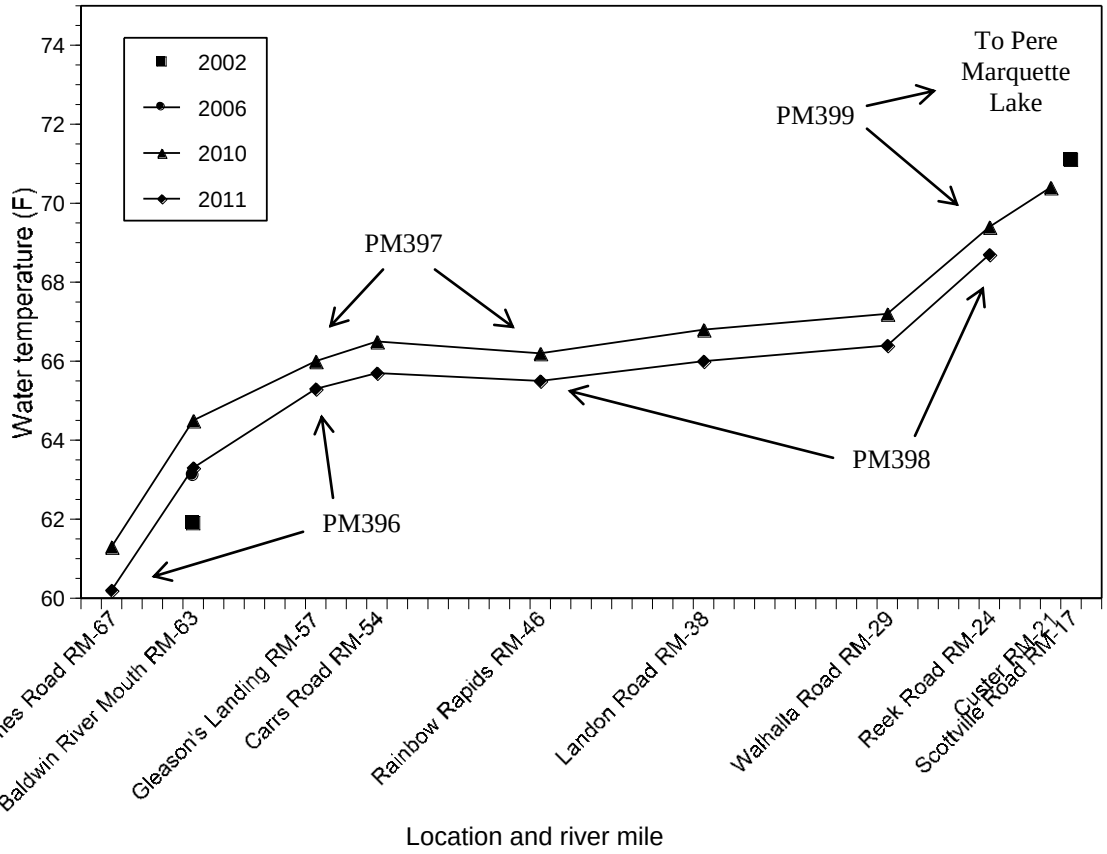

Figure 3. Mean July water temperatures measured in the Pere Marquette River. Confidence intervals have been omitted for clarity. The X-axis scale is in river miles (RM). Data compiled from O'Neal (2013b).

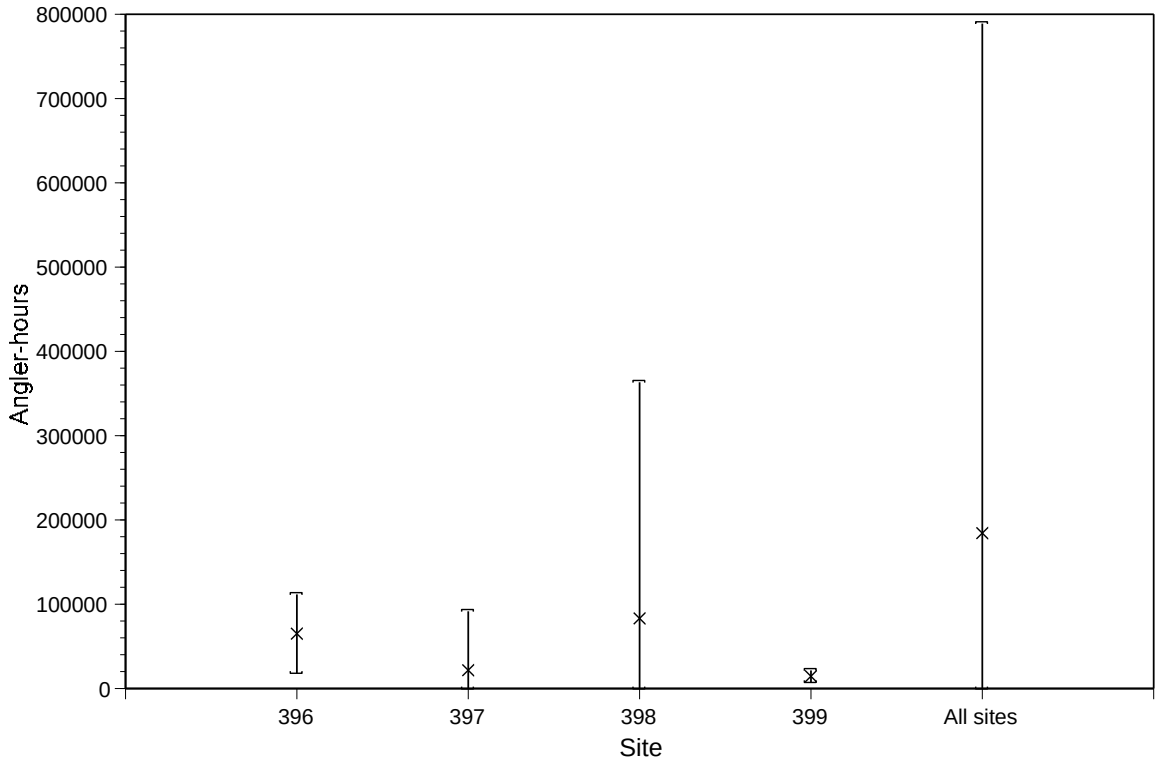

Figure 4. Estimated angling effort expended on the Pere Marquette River, from April − September 2011. The error bars represent the 95% confidence intervals, with a minimum possible value of zero for the lower interval.

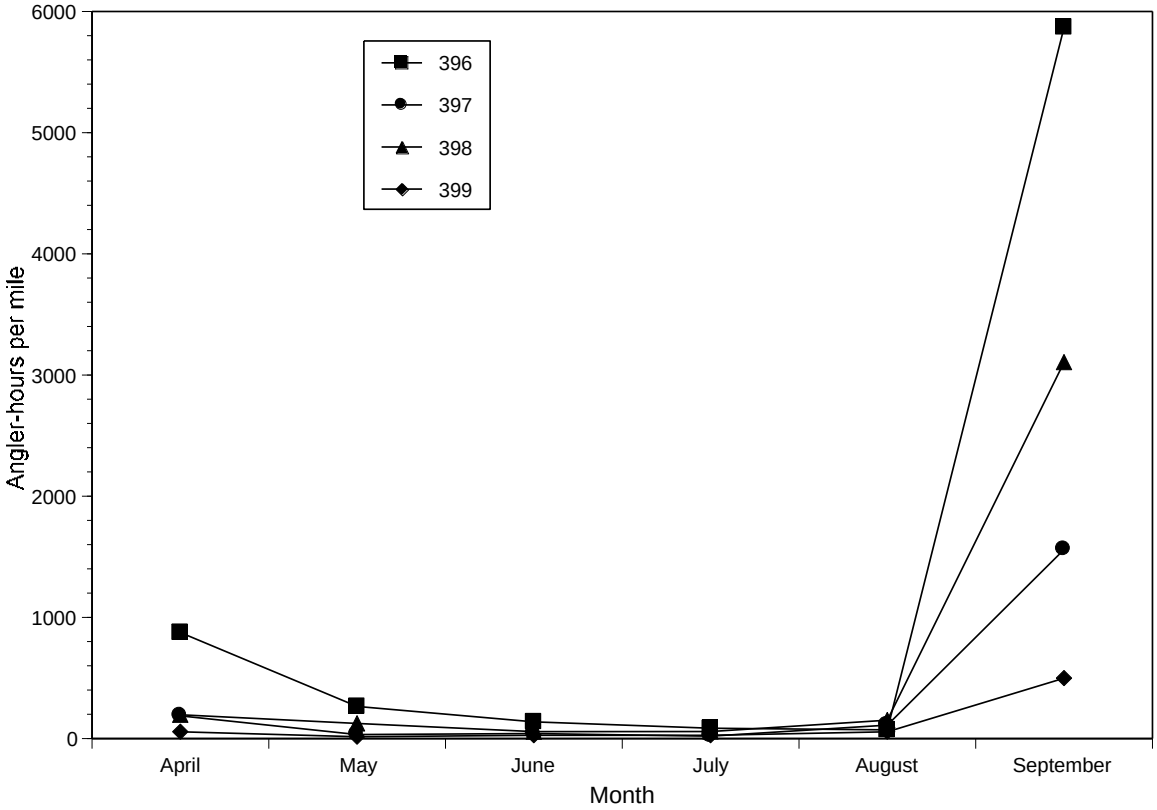

Figure 5. Estimated angling effort at four sampling sites on the Pere Marquette River, from April − September 2011. Confidence intervals have been omitted for clarity.

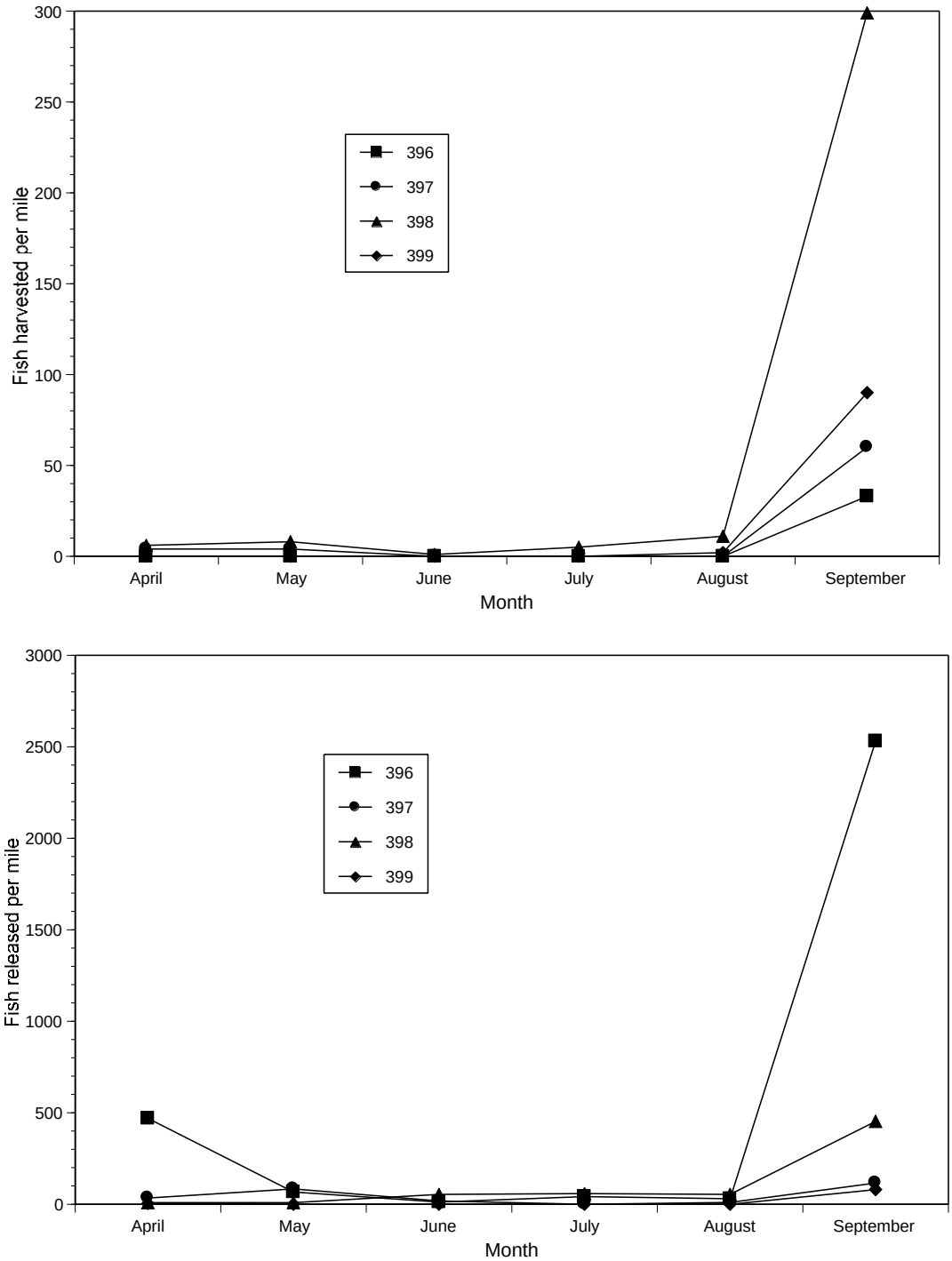

Figure 6. Estimated harvest rate (upper graph) and release rate (lower graph) of rainbow trout, brown trout, and Chinook salmon at four sampling sites on the Pere Marquette River, from April − September 2011. Confidence intervals have been omitted for clarity.

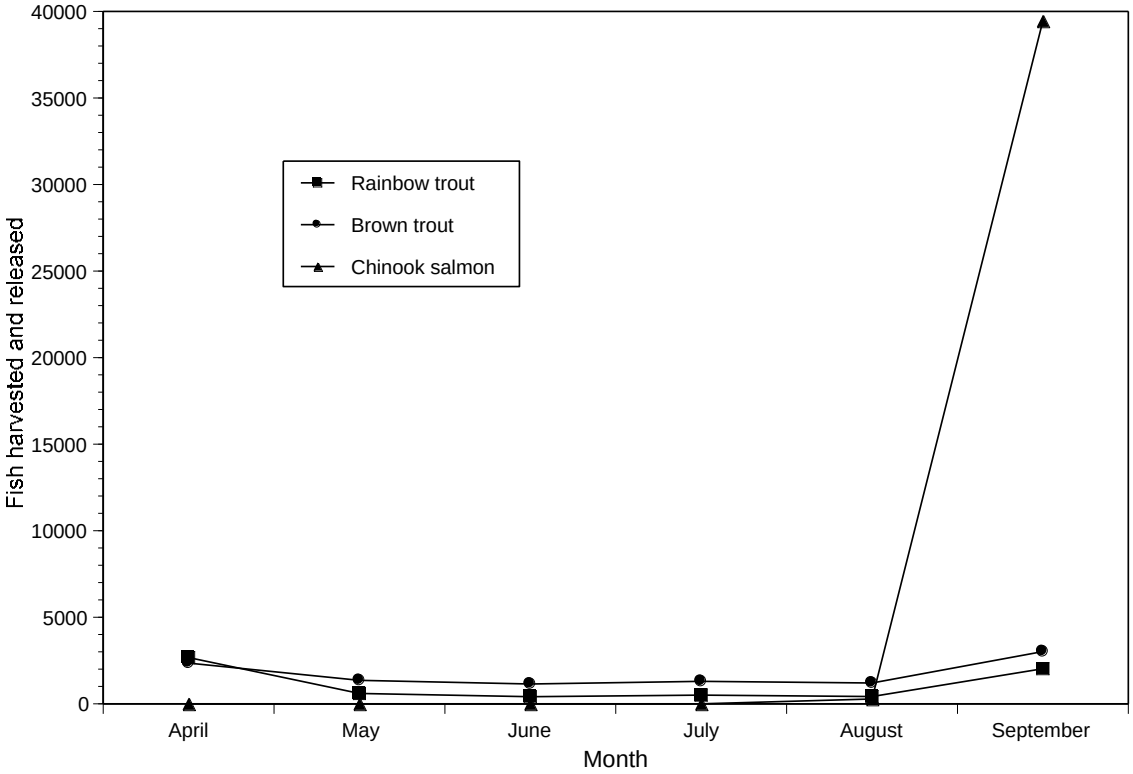

Figure 7. Estimated total catch (harvested and released) of rainbow trout, brown trout, and Chinook salmon at four sites on the Pere Marquette River, from April − September 2011. Confidence intervals have been omitted for clarity.

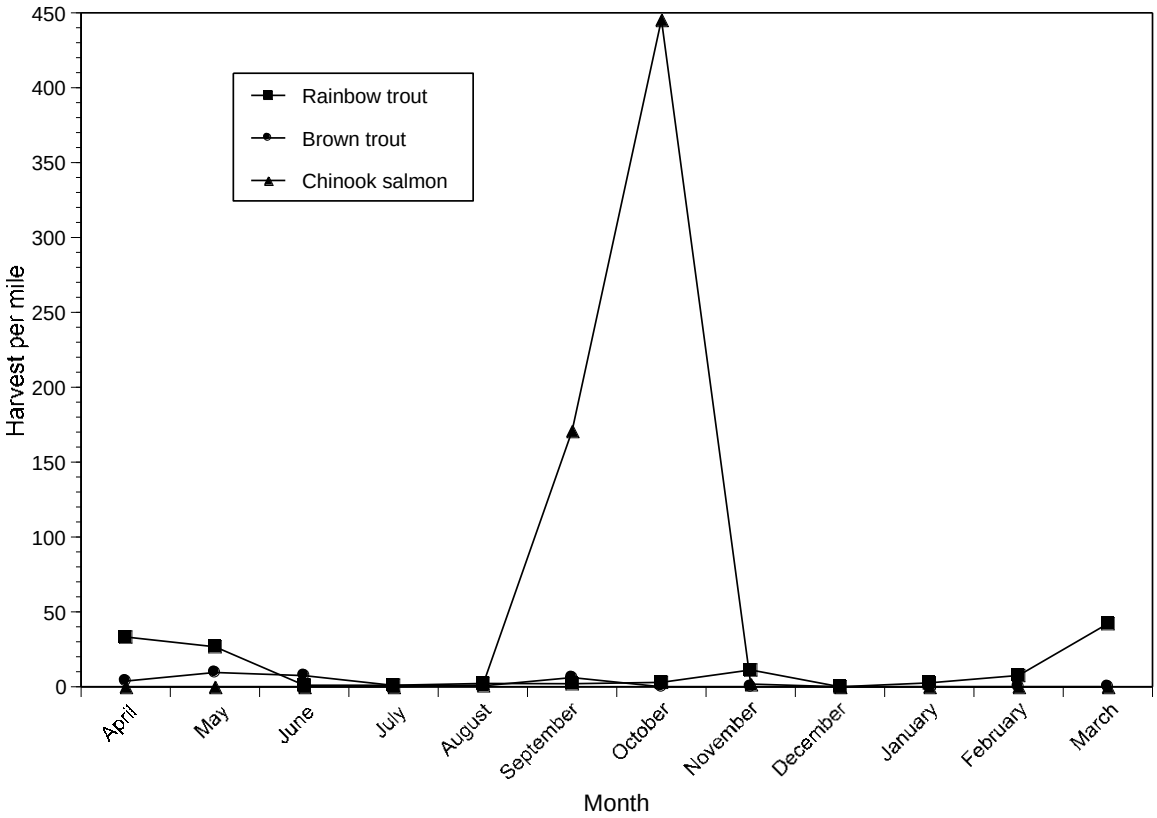

Figure 8. Estimated harvest rate of rainbow trout, brown trout, and Chinook salmon at PM396 in the Pere Marquette River from April 1982 − March 1983. Data from Kruger et al. (1983).

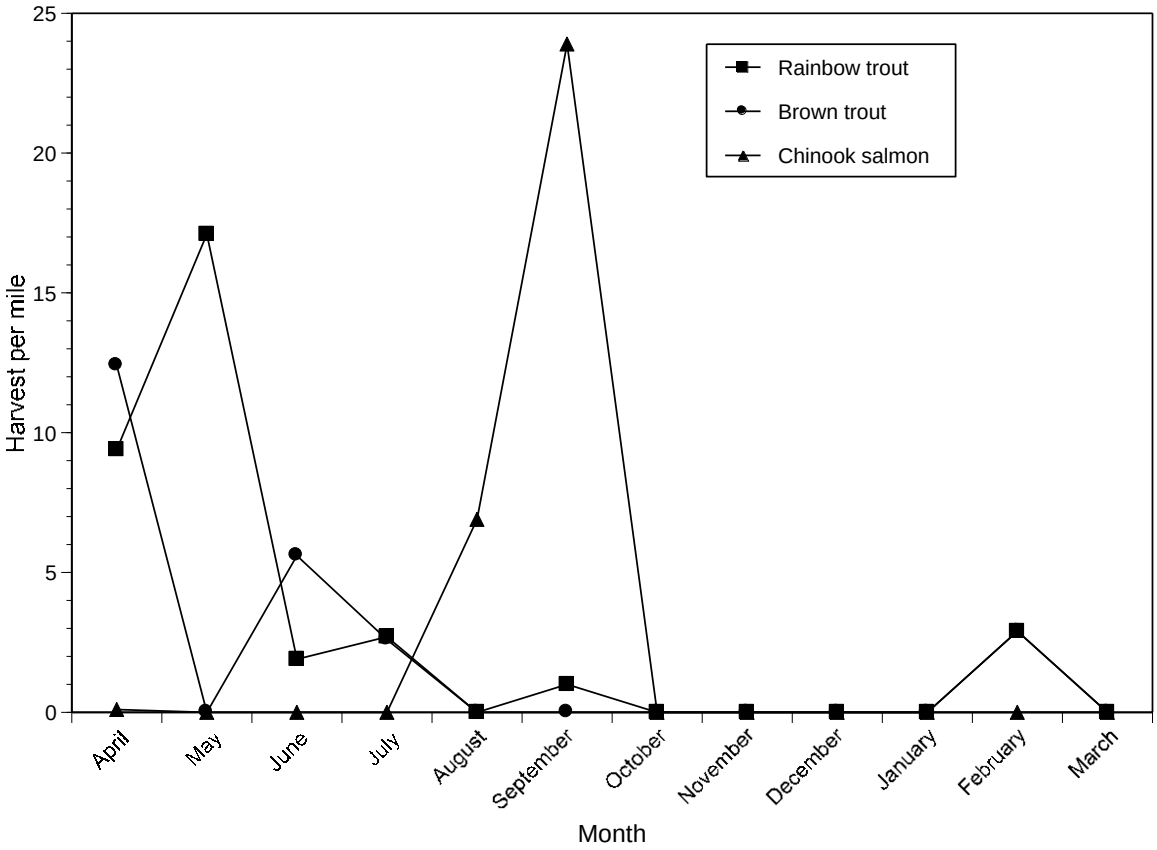

Figure 9. Estimated harvest rate of rainbow trout, brown trout, and Chinook salmon at PM397 in the Pere Marquette River, from April 1982 − March 1983. Data from Kruger et al. (1983).

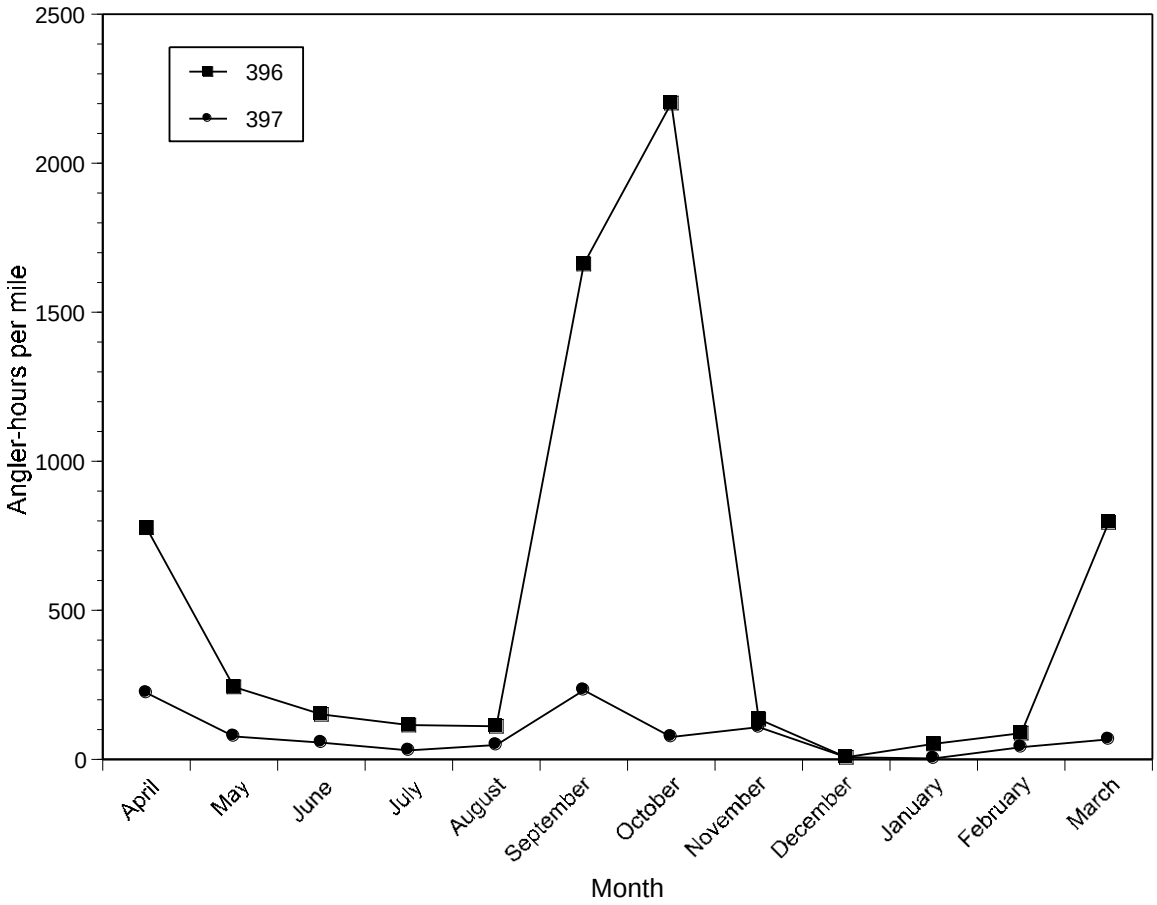

Figure 10. Estimated angler effort expended at two sampling sites on the Pere Marquette River from April 1982 − March 1983. Data from Kruger et al. (1983).

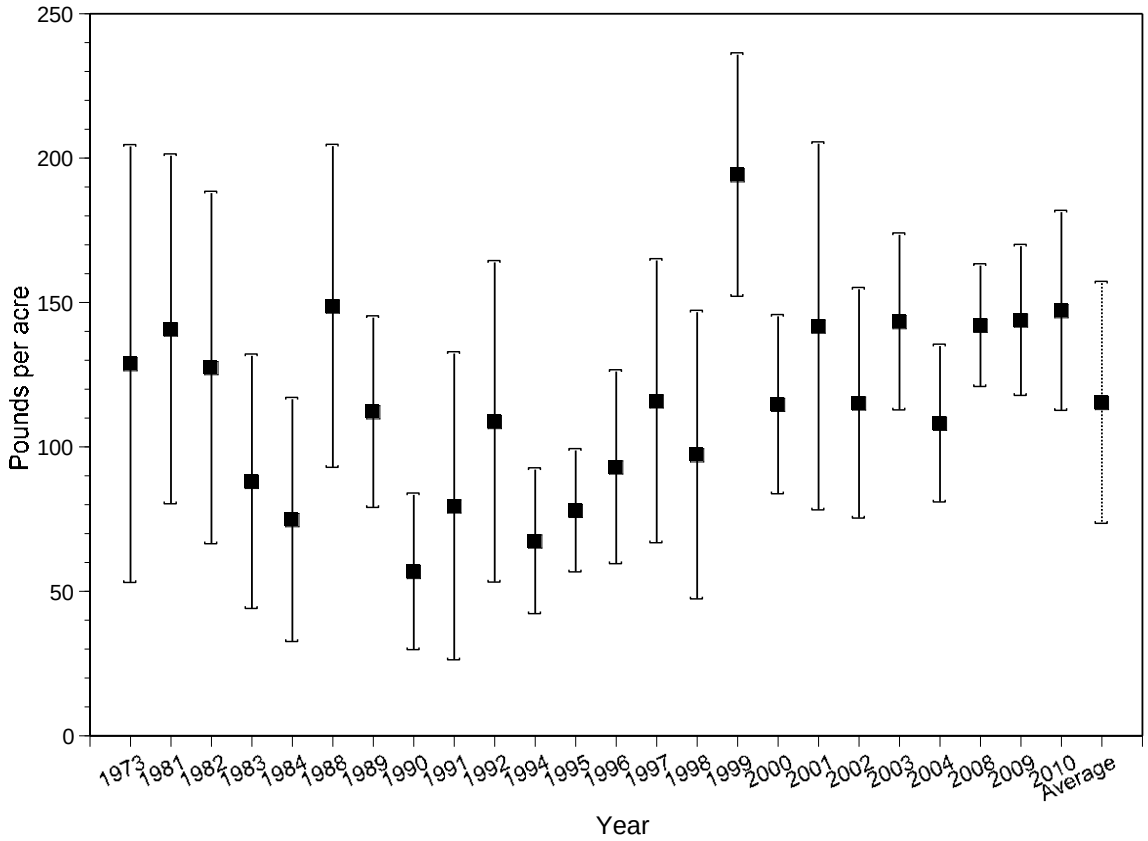

Figure 11. Biomass of all trout and salmon (including brown trout, rainbow trout, Chinook salmon and coho salmon) in the Pere Marquette River, from 1973 − 2010. Error bars represent the 95% confidence intervals.

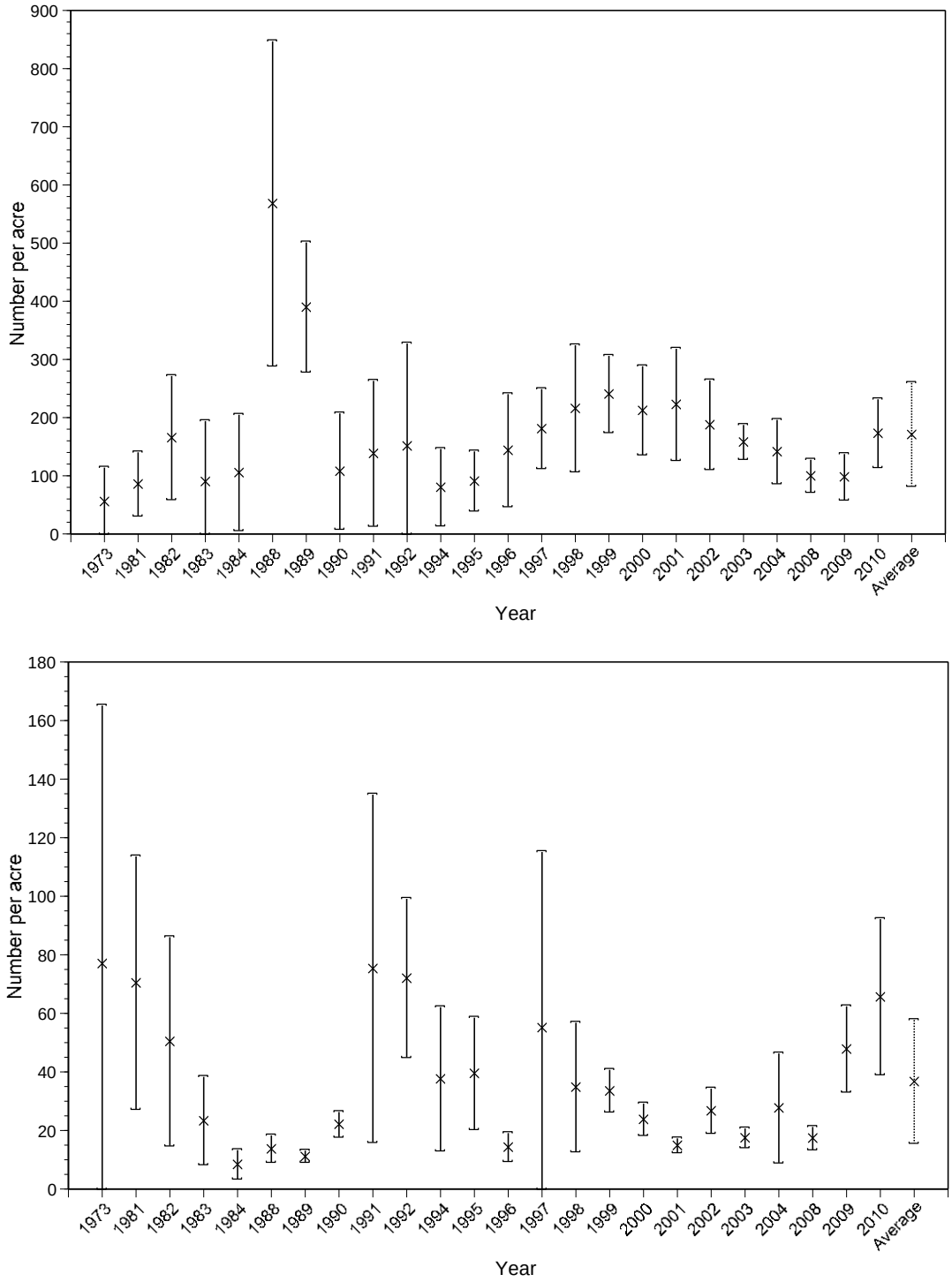

Figure 12. Density of age-1 rainbow trout (upper graph) and brown trout (lower graph) in the mainstem Pere Marquette River at the site near the mouth of the Baldwin River, from 1973 − 2010. Error bars represent the 95% confidence intervals.

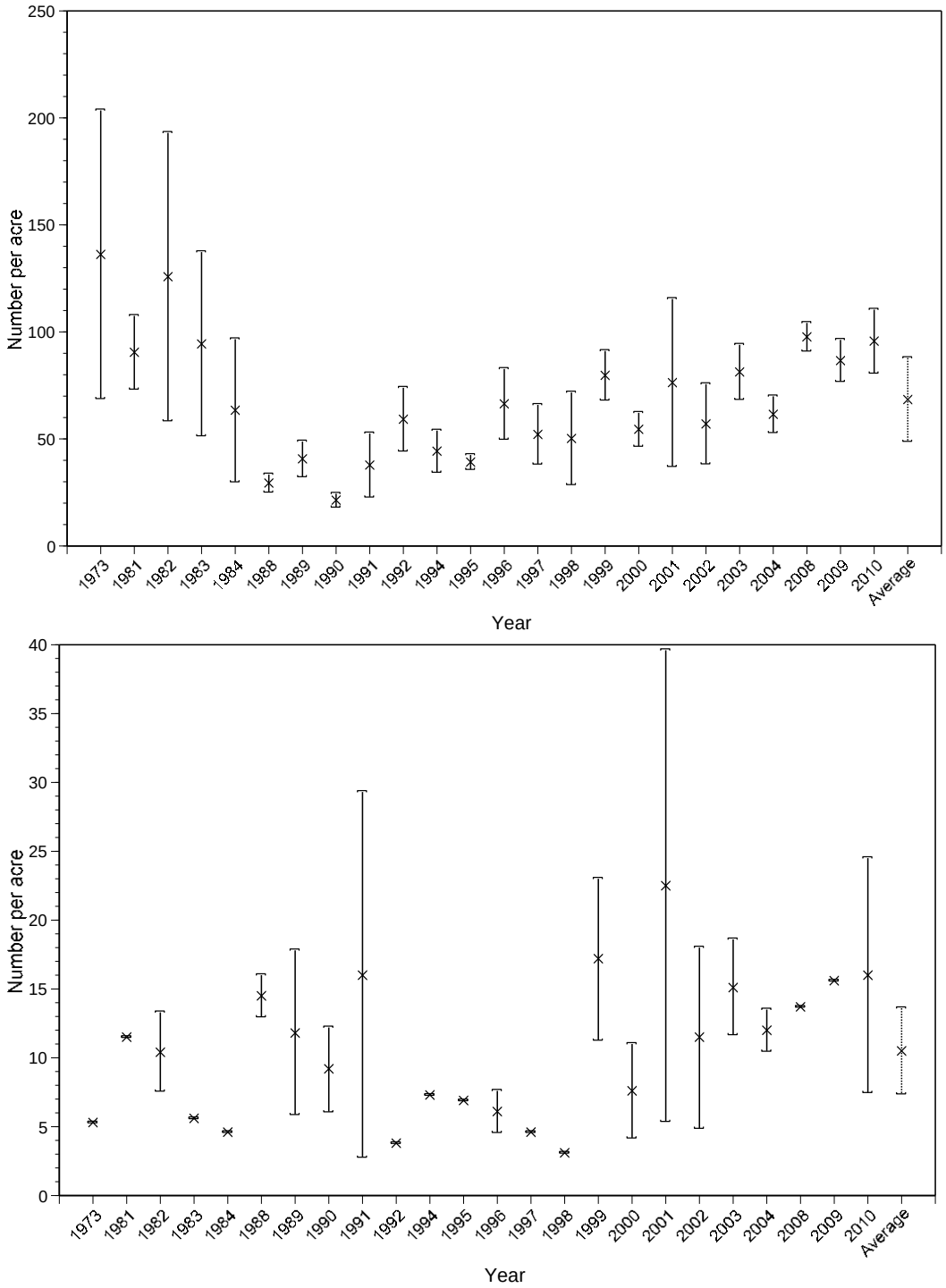

Figure 13. Density of brown trout ≥ 10 inches (upper graph) and ≥ 16 inches in the Pere Marquette River (sample site within PM396), 1973 − 2010. Error bars represent the 95% confidence intervals.

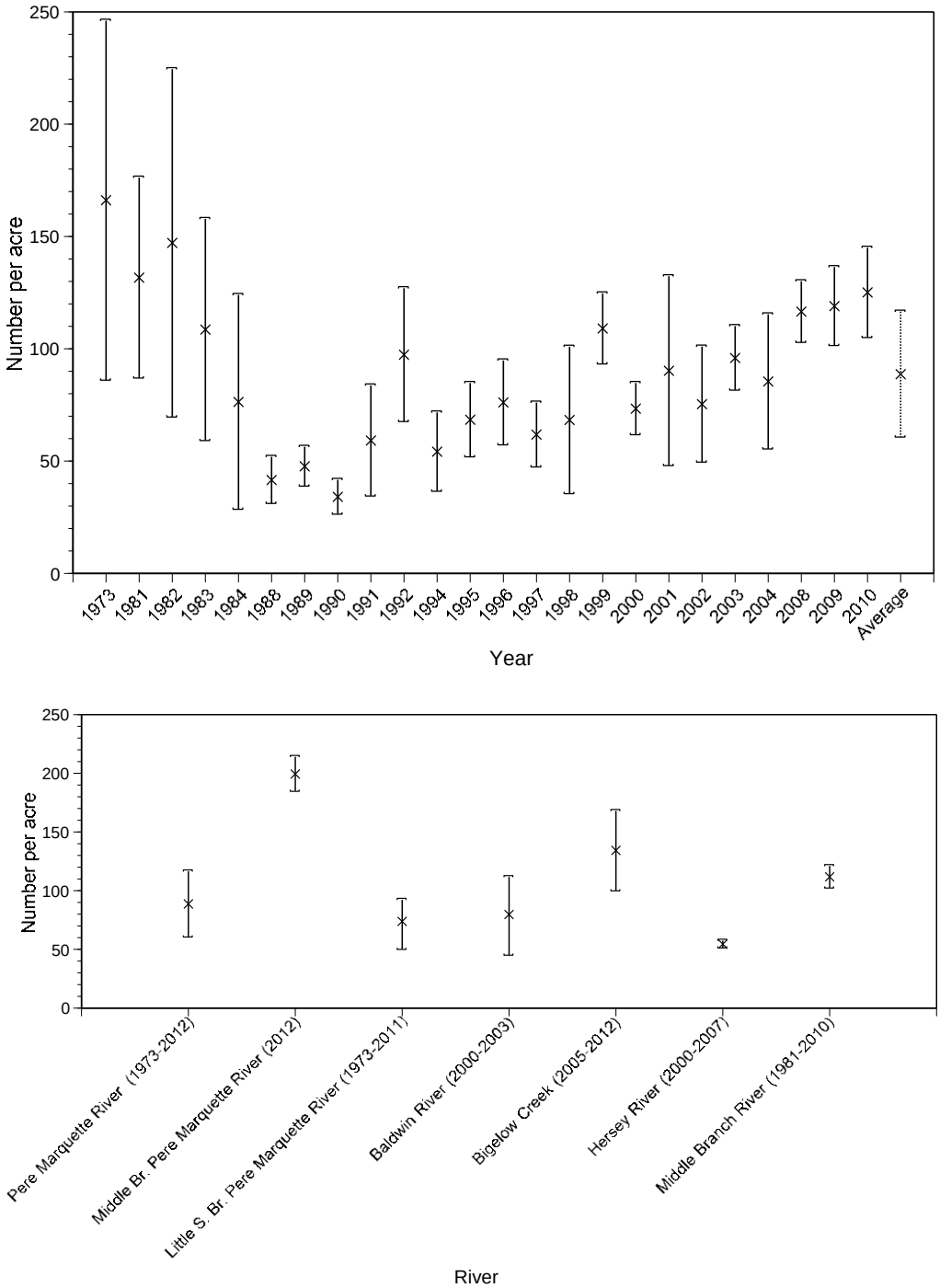

Figure 14. Densities of brown trout ≥ 8 inches in the Pere Marquette River (sample site within PM396, upper graph), 1973 – 2010, and the average compared to other high quality coldwater streams in Michigan (lower graph). Error bars represent the 95% confidence intervals.

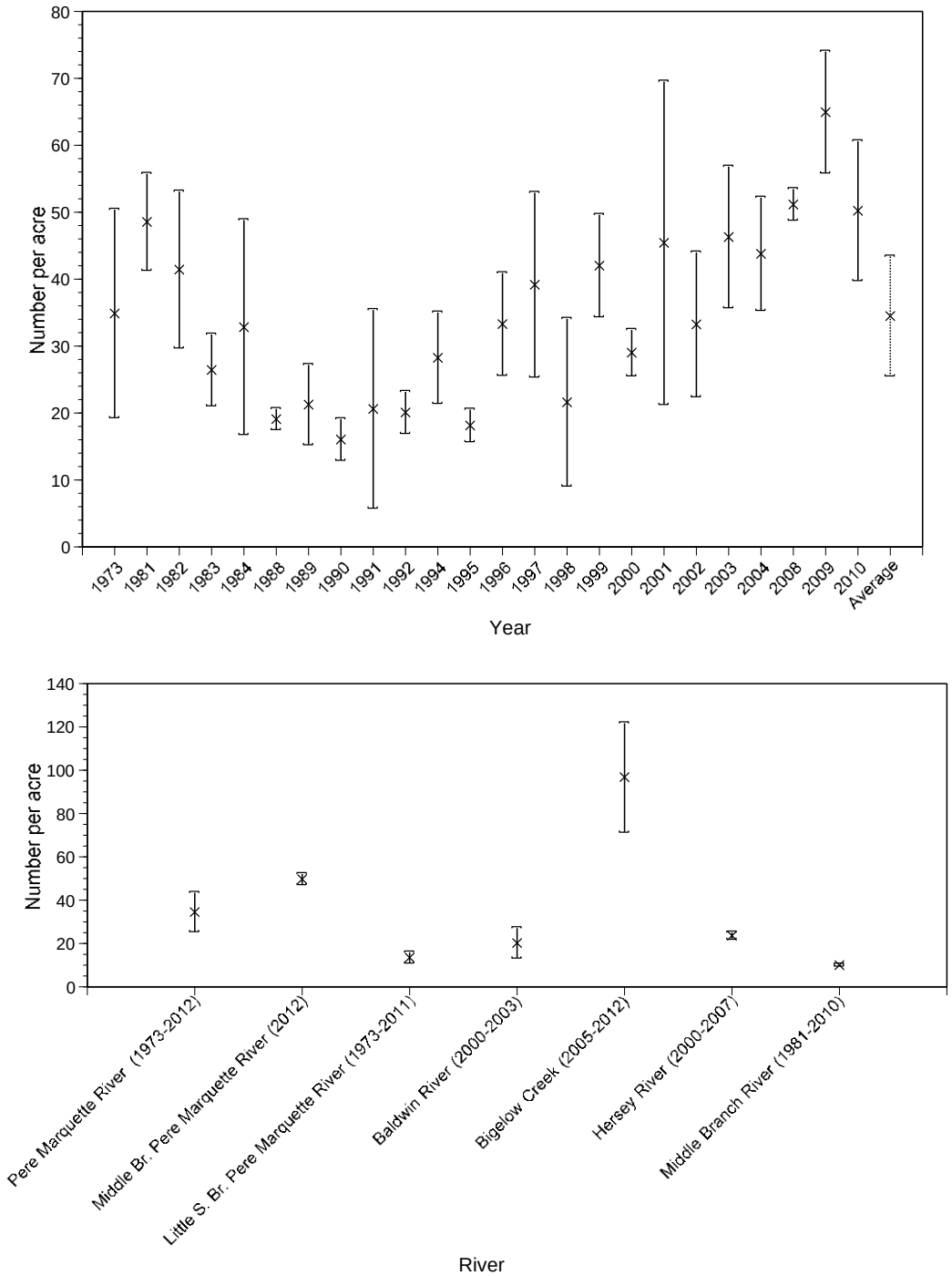

Figure 15. Densities of brown trout ≥ 13 inches (upper graph) in the Pere Marquette River (sample site within PM396, upper graph), 1973 – 2010, and the average compared to other high quality coldwater streams in Michigan (lower graph). Error bars represent the 95% confidence intervals.

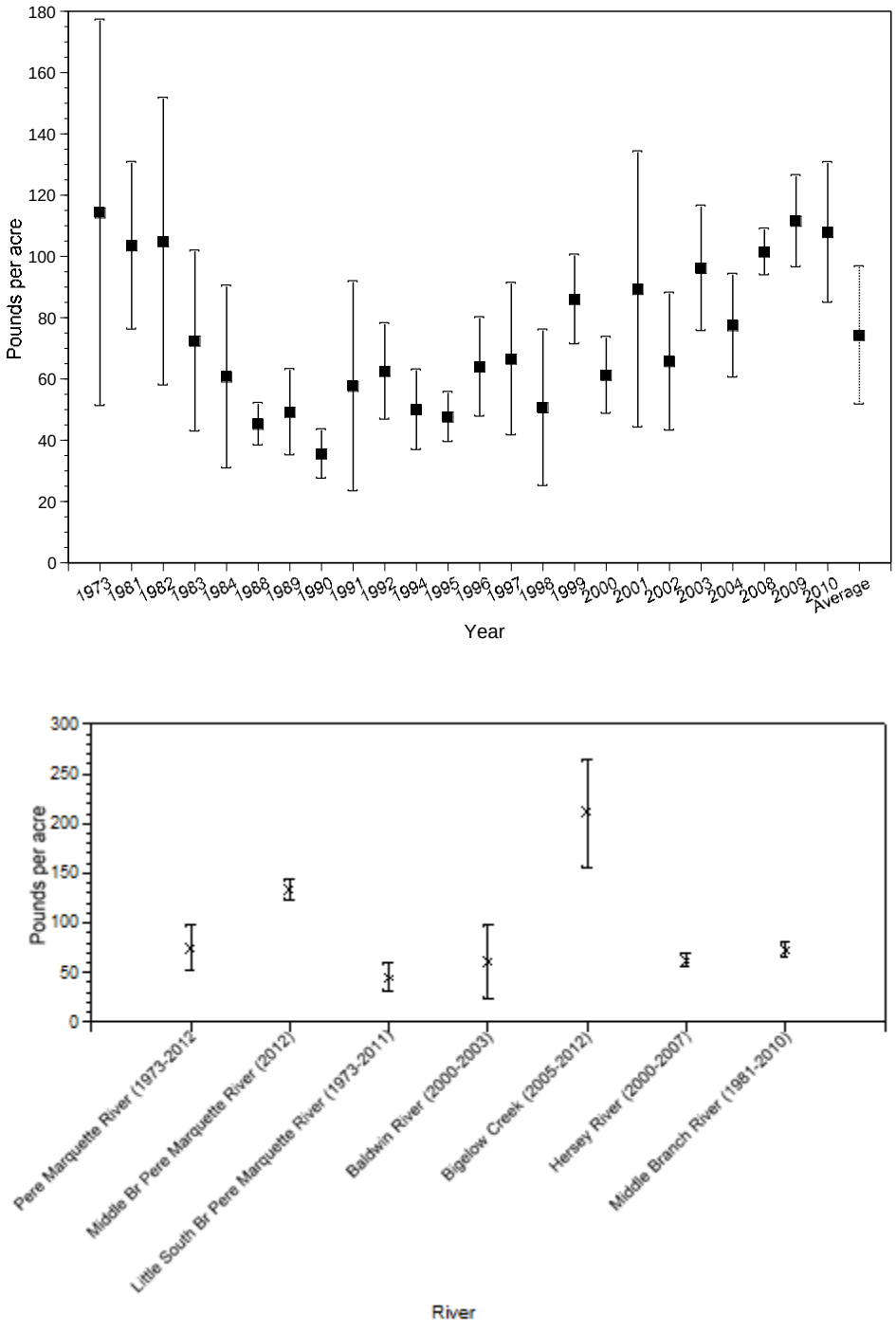

Figure 16. Average biomass of brown trout in the Pere Marquette River (upper graph), 1973 – 2010, and for other high quality coldwater streams located in Michigan (lower graph). Error bars represent the 95% confidence intervals.

Table 1. Survey sites used to estimate fish catch and angler effort on the mainstem Pere Marquette River, from April 1 − September 30, 2011, and April 1, 1982 − March 30, 1983. In the 1982-1983 survey site PM397 was 2.9 miles shorter than in 2011, including the area from the Carrs Road crossing (Bowman's Bridge) to the Rainbow Rapids PAS.

Site number	Location	2011	1982 - 1983
PM396	M-37 PAS to Gleason's Landing PAS (8.9 miles)	X	X
PM397	Gleason's Landing PAS to Rainbow Rapids PAS (2011, 11.1 miles) Carrs Road (56th) PAS to Rainbow Rapids PAS (1982-1983, 8.2 miles)	X	X
PM398	Rainbow Rapids PAS to Reek Road PAS (22.5 miles)	X	
PM399	Reek Road PAS to Old U.S.-31 (21.3 miles)	X	

Table 2. Fishing regulations at four sites on the Pere Marquette River in 2011 and two sites in 1982.

Site and date	Regulations
396 – 2011	Fishing season: entire year. Possession season: closed all year except for children under the age of 12 all year. Tackle: artificial flies only. Possession limit: zero except for children under 12 years old the daily possession is one trout or salmon. Size limit: From 8" to 12" inches for children under 12 years old.
397 – 2011	Fishing season: entire year Possession season: Last Saturday in April to September 30 for brook trout, brown trout, and Atlantic salmon. Entire year for other trout and salmon. Size limit: brook trout – 8", all other trout and salmon – 10 inches. Daily possession – 5 fish but no more than 3 trout 15" or greater. Exceptions: From September 1 through Friday before the last Saturday in April the daily possession limit is zero brook trout, zero brown trout, and one rainbow trout. Exception: From the last Saturday in April through August 31, tackle is restricted to artificial lures only; the daily possession limit is two trout or salmon but only one rainbow trout may be kept and only one brown trout 18' or greater may be kept; the minimum size limits for brook trout, brown trout, and rainbow trout is 8", except that the harvest of fish greater than 14" and less than 18" shall be prohibited for brook trout, brown trout, and rainbow trout.
398 – 2011	Fishing season: entire year. Possession season: Last Saturday in April to September 30 for brook trout, brown trout, and Atlantic salmon. Entire year for other trout and salmon. Size limit: brook trout – 8", all other trout and salmon – 10 inches. Daily possession – 5 fish but no more than 3 trout 15" or greater.
399 – 2011	Fishing and possession seasons: entire year. Size limit: brook and brown trout – 15", all other trout and salmon – 10". Daily possession – 5 fish but no more than 3 trout 15" or greater.
396 – 1982	Fishing and possession seasons: entire year. Size limit: 10'. Tackle: flies only Daily possession: Five trout or salmon from April 24 – September 30. One rainbow trout, 3 coho or Chinook salmon but zero Atlantic salmon or brown trout from October 1 – April 23.
397 - 1982	Fishing and possession season: entire year. Size limit: 8" for all trout and salmon. Daily possession: 5 in any combination but no more than 2 lake trout or splake. Five more brook or brown trout from April 24 – September 30.

Table 3. Angler fishing effort, and trout and salmon harvest and catch in the Pere Marquette River, from April 1 − September 30, 2011. Hr = hour, mi = mile, num = number.

Site	PM396		PM397		PM398		PM399		Total	
Effort	**Hrs**	**Hrs/mi**	**Hrs**	**Hrs/mi**	**Hrs**	**Hrs/mi**	**Hrs**	**Hrs/mi**	**Hrs**	**Hrs/mi**
Boat	7,425	834	3,263	294	7,565	336	4,369	205	22,622	355
Shore	57,590	6,471	18,391	1,657	75,543	3,357	10,118	475	161,641	2,534
Combined	65,015	7,305	21,654	1,951	83,107	3,694	14,487	680	184,263	2,888
	Trips	**Trips/mi**	**Trips**	**Trips/mi**	**Trips**	**Trips/mi**	**Trips**	**Trips/mi**	**Trips**	**Trips/mi**
Combined	18,702	2,101	4,788	431	20,821	925	6,610	310	50,921	798
Harvest	**Number**	**Num/mi**	**Number**	**Num/mi**	**Number**	**Num/mi**	**Number**	**Num/mi**	**Number**	**Num/mi**
Brown trout	-	-	43	4	350	16	-	-	393	6
Rainbow trout	-	-	45	4	153	7	-	-	198	3
Chinook Salmon	293	33	662	60	6,935	308	1,972	93	9,862	155
Total	293	33	750	68	7,438	331	1,972	93	10,453	164
Released	**Number**	**Num/mi**	**Number**	**Num/mi**	**Number**	**Num/mi**	**Number**	**Num/mi**	**Number**	**Num/mi**
Brown trout	4,868	547	1,235	111	3,777	168	85	4	9,965	156
Rainbow trout	4,491	505	505	45	1,419	63	-	-	6,415	101
Chinook Salmon	17,866	2,007	1,161	105	9,132	406	1,711	80	29,871	468
Total	27,225	3,059	2,901	261	14,328	637	1,796	84	46,251	725
Fishing rates per hour	**Catch**	**Harvest**	**Catch**	**Harvest**	**Catch**	**Harvest**	**Catch**	**Harvest**	**Catch**	**Harvest**
Brown trout	0.075	0	0.059	0.002	0.050	0.004	0.006	0	0.064	0.001
Rainbow trout	0.069	0	0.025	0.002	0.019	0.002	0	0	0.034	<0.001
Chinook salmon	0.275	0.004	0.084	0.031	0.193	0.083	0.254	0.136	0.095	0.022
Total	0.423	0.004	0.169	0.035	0.262	0.089	0.260	0.136	0.193	0.023

Table 4. Comparison of angler effort and trout and salmon harvest rates in the Pere Marquette River from April − September in 1982 and 2011. Note that a smaller portion of site 397 was sampled in 1982 (Kruger et al. 1983).

Site	396- M37 to Gleason's Landing		397- Gleason's Landing to Rainbow Rapids	
	1982	2011	1982	2011
River miles	8.9	8.9	8.2	11.1
Angler-hours/mi	3,060	7,305	667	1,951
Rainbow trout/mi	64	0	32	4
Rainbow trout/hr	0.0211	0	0.0481	0.0021
Brown trout/mi	28	0	21	4
Brown trout/hr	0.0093	0	0.0309	0.0020
Chinook salmon/mi	172	33	31	60
Chinook salmon/hr	0.0562	0.0045	0.0464	0.0306
All species/mi	264	33	84	68
All species/hr	0.0865	0.0045	0.1254	0.0346

Table 5. Estimated angler effort on streams with Great Lakes migratory trout and salmon fisheries in Michigan. Data from MDNR Fisheries Division (2013). Site 151 was from Croton Dam to the Newaygo MDNR Public Access, site 152 was from the Newaygo MDNR Public Access to Muskegon Lake, site 130 was from Tippy Dam to the mouth of Bear Creek, and site 341 was from the mouth of Bear Creek to Stronach.

River	County	Site number	Sample period	Sample Year	Angler trips	Angler trips/mi
Muskegon	Newaygo	151	Feb-Dec	1999-2005	67,233	4,482
Muskegon	Newaygo & Muskegon	152	Feb-Dec	1999-2005	24286	725
Muskegon		151 & 152	Feb-Dec	1999-2005	91,519	1,887
Manistee	Manistee	130	Feb-Dec	1999-2004	97,846	5,789
Manistee	Manistee	341	Feb-Dec	1999-2004	24,318	1,961
Manistee		130 & 141	Feb-Dec	1999-2004	122,164	4,169
AuSable	Iosco		Mar-Dec	1999	77,448	7,593
St. Joseph	Berrien		Feb-Dec	1997-1999	138,661	2,201
St. Joseph	Berrien		Feb-Dec	2001	85,514	1,357
Dead	Marquette		Jan-Dec	1984-1997	8,131	8,131
Carp	Marquette		Jan-Dec	1984-1997	3,010	753
Chocolay	Marquette		Jan-Dec	1984-1997	4,448	2,965
Average					53,090	3,596
Muskegon	Newaygo	151	Apr-Sept	1999-2005	41,189	2,746
Muskegon	Newaygo & Muskegon	152	Apr-Sept	1999-2005	15,168	453
Muskegon	Newaygo & Muskegon	151 & 152	Apr-Sept	1999-2005	56,357	1,162
Manistee	Manistee	130	Apr-Sept	1999-2004	56,646	3,352
Manistee	Manistee	341	Apr-Sept	1999-2004	12,138	979
Manistee	Manistee	130 & 341	Apr-Sept	1999-2004	68,784	2,348

Table 6. Estimated angler effort on Michigan inland coldwater trout streams, from April-September. Data from Alexander and Shetter (1957, 1958, 1959, 1960, 1961, 1962, 1963), Alexander et al. (1964), Bacon et al. (1958), Clark and Alexander (1992), Latta (1959a, 1959b, 1961a, 1961b, 1962, 1963, 1964, 1965), Lemmien et al. (1957), Lockwood (2000a, 2000b, 2001), Wagner et al. (1994), Waters (1957a, 1957b, 1957c), Williams et al. (1966).

River	County	Year	Angler trips/mile
E. Br. Escanaba	Marquette	1988-92	69
W. Br. Escanaba	Dickinson	1988-93	38
M. Br. Ontonogan	Gogebic	1988-94	85
Iron River	Iron	1988-95	150
Augusta Creek	Kalamazoo	1949-55	983
Pigeon River	Otsego	1951-64	300
Hunt Creek	Montmorency	1951-64	348
Fuller Creek	Montmorency	1951-64	74
FishDam River	Delta Co.	1995	133
Indian River	Schoolcraft	1995	119
Manistee River	Crawford, Kalkaska	1998	113
Manistee River	Crawford, Kalkaska	1998	265
Manistee River	Crawford, Kalkaska	1998	65
Rogue	Kent	1994, 95, 98	1,253
Rogue	Kent	1994, 95, 98	1,810
Rogue	Kent	1994, 95, 98	971
AuSable River	Oscoda, Alcona	1999	147
AuSable River, S. Branch	Crawford	1981-82 & 85-90	1,173
AuSable River, S. Branch	Crawford	1981-82	1,103
AuSable River, S. Branch	Crawford	1985-90	755
AuSable River, N. Branch	Crawford	1981-82 & 85-90	951
Average			519

Table 7. Summary of special fishing regulations in the M-37 to Gleason's Landing segment (PM396) of the Pere Marquette River. Regular season refers to the period from the last Saturday in April − September 30 and the extended season typically was all or part of the rest of the year. Abbreviations refer to brook trout (BKT), rainbow trout (RBT), Chinook salmon (CHS), and Coho salmon (COH).

Year	Regular season		Extended season		Other
	Minimum size	Possession limit	Minimum size	Possession limit	
1970	BKT-7 in Others- 10 in	5	BKT-7 in Others- 10 in	5	Flies only tackle from June 1 – October 16
1978	BKT-7 in Others- 10 in	5	BKT-7 in Others- 10 in	2 RBT, CHS, or COH	Flies only tackle
1981	BKT-8 in Others- 10 in	5	BKT-8 in Others- 10 in	2 RBT and 3 CHS or COH	Flies only tackle
1982	All trout & salmon-10 in	5	All trout & salmon-10 in	2 RBT and 3 CHS or COH	Flies only tackle
1983	All trout & salmon-10 in	5	All trout & salmon-10 in	1 RBT and 3 CHS or COH	Flies only tackle
1990	All trout & salmon-10 in	3/1≥16 in	All trout & salmon-16 in	3 RBT, CHS, or COH	Flies only tackle
1999	All trout & salmon-16 in	1	All trout & salmon-16 in	1 RBT, CHS or COH	Flies only tackle
2000		0		0	Flies only tackle

Appendix 1. Estimated harvest, catch per hour, and fishing pressure for Site 396 - boat mode. Two standard errors are given in parentheses.

Species	C/H	April	May	June	July	August	Sept.	Season
HARVEST								
Rainbow trout	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Brown trout	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Common white sucker	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Redhorse	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Chinook salmon	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
TOTAL HARVEST	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
RELEASED								
Northern pike	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Smallmouth bass	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Rainbow trout	0.0412	194	112	0	0	0	0	306
	0.0490	248	178	0	0	0	0	306
Brown trout	0.0532	194	90	111	0	0	0	395
	0.0800	248	166	NAN	0	0	0	537
Redhorse	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Brook trout	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Chinook salmon	0.1422	0	0	0	0	0	1,056	1,056
	0.2989	0	0	0	0	0	2,112	2,112
TOTAL RELEASED	0.2366	388	202	111	0	0	1,056	1,757
	0.3335	351	243	NAN	0	0	2,112	2,200
TOTAL CATCH	0.2366	388	202	111	0	0	1,056	1,757
	0.3335	351	243	NAN	0	0	2,112	2,200
ANGLER HOURS		720	975	690	0	0	5,040	7,425
		588	970	NAN	0	0	3,761	4,801
ANGLER TRIPS		156	211	149	0	0	1,090	1,605
		129	212	NAN	0	0	821	1,045

Appendix 2. Estimated harvest, catch per hour, and fishing pressure for Site 396 – shore mode. Two standard errors are given in parentheses.

Species	C/H	April	May	June	July	August	Sept	Season
HARVEST								
Rainbow trout	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Brown trout	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Common white sucker	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Redhorse	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Chinook salmon	0.0051	0	0	0	0	0	293	293
	0.0092	0	0	0	0	0	482	482
TOTAL HARVEST	0.0051	0	0	0	0	0	293	293
	0.0092	0	0	0	0	0	482	482
RELEASED								
Northern pike	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Smallmouth bass	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Rainbow trout	0.0727	2,021	39	0	89	166	1,870	4,185
	0.1638	NAN	91	0	NAN	288	3,615	8,867
Brown trout	0.0777	1,768	354	0	284	102	1,964	4,474
	0.1518	NAN	357	0	NAN	239	3,623	8,039
Redhorse	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Brook trout	0.0143	0	0	0	0	0	825	825
	0.0300	0	0	0	0	0	1,607	1,607
Chinook salmon	0.2919	0	0	0	0	0	16,810	16,810
	0.3349	0	0	0	0	0	14,316	14,316
TOTAL RELEASED	0.4566	3,789	393	0	373	269	21,469	26,294
	0.5135	NAN	368	0	NAN	374	15,288	21,586
TOTAL CATCH	0.4617	3,789	393	0	373	269	21,762	26,587
	0.5162	NAN	368	0	NAN	374	15,295	21,591
ANGLER HOURS		7,070	1,380	540	760	640	47,200	57,590
		NAN	522	NAN	NAN	554	33,840	44,265
ANGLER TRIPS		2,303	457	217	317	512	13,290	17,097
		NAN	267	NAN	NAN	488	12,884	15,924

Appendix 3. Estimated harvest, catch per hour, and fishing pressure for Site 397 – boat mode. Two standard errors are given in parentheses.

Species	C/H	April	May	June	July	August	Sept	Season
HARVEST								
Rainbow trout	0.0030	10	0	0	0	0	0	10
	0.0141	NAN	0	0	0	0	0	39
Brown trout	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Common white sucker	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Redhorse	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Chinook salmon	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
TOTAL HARVEST	0.0030	10	0	0	0	0	0	10
	0.0141	NAN	0	0	0	0	0	39
RELEASED								
Northern pike	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Smallmouth bass	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Rainbow trout	0.0599	89	0	0	0	107	0	195
	0.2218	NAN	0	0	0	NAN	0	555
Brown trout	0.0749	44	0	200	0	0	0	244
	0.3078	NAN	0	NAN	0	0	0	819
Redhorse	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Brook trout	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Chinook salmon	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
TOTAL RELEASED	0.1348	133	0	200	0	107	0	440
	0.4544	NAN	0	NAN	0	NAN	0	1,051
TOTAL CATCH	0.1378	143	0	200	0	107	0	450
	0.4596	NAN	0	NAN	0	NAN	0	1,052
ANGLER HOURS		1,245	0	450	0	160	1,408	3,263
		NAN	0	NAN	0	NAN	NAN	7,757
ANGLER TRIPS		176	0	64	0	23	199	461
		NAN	0	NAN	0	NAN	NAN	1,095

Appendix 4. Estimated harvest, catch per hour, and fishing pressure for Site 397 – shore mode. Two standard errors are given in parentheses.

Species	C/H	April	May	June	July	August	Sept	Season
HARVEST								
Rainbow trout	0.0019	35	0	0	0	0	0	35
	0.0077	NAN	0	0	0	0	0	140
Brown trout	0.0023	0	43	0	0	0	0	43
	0.0069	0	124	0	0	0	0	124
Common white sucker	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Redhorse	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Chinook salmon	0.0360	0	0	0	0	0	662	662
	0.0432	0	0	0	0	0	710	710
TOTAL HARVEST	0.0402	35	43	0	0	0	662	740
	0.0454	NAN	124	0	0	0	710	734
RELEASED								
Northern pike	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Smallmouth bass	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Rainbow trout	0.0168	70	240	0	0	0	0	310
	0.0550	NAN	NAN	0	0	0	0	998
Brown trout	0.0538	179	688	0	0	0	124	990
	0.1578	NAN	NAN	0	0	0	248	2,853
Redhorse	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Brook trout	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Chinook salmon	0.0632	0	0	0	0	0	1,161	1,161
	0.0657	0	0	0	0	0	1,034	1,034
TOTAL RELEASED	0.1338	249	927	0	0	0	1,286	2,461
	0.2283	NAN	NAN	0	0	0	1,063	3,984
TOTAL CATCH	0.1741	284	970	0	0	0	1,947	3,201
	0.2394	NAN	NAN	0	0	0	1,279	4,052
ANGLER HOURS		830	370	0	220	1,067	15,904	18,391
		NAN	336	0	NAN	1,823	9,085	9,887
ANGLER TRIPS		195	87	0	52	251	3,742	4,327
		NAN	90	0	NAN	454	2,648	2,807

Appendix 5. Estimated harvest, catch per hour, and fishing pressure for Site 398 – boat mode. Two standard errors are given in parentheses.

Species	C/H	April	May	June	July	August	Sept	Season
HARVEST								
Rainbow trout	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Brown trout	0.0024	0	0	18	0	0	0	18
	0.0080	0	0	33	0	0	0	33
Common white sucker	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Redhorse	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Chinook salmon	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
TOTAL HARVEST	0.0024	0	0	18	0	0	0	18
	0.0080	0	0	33	0	0	0	33
RELEASED								
Northern pike	0.0194	0	0	147	0	0	0	147
	0.0950	0	0	NAN	0	0	0	587
Smallmouth bass	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Rainbow trout	0.0333	0	204	6	0	42	0	252
	0.1435	0	NAN	11	0	63	0	818
Brown trout	0.1005	0	0	83	0	250	427	760
	0.3706	0	0	106	0	538	NAN	1,792
Redhorse	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Brook trout	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Chinook salmon	0.0799	0	0	0	0	0	605	605
	0.2772	0	0	0	0	0	1,209	1,209
TOTAL RELEASED	0.2331	0	204	236	0	292	1,031	1,763
	0.8753	0	NAN	NAN	0	541	NAN	4,343
TOTAL CATCH	0.2355	0	204	254	0	292	1,031	1,781
	0.8803	0	NAN	NAN	0	541	NAN	4,343
ANGLER HOURS		0	1,020	443	200	710	5,191	7,565
		0	NAN	NAN	NAN	NAN	NAN	21,441
ANGLER TRIPS		0	193	78	38	145	981	1,434
		0	NAN	NAN	NAN	NAN	NAN	4,056

Appendix 6. Estimated harvest, catch per hour, and fishing pressure for Site 398 – shore mode. Two standard errors are given in parentheses.

Species	C/H	April	May	June	July	August	Sept	Season
HARVEST								
Rainbow trout	0.0020	140	0	0	0	13	0	153
	0.0034	247	0	0	0	27	0	248
Brown trout	0.0044	0	179	0	114	38	0	332
	0.0103	0	NAN	0	259	81	0	767
Common white sucker	0.0339	2,560	0	0	0	0	0	2,560
	0.0694	5,120	0	0	0	0	0	5,120
Redhorse	0.0007	56	0	0	0	0	0	56
	0.0015	112	0	0	0	0	0	112
Chinook salmon	0.0918	0	0	0	0	203	6,733	6,935
	0.0748	0	0	0	0	244	4,730	4,736
TOTAL HARVEST	0.1329	2,756	179	0	114	253	6,733	10,036
	0.1101	5,127	NAN	0	259	259	4,730	7,022
RELEASED								
Northern pike	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Smallmouth bass	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Rainbow trout	0.0154	109	0	400	413	89	156	1,167
	0.0240	223	0	NAN	540	170	312	1,740
Brown trout	0.0399	84	0	726	896	810	500	3,016
	0.0623	167	0	NAN	885	NAN	787	4,513
Redhorse	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Brook trout	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Chinook salmon	0.1129	0	0	0	0	25	8,502	8,528
	0.1078	0	0	0	0	44	7,213	7,213
TOTAL RELEASED	0.1683	193	0	1,126	1,309	925	9,159	12,711
	0.1448	279	0	NAN	1,037	NAN	7,262	9,373
TOTAL CATCH	0.3011	2,949	179	1,126	1,424	1,178	15,891	22,747
	0.2047	5,135	NAN	NAN	1,069	NAN	8,667	11,712
ANGLER HOURS		4,400	1,797	840	1,103	2,720	64,683	75,543
		4,462	NAN	941	273	1,418	32,398	33,528
ANGLER TRIPS		1,558	526	250	449	807	15,798	19,387
		1,624	NAN	284	184	487	9,323	9,713

Appendix 7. Estimated harvest, catch per hour, and fishing pressure for Site 399 – boat mode. Two standard errors are given in parentheses.

Species	C/H	April	May	June	July	August	Sept	Season
HARVEST								
Rainbow trout	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Brown trout	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Common white sucker	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Redhorse	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Chinook salmon	0.1128	0	0	0	0	0	493	493
	0.1722	0	0	0	0	0	709	709
TOTAL HARVEST	0.1128	0	0	0	0	0	493	493
	0.1722	0	0	0	0	0	709	709
RELEASED								
Northern pike	0.0106	0	0	0	46	0	0	46
	0.0104	0	0	0	39	0	0	39
Smallmouth bass	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Rainbow trout	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Brown trout	0.0060	21	0	5	0	0	0	26
	0.0203	NAN	0	NAN	0	0	0	88
Redhorse	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Brook trout	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Chinook salmon	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
TOTAL RELEASED	0.0166	21	0	5	46	0	0	72
	0.0235	NAN	0	NAN	39	0	0	96
TOTAL CATCH	0.1294	21	0	5	46	0	493	566
	0.1766	NAN	0	NAN	39	0	709	715
ANGLER HOURS		213	0	53	220	0	3,883	4,369
		NAN	0	NAN	180	0	2,043	2,231
ANGLER TRIPS		41	0	10	88	0	493	632
		NAN	0	NAN	158	0	264	351

Appendix 8. Estimated harvest, catch per hour, and fishing pressure for Site 399 – shore mode. Two standard errors are given in parentheses.

Species	C/H	April	May	June	July	August	Sept	Season
HARVEST								
Rainbow trout	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Brown trout	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Common white sucker	0.0087	88	0	0	0	0	0	88
	0.0140	137	0	0	0	0	0	137
Redhorse	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Chinook salmon	0.1462	0	0	0	0	53	1,426	1,479
	0.1791	0	0	0	0	106	1,703	1,706
TOTAL HARVEST	0.1549	88	0	0	0	53	1,426	1,567
	0.1809	137	0	0	0	106	1,703	1,711
RELEASED								
Northern pike	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Smallmouth bass	0.0109	0	0	110	0	0	0	110
	0.0437	0	0	NAN	0	0	0	440
Rainbow trout	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Brown trout	0.0058	59	0	0	0	0	0	59
	0.0118	117	0	0	0	0	0	117
Redhorse	0.0058	59	0	0	0	0	0	59
	0.0118	117	0	0	0	0	0	117
Brook trout	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Chinook salmon	0.1691	0	0	0	0	0	1,711	1,711
	0.2137	0	0	0	0	0	2,043	2,043
TOTAL RELEASED	0.1916	117	0	110	0	0	1,711	1,939
	0.2218	166	0	NAN	0	0	2,043	2,096
TOTAL CATCH	0.3465	205	0	110	0	53	3,137	3,505
	0.3034	215	0	NAN	0	106	2,659	2,706
ANGLER HOURS		987	327	513	357	1,200	6,735	10,118
		1,286	NAN	453	551	1,133	3,515	4,184
ANGLER TRIPS		853	173	237	195	677	3,843	5,977
		1,041	NAN	326	370	977	4,237	4,551

Appendix 9. Estimated harvest, catch per hour, and fishing pressure for Site 396 – boat and shore modes combined. Two standard errors are given in parentheses.

Species	C/H	April	May	June	July	August	Sept	Season
HARVEST								
Rainbow trout	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Brown trout	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Common white sucker	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Redhorse	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Chinook salmon	0.0045	0	0	0	0	0	293	293
	0.0081	0	0	0	0	0	482	482
TOTAL HARVEST	0.0045	0	0	0	0	0	293	293
	0.0081	0	0	0	0	0	482	482
RELEASED								
Northern pike	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Smallmouth bass	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Rainbow trout	0.0691	2,215	151	0	89	166	1,870	4,491
	0.1554	NAN	200	0	NAN	288	3,615	9,581
Brown trout	0.0749	1,962	444	111	284	102	1,964	4,868
	0.1448	NAN	394	NAN	NAN	239	3,623	8,742
Redhorse	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Brook trout	0.0127	0	0	0	0	0	825	825
	0.0263	0	0	0	0	0	1,607	1,607
Chinook salmon	0.2748	0	0	0	0	0	17,866	17,866
	0.2970	0	0	0	0	0	14,471	14,471
TOTAL RELEASED	0.4315	4,177	595	111	373	269	22,525	28,051
	0.4673	NAN	442	NAN	NAN	374	15,433	22,805
TOTAL CATCH	0.4360	4,177	595	111	373	269	22,818	28,344
	0.4695	NAN	442	NAN	NAN	374	15,440	22,810
ANGLER HOURS		7,790	2,355	1,230	760	640	52,240	65,015
		NAN	1,101	NAN	NAN	554	34,048	46,532
ANGLER TRIPS		2,459	668	366	317	512	14,380	18,702
		NAN	341	NAN	NAN	488	12,910	16,356

Appendix 10. Estimated harvest, catch per hour, and fishing pressure for Site 397 – boat and shore modes combined. Two standard errors are given in parentheses.

Species	C/H	April	May	June	July	August	Sept	Season
HARVEST								
Rainbow trout	0.0021	45	0	0	0	0	0	45
	0.0107	NAN	0	0	0	0	0	179
Brown trout	0.0020	0	43	0	0	0	0	43
	0.0086	0	124	0	0	0	0	124
Common white sucker	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Redhorse	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Chinook salmon	0.0306	0	0	0	0	0	662	662
	0.1041	0	0	0	0	0	710	710
TOTAL HARVEST	0.0346	45	43	0	0	0	662	750
	0.1170	NAN	124	0	0	0	710	743
RELEASED								
Northern pike	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Smallmouth bass	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Rainbow trout	0.0233	159	240	0	0	107	0	505
	0.0942	NAN	NAN	0	0	NAN	0	1,226
Brown trout	0.0570	223	688	200	0	0	124	1,235
	0.2308	NAN	NAN	NAN	0	0	248	3,010
Redhorse	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Brook trout	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Chinook salmon	0.0536	0	0	0	0	0	1,161	1,161
	0.1797	0	0	0	0	0	1,034	1,034
TOTAL RELEASED	0.1340	382	927	200	0	107	1,286	2,901
	0.4751	NAN	NAN	NAN	0	NAN	1,063	4,247
TOTAL CATCH	0.1686	427	970	200	0	107	1,947	3,651
	0.5799	NAN	NAN	NAN	0	NAN	1,279	4,312
ANGLER HOURS		2,075	370	450	220	1,227	17,312	21,654
		NAN	336	NAN	NAN	NAN	NAN	69,946
ANGLER TRIPS		371	87	64	52	274	3,941	4,788
		NAN	90	NAN	NAN	NAN	NAN	15,875

Appendix 11. Estimated harvest, catch per hour, and fishing pressure for Site 398 – boat and shore modes combined. Two standard errors are given in parentheses.

Species	C/H	April	May	June	July	August	Sept	Season
HARVEST								
Rainbow trout	0.0018	140	0	0	0	13	0	153
	0.0069	247	0	0	0	27	0	248
Brown trout	0.0042	0	179	18	114	38	0	350
	0.0169	0	NAN	33	259	81	0	768
Common white sucker	0.0308	2,560	0	0	0	0	0	2,560
	0.1208	5,120	0	0	0	0	0	5,120
Redhorse	0.0007	56	0	0	0	0	0	56
	0.0026	112	0	0	0	0	0	112
Chinook salmon	0.0834	0	0	0	0	203	6,733	6,935
	0.2871	0	0	0	0	244	4,730	4,736
TOTAL HARVEST	0.1210	2,756	179	18	114	253	6,733	10,054
	0.4165	5,127	NAN	33	259	259	4,730	7,022
RELEASED								
Northern pike	0.0018	0	0	147	0	0	0	147
	0.0092	0	0	NAN	0	0	0	587
Smallmouth bass	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Rainbow trout	0.0171	109	204	406	413	131	156	1,419
	0.0621	223	NAN	NAN	540	181	312	1,943
Brown trout	0.0454	84	0	809	896	1,061	927	3,777
	0.1723	167	0	NAN	885	NAN	NAN	6,560
Redhorse	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Brook trout	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Chinook salmon	0.1099	0	0	0	0	25	9,107	9,132
	0.3808	0	0	0	0	44	7,314	7,314
TOTAL RELEASED	0.1742	193	204	1,362	1,309	1,217	10,190	14,474
	0.7703	279	NAN	NAN	1,037	NAN	NAN	41,430
TOTAL CATCH	0.2951	2,949	383	1,380	1,424	1,470	16,922	24,528
	1.1161	5,135	NAN	NAN	1,069	NAN	NAN	42,021
ANGLER HOURS		4,400	2,817	1,283	1,303	3,430	69,874	83,107
		4,462	NAN	NAN	NAN	NAN	NAN	280,190
ANGLER TRIPS		1,558	719	328	487	951	16,779	20,821
		1,624	NAN	NAN	NAN	NAN	NAN	67,344

Appendix 12. Estimated harvest, catch per hour, and fishing pressure for Site 399 – boat and shore modes combined. Two standard errors are given in parentheses.

Species	C/H	April	May	June	July	August	Sept	Season
HARVEST								
Rainbow trout	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Brown trout	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Common white sucker	0.0061	88	0	0	0	0	0	88
	0.0099	137	0	0	0	0	0	137
Redhorse	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Chinook salmon	0.1361	0	0	0	0	53	1,919	1,972
	0.1432	0	0	0	0	106	1,844	1,847
TOTAL HARVEST	0.1422	88	0	0	0	53	1,919	2,060
	0.1448	137	0	0	0	106	1,844	1,852
RELEASED								
Northern pike	0.0032	0	0	0	46	0	0	46
	0.0031	0	0	0	39	0	0	39
Smallmouth bass	0.0076	0	0	110	0	0	0	110
	0.0306	0	0	NAN	0	0	0	440
Rainbow trout	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Brown trout	0.0059	80	0	5	0	0	0	85
	0.0223	NAN	0	NAN	0	0	0	321
Redhorse	0.0040	59	0	0	0	0	0	59
	0.0083	117	0	0	0	0	0	117
Brook trout	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Chinook salmon	0.1181	0	0	0	0	0	1,711	1,711
	0.1519	0	0	0	0	0	2,043	2,043
TOTAL RELEASED	0.1388	139	0	115	46	0	1,711	2,011
	0.1636	NAN	0	NAN	39	0	2,043	2,167
TOTAL CATCH	0.2810	227	0	115	46	53	3,630	4,071
	0.2383	NAN	0	NAN	39	106	2,752	2,851
ANGLER HOURS		1,200	327	567	577	1,200	10,617	14,487
		NAN	NAN	NAN	579	1,133	4,065	6,931
ANGLER TRIPS		894	173	247	283	677	4,336	6,610
		NAN	NAN	NAN	403	977	4,245	5,779

Appendix 13. Estimated harvest, catch per hour, and fishing pressure for all sites combined – boat mode only. Two standard errors are given in parentheses.

Species	C/H	April	May	June	July	August	Sept	Season
HARVEST								
Rainbow trout	0.0004	10	0	0	0	0	0	10
	0.0021	NAN	0	0	0	0	0	39
Brown trout	0.0008	0	0	18	0	0	0	18
	0.0026	0	0	33	0	0	0	33
Common white sucker	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Redhorse	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Chinook salmon	0.0218	0	0	0	0	0	493	493
	0.0689	0	0	0	0	0	709	709
TOTAL HARVEST	0.0230	10	0	18	0	0	493	521
	0.0720	NAN	0	33	0	0	709	711
RELEASED								
Northern pike	0.0085	0	0	147	46	0	0	193
	0.0354	0	0	NAN	39	0	0	588
Smallmouth bass	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Rainbow trout	0.0333	283	316	6	0	148	0	753
	0.1228	NAN	NAN	11	0	NAN	0	1,797
Brown trout	0.0630	260	90	400	0	250	427	1,426
	0.2118	NAN	166	NAN	0	538	NAN	2,620
Redhorse	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Brook trout	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Chinook salmon	0.0734	0	0	0	0	0	1,661	1,661
	0.2329	0	0	0	0	0	2,434	2,434
TOTAL RELEASED	0.1783	542	406	552	46	399	2,087	4,032
	0.6455	NAN	NAN	NAN	39	NAN	NAN	9,190
TOTAL CATCH	0.2013	552	406	570	46	399	2,580	4,553
	0.6977	NAN	NAN	NAN	39	NAN	NAN	9,218
ANGLER HOURS		2,178	1,995	1,637	420	870	15,522	22,622
		NAN	NAN	NAN	NAN	NAN	NAN	63,658
ANGLER TRIPS		373	404	301	126	167	2,763	4,133
		NAN	NAN	NAN	NAN	NAN	NAN	11,362

Appendix 14. Estimated harvest, catch per hour, and fishing pressure for all sites combined – shore mode only. Two standard errors are given in parentheses.

Species	C/H	April	May	June	July	August	Sept	Season
HARVEST								
Rainbow trout	0.0012	175	0	0	0	13	0	188
	0.0044	NAN	0	0	0	27	0	702
Brown trout	0.0023	0	222	0	114	38	0	375
	0.0058	0	NAN	0	259	81	0	930
Common white sucker	0.0164	2,648	0	0	0	0	0	2,648
	0.0326	5,122	0	0	0	0	0	5,122
Redhorse	0.0003	56	0	0	0	0	0	56
	0.0007	112	0	0	0	0	0	112
Chinook salmon	0.0580	0	0	0	0	255	9,114	9,369
	0.0413	0	0	0	0	266	5,100	5,107
TOTAL HARVEST	0.0782	2,879	222	0	114	306	9,114	12,636
	0.0860	NAN	NAN	0	259	279	5,100	12,633
RELEASED								
Northern pike	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
Smallmouth bass	0.0007	0	0	110	0	0	0	110
	0.0027	0	0	NAN	0	0	0	440
Rainbow trout	0.0350	2,200	279	400	502	255	2,026	5,662
	0.0635	NAN	NAN	NAN	NAN	335	3,628	9,928
Brown trout	0.0528	2,089	1,042	726	1,181	913	2,589	8,539
	0.0784	NAN	NAN	NAN	NAN	NAN	3,715	12,044
Redhorse	0.0004	59	0	0	0	0	0	59
	0.0007	117	0	0	0	0	0	117
Brook trout	0.0051	0	0	0	0	0	825	825
	0.0102	0	0	0	0	0	1,607	1,607
Chinook salmon	0.1745	0	0	0	0	25	28,185	28,211
	0.1283	0	0	0	0	44	16,193	16,193
TOTAL RELEASED	0.2685	4,348	1,321	1,236	1,683	1,193	33,625	43,405
	0.2063	NAN	NAN	NAN	NAN	NAN	17,081	26,733
TOTAL CATCH	0.3467	7,227	1,543	1,236	1,797	1,500	42,738	56,041
	0.2425	NAN	NAN	NAN	NAN	NAN	17,826	29,568
ANGLER HOURS		13,287	3,873	1,893	2,440	5,627	134,521	161,641
		NAN	NAN	NAN	NAN	2,631	47,850	74,255
ANGLER TRIPS		4,910	1,243	704	1,013	2,246	36,672	46,788
		NAN	NAN	NAN	NAN	1,279	16,670	26,726

Appendix 15. Estimated harvest, catch per hour, and fishing pressure for all sites combined – all modes combined. Two standard errors are given in parentheses.

Species	C/H	April	May	June	July	August	Sept	Season
HARVEST								
Rainbow trout	0.0011	185	0	0	0	13	0	198
	0.0054	NAN	0	0	0	27	0	742
Brown trout	0.0021	0	222	18	114	38	0	393
	0.0086	0	NAN	33	259	81	0	930
Common white sucker	0.0144	2,648	0	0	0	0	0	2,648
	0.0547	5,122	0	0	0	0	0	5,122
Redhorse	0.0003	56	0	0	0	0	0	56
	0.0012	112	0	0	0	0	0	112
Chinook salmon	0.0535	0	0	0	0	255	9,607	9,862
	0.1778	0	0	0	0	266	5,149	5,156
TOTAL HARVEST	0.0714	2,889	222	18	114	306	9,607	13,157
	0.2442	NAN	NAN	33	259	279	5,149	12,689
RELEASED								
Northern pike	0.0010	0	0	147	46	0	0	193
	0.0047	0	0	NAN	39	0	0	588
Smallmouth bass	0.0006	0	0	110	0	0	0	110
	0.0031	0	0	NAN	0	0	0	440
Rainbow trout	0.0348	2,483	595	406	502	404	2,026	6,415
	0.1296	NAN	NAN	NAN	NAN	NAN	3,628	11,257
Brown trout	0.0541	2,349	1,131	1,125	1,181	1,163	3,015	9,965
	0.2022	NAN	NAN	NAN	NAN	NAN	NAN	17,845
Redhorse	0.0003	59	0	0	0	0	0	59
	0.0012	117	0	0	0	0	0	117
Brook trout	0.0045	0	0	0	0	0	825	825
	0.0171	0	0	0	0	0	1,607	1,607
Chinook salmon	0.1621	0	0	0	0	25	29,846	29,871
	0.5393	0	0	0	0	44	16,375	16,375
TOTAL RELEASED	0.2574	4,890	1,726	1,788	1,729	1,592	35,712	47,437
	1.1539	NAN	NAN	NAN	NAN	NAN	NAN	144,828
TOTAL CATCH	0.3288	7,779	1,949	1,806	1,843	1,898	45,319	60,594
	1.3368	NAN	NAN	NAN	NAN	NAN	NAN	145,383
ANGLER HOURS		15,465	5,868	3,530	2,860	6,497	150,043	184,263
		NAN	NAN	NAN	NAN	NAN	NAN	604,641
ANGLER TRIPS		5,282	1,647	1,005	1,139	2,413	39,435	50,921
		NAN	NAN	NAN	NAN	NAN	NAN	159,693