

**Boardman River Angler Survey Report, 2015**  
Michigan Department of Natural Resources, Fisheries Division

by  
Heather Hettinger  
and  
Tracy Claramunt

May 2019

### **Introduction**

The Boardman River is a 26-mile-long river that flows through Kalkaska and Grand Traverse Counties in the northwestern lower peninsula of Michigan (Figure 1). The Boardman River and its tributaries drain approximately 186,000 acres, or 287 square miles (Kalish et al. 2018). It originates from tributaries in the Mahan swamp near Kalkaska in central Kalkaska County. The Boardman River then flows generally west and then north until it empties into West Grand Traverse Bay of Lake Michigan in downtown Traverse City. Since the removal of Brown Bridge Dam in 2012, Boardman Dam in 2017, and Sabin Dam in 2018, this leaves only one dam in place on the Boardman River. Union Street Dam and its associated fish ladder are slated for reconfiguration beginning in late 2019. Currently, native and desired migratory fish from Lake Michigan have access to only approximately 1.5 miles of river in the lower watershed below the Union Street Dam.

The Boardman River has had two creel surveys conducted under a formal protocol, once in 2005 and this most recent survey in 2015. From April through October of 2015, the Michigan Department of Natural Resources (MDNR), Fisheries Division conducted a survey to assess the level of angler-effort, fish harvest, and fish catch on the Boardman River. This report summarizes the results of these surveys.

### **Methods**

Angler surveys were conducted on the Boardman River during 2005 and most recently in 2015. The 2015 survey area included approximately 45 miles of the Boardman River. The surveys followed a roving (instantaneous)-access design. Funding was provided by the Federal Aid to Sport Fish Restoration Project F-81, Study 230499. Two creel clerks each worked 40-hours per week to complete the surveys from April through October (Table 1). Two weekend days and three weekdays were randomly selected for sampling during each week of the survey season. No holidays were sampled. Clerks followed a randomized count and interview schedule. One of two shifts was selected each sample day. The May to September survey consisted of a portion of the Boardman River from the mouth at West Grand Traverse Bay upstream to the Mill Pond in Kalkaska that was divided into 4 sites during the period from May through September: 1.) Mouth to Beitner Road, 2.) Beitner Road to Brown Bridge Road, 3.) Brown Bridge Road to The Forks, and 4.) The Forks to the Mill Pond in Kalkaska. During a week, each section was sampled every other scheduled day. One creel clerk was used to sample Site 1a (a portion of site 1) in April and October, as this was the only stretch of river open to fishing during those months.

The starting point within a river section for collecting interviews and performing a count was alternated daily following a randomized schedule. Angler counts were made each day by boat, starting at the most

upstream location of the Site and paddling downstream to the lower end of the Site. Counts were made of shore and boat anglers separately. Angler effort and fish catch was estimated from the angler interview and count information.

One count of boat and shore anglers was made each survey day for the section of river sampled. Clerks interviewed each individual shore fishing angler or boat anglers (combined) that returned to the access Sites 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. Anglers were usually interviewed at the end of their fishing trip, rather than during their fishing trip. Interviews were collected at 16 locations on the river (Table 2).

Estimates of two measures of fishing effort: angler-hours and angler-trips were generated from these angler surveys. An angler-trip was one completed fishing excursion, with a minimum restriction of at least one hour spent fishing. Other estimates generated from this creel survey included: number of fish harvested (caught and kept by anglers), number of fish caught (harvested and released by anglers) and species-specific harvest and catch rates. Separate estimates were made for both boat and shore modes of fishing, for each month (Tables 3- 16). 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).

## Results

Results will be broken up into parts for discussion; first for Sites 1,2,3, and 4 during the months when the entire river is open to fishing (May-September), then for Site 1a during the extending season months (April and October)

The number of angler-hours at Site 1 during the months of May, June, July, August, and September, for shore and boat anglers combined was estimated at 10,692 (Table 5). Estimated total fish harvested for those months included the following; 89 Walleye, 91 Smallmouth Bass, 472 Rock Bass, 248 Rainbow Trout (Steelhead), 42 Chinook Salmon, and 55 Coho Salmon. Estimated total fish released for those months included the following; 59 Northern Pike, 3,494 Smallmouth Bass, 105 Yellow Perch, 2,575 Rock Bass, 1,790 Rainbow Trout (Steelhead), 1,023 Brown Trout, 222 Brook Trout, 291 Carp, 49 Coho Salmon, and 1,249 additional fish.

Site 2 data was only reported from shore anglers (Table 6). The number of angler hours at Site 2 during the months of May, June, July, August, and September was 2,122. No fish were reported harvested at this site during the survey. Estimated total fish released for those months included the following; 98 Rock Bass, 294 Rainbow Trout (Steelhead), and 578 Brown Trout.

The number of angler-hours at Site 3 during the months of May, June, July, August, and September, for shore and boat anglers combined was estimated at 2,509 (Table 9). Estimated total fish harvested for those months included the following; 22 Brown Trout and 179 Brook Trout. Estimated total fish released for those months included 595 Brown Trout and 1,353 Brook Trout.

Site 4 data was only reported from shore anglers (Table 10). The number of angler hours at Site 4 during the months of May, June, July, August, and September was 664. Estimated total fish harvested for those

months included the following; 39 Brown Trout and 150 Brook Trout. Estimated total fish released for those months included 645 Brown Trout and 298 Brook Trout.

Site 1a is open to angling during the extended season months of April and October. This resulted in an additional 7,540 angling hours (Table 16). These two months alone equaled nearly half of the total hours (15,987 (Table 13)) produced at all four sites combined during the months of May, June, July, August, and September. Estimated total fish harvested for those months included the following; seven Brown Trout, 42 Chinook Salmon, 52 Coho Salmon, 213 Rainbow Trout (Steelhead), and 737 Lake Trout. Estimated total fish released for those months included 595 Brown Trout and 1,353 Brook Trout. Estimated total fish released included the following: 36 Walleye, 94 White Sucker, 69 Chinook Salmon, 83 Coho Salmon, 362 Lake Trout, 1,192 Brown Trout, 1,310 Rainbow Trout (Steelhead), and 108 fish reported as “other”.

## **Discussion**

The Boardman River, from its mouth at West Grand Traverse Bay to the Kalkaska Mill Pond, provides a significant multiple-species fishery. Based on the estimated number of angler-trips (9,683) calculated for 2015 value of this fishery to the local economy was \$377,637 (estimating one trip per day, using a value of \$39 per day from: U.S. Department of the Interior 2013). The estimate is most likely low, as there was not enough creel data available to make an estimate of angler-trips for shore/wading anglers at some sites. Seasonally, estimated angler effort was greatest during April (4,130 hours), May (4,024 hours), and October (3,410 hours), during the peak Steelhead, Coho Salmon, and Chinook salmon spawning runs. June was also a high effort month, with 3,956 hours occurring in Sites 1 and 3. Most likely this is a combination of trout anglers in Site 3, and tourism bringing in cool/warm water anglers in Site 1. These estimates do not include fishing that occurred after dark or during the winter season. Though not many rivers or streams in Michigan have had complete creel estimates compiled, based on the information we do have, angling effort overall on the Boardman river is low to moderate when compared to other systems across the State (Table 17).

The angler surveys conducted in 2015 provide the most complete and recent angler-use information for the Boardman River. Some comparisons to the 2005 survey can be made, although the 2005 creel survey only covered from the Forks Access site down to the river mouth at Lake Michigan. This encompasses Sites 1, 2, and 3 in the 2015 survey, but excludes Site 4. Seasonally, estimated angler effort was again greatest in the spring with April/May (4,905 hours) seeing the most effort. In both surveys Rock Bass was the species anglers harvested the most, with 422 fish harvested in 2005 and 472 fish harvested in 2015. Smallmouth bass was the species with the highest angler release in both surveys as well, with 4,120 fish released in 2005 and 3,494 fish released in 2015.

Angling trips on the Boardman River differed slightly in 2015 when compared to 2005. A total of 9,683 trips by anglers were estimated for 2015, while the trip estimate for 2005 was 8,955. This is an increase of 728 trips, or 8.13%. Again the 2005 survey effort only encompassed Sites 1-3, so by adding Site 4 we can account for an estimated 254 trips. While not exact this shows us that the angling effort on the Boardman River did increase slightly in the 10 years between creel surveys.

### Fish stocking considerations

A substantial number of fish are stocked into the lower Boardman River each year, including Steelhead, Chinook Salmon, and Coho Salmon. Use of the fisheries by anglers is one measure that can help determine the benefits of fish stocking. The total annual cost of fish stocking in the lower Boardman River, for all species allocated in the Fisheries Division Management Prescription during 2015, was

\$114,972. The cost by species is as follows: Steelhead yearlings at 17,600 fish - \$29,216; Chinook Salmon spring fingerlings at 60,130 fish- \$25,856; and Coho Salmon yearlings at 63,724 fish- \$59,900.

Fish stocking in Michigan follows the criteria and recommendations provided in the Michigan Fish Stocking Guidelines II; with Periodic Updates (Dexter and O'Neal 2004). Fish stocking in the Boardman River is also guided by the recommendations provided in the Boardman River Assessment (Kalish et. al, 2018). Important native fish species that are currently under study and included in management and stocking decisions include Walleye, Lake Sturgeon, Lake Trout, Smallmouth Bass, Rock Bass, Yellow Perch, and White Sucker. The benefits to the fisheries in the lower Boardman River of stocking the naturalized species of trout and salmon are clearly evident in the angler catch information.

### Fishing regulations

The Type 1 regulation has been used for Sites 2, 3, and 4, as well as the uppermost portion of Site 1 (from Sabin Dam upstream to Beitner Road). The Type 3 regulation has been used through 2015 for most of Site 1. This regulation allows the harvest of migratory steelhead and brown trout throughout the year. The Type 3 regulation establishes a higher size limit of 15 inches for brown trout and rainbow trout. The higher size limit does not affect the fishery because the number of trout smaller than 15 inches is low in this river section.

As the dams are removed and habitat for fish and other aquatic species is improved upon, the fishing regulations on the Boardman River may be up for review. It would be prudent to let the river adjust to the drastic changes that have occurred in its corridor and allow for a few years of fish community sampling and population estimates to occur at various locations in the watershed before these regulations are decided upon.

## **Conclusions and Management Recommendations**

Management of the Boardman River fishery requires consideration of many factors including the life history of the ecologically and recreationally important fish that inhabit the system, the physical habitat characteristics of the watershed, and the integrated fisheries and issues with Lake Michigan. These considerations guide the management recommendations presented below. There are currently 56 species of fish in the watershed that include important sport fish, threatened and endangered species, and invasive species. The principal guiding document for management of the fisheries resources is the Boardman River Assessment.

1. Angler-use of the lower Boardman River is high. The fishery provides substantial economic benefits to the local economy, as well as fresh fish to anglers. Fishing occurs throughout the year, with peaks that occur in April and October that are associated with Steelhead, Coho Salmon, Lake Trout and Chinook Salmon spawning runs. Substantial angling occurs from shore. Non-fishing watercraft use is also substantial in this river section. Angler access is good in this stretch of river.

Recommendation: Another angler survey should be conducted to determine if changes have occurred in the fishery and use of the fishery. This survey should include measures of guided anglers and non-fishing watercraft use (person hours). Including survey periods after dark would provide information to evaluate the amount of night fishing effort and fish catch occurring in the river.

2. Angler –use of the middle and upper Boardman River is moderate to low. Fishing occurs throughout the summer months, partially due to Type 1 stream designations. Substantial angling occurs from shore/wading. Non-fishing watercraft use is also substantial in this river section. Angler access is good but could be improved upon in certain reaches.

Recommendation: Boardman River angler access points should be evaluated, improved upon, and locations for new or improved access sites should be investigated.

3. The fisheries encompassing the mainstem of the Boardman River provide substantial recreational and economic benefits to the watershed. The lower river section, from the former Sabin Dam location to Lake Michigan, has the most intensive angler-use rates. Angler effort is high in this river section because of the good angler access, the Lake Michigan migratory spawning runs of Steelhead, Coho Salmon, Lake Trout, and Chinook Salmon, and abundance of coolwater fish for summer fisheries. Based on the existing river fisheries downstream of the former Sabin Dam site, there is the potential for significant fisheries improvements upstream with dam removals, fish passage, and improved angler access.

Recommendation: Angler use information found in this report, along with other resource information, should be used to promote the ongoing dam removals, moving forward with fish passage improvements, and improving angler access.

## References

Dexter, J. L., Jr., and R. P. O’Neal, editors. 2004. Michigan fish stocking guidelines II: with periodic updates. Michigan Department of Natural Resources, Fisheries Special Report 32, Ann Arbor.

Kalish, T.G., M.A. Tonello, and H.L. Hettinger. 2018. Boardman River assessment. Michigan Department of Natural Resources. Fisheries Report 31, Lansing.

Lockwood, R. N., D. M. Benjamin, and J. R. Bence. 1999. Estimating angling effort and catch from Michigan roving and access Site angler survey data. Michigan Department of Natural Resources, Fisheries Division Research Report Number 2044, Ann Arbor.

U.S. Department of the Interior, Fish and Wildlife Service, and U.S. Department of Commerce, Bureau of the Census. [2013]. 2011 National survey of fishing, hunting and wildlife associated recreation (<http://www.census.gov/prod/2013pubs/fhw11-mi.pdf>).

Figure 1. Angler survey Sites used on the Boardman River.

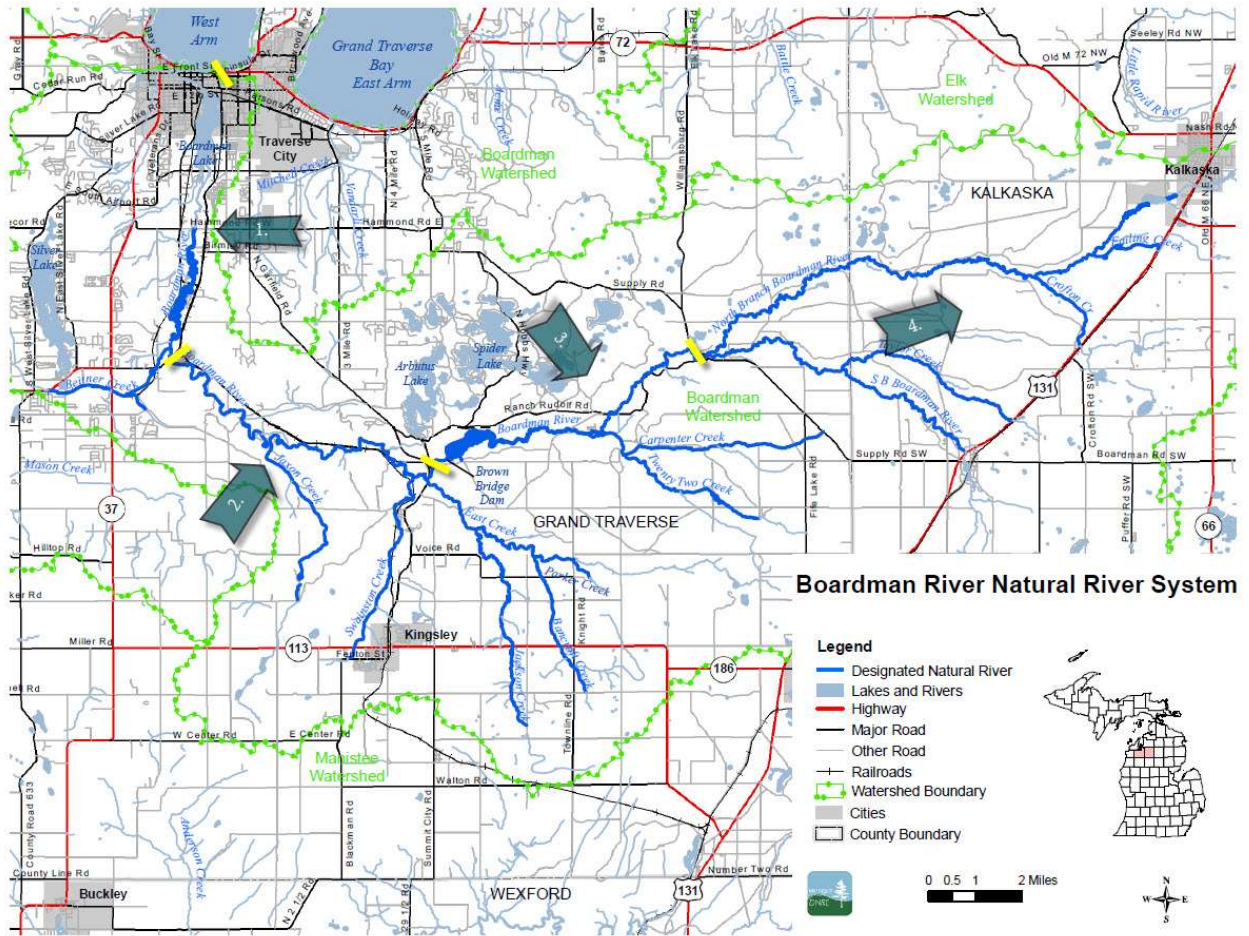


Table 1. Daylight hours used to estimate catch and effort on the Boardman River from the mouth to Kalkaska, May 1 to September 30, 2015 and mouth to Sabin Dam, April 1-30 and October 1-31, 2015.

<b>Year</b>	<b>Month</b>	<b>Daylight hours</b>
2015	4	15
2015	5	15
2015	6	16
2015	7	16
2015	8	15
2015	9	14
2015	10	12

Table 2. Interview locations for the Boardman River angler surveys.

Location	County	Site Number	Boat Access	Shore Fishing
Boardman River Boardwalk	Grand Traverse	1	X	X
Boardman Weir	Grand Traverse	1		X
Union Street Dam	Grand Traverse	1		X
Boardman Lake (Hull Park)	Grand Traverse	1	X	X
Sabin Dam	Grand Traverse	1		X
Boardman Dam	Grand Traverse	1	X	X
Beitner Road	Grand Traverse	1	X	X
Shumsky's Access	Grand Traverse	1& 2	X	X
Garfield Road	Grand Traverse	2	X	X
Brown Bridge Road	Grand Traverse	2	X	X
Brown Bridge Quiet Area	Grand Traverse	2	X	X
Scheck's Place	Grand Traverse	3	X	X
The Fork's State Forest Campground	Grand Traverse	3	X	X
Multiple Road Crossings on the North Branch	GT & Kalkaska	4		X
Multiple Road Crossings on the South Branch	GT & Kalkaska	4		X
Kalkaska Mill Pond	Kalkaska	4		X



Table 3. Estimated harvest, catch per hour, and fishing pressure for the Site 1, Mouth to Beitner Road, boat fishery. Two standard errors are given below the estimates.

Species	C/H	May	June	July	August	September	Season
<b>HARVEST</b>							
Walleye	-	-	-	-	-	-	-
Smallmouth Bass	-	-	-	-	-	-	-
Rock Bass	-	-	-	-	-	-	-
Rainbow Trout	0.2409 1.0823	49 NAN	-	-	-	-	49 196
Brown Trout	-	-	-	-	-	-	-
Brook Trout	-	-	-	-	-	-	-
Chinook Salmon	-	-	-	-	-	-	-
Coho Salmon	-	-	-	-	-	-	-
TOTAL HARVEST	0.2409 1.0823	49 NAN	-	-	-	-	49 196
<b>RELEASED</b>							
Northern pike	-	-	-	-	-	-	-
Smallmouth bass	1.9272 8.6580	392 NAN	-	-	-	-	392 1,567
Yellow Perch	-	-	-	-	-	-	-
Rock bass	-	-	-	-	-	-	-
Rainbow trout	-	-	-	-	-	-	-
Brown trout	-	-	-	-	-	-	-
Brook trout	-	-	-	-	-	-	-
Carp	-	-	-	-	-	-	-
Coho salmon	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-
TOTAL RELEASED	1.9272 8.6580	392 NAN	-	-	-	-	392 1,567
TOTAL CATCH	2.1682 8.9452	441 NAN	-	-	-	-	441 1,580
ANGLER HOURS		86 NAN	-	-	-	118 235	203 416
ANGLER TRIPS		69 NAN	-	-	-	94 192	163 335

Table 4. Estimated harvest, catch per hour, and fishing pressure for the Site 1, Mouth to Beitner Road, shore fishery. Two standard errors are given below the estimates.

Species	C/H	May	June	July	August	September	Season
<b>HARVEST</b>							
Walleye	0.0085	44	45	-	-	-	89
	0.0120	87	89	-	-	-	124
Smallmouth Bass	0.0087	71	-	20	-	-	91
	0.0098	93	-	40	-	-	101
Rock Bass	0.0450	-	472	-	-	-	472
	0.0904	-	943	-	-	-	943
Rainbow Trout	0.0190	14	-	185	-	-	199
	0.0272	28	-	281	-	-	282
Brown Trout	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
Brook Trout	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
Chinook Salmon	0.0040	-	-	-	-	42	42
	0.0044	-	-	-	-	46	46
Coho Salmon	0.0053	-	-	-	-	55	55
	0.0078	-	-	-	-	82	82
<b>TOTAL HARVEST</b>	0.0904	129	516	205	-	97	948
	0.0971	131	947	284	-	93	1,002
<b>RELEASED</b>							
Northern pike	0.0056	-	59	-	-	-	59
	0.0113	-	118	-	-	-	118
Smallmouth bass	0.2957	918	586	1,319	279	-	3,102
	0.1575	843	622	1,045	414	-	1,536
Yellow Perch	0.0100	-	-	47	58	-	105
	0.0141	-	-	76	125	-	146
Rock bass	0.2455	76	1,105	1,343	51	-	2,575
	0.1517	117	764	1,291	102	-	1,509
Rainbow trout	0.1707	540	134	812	299	6	1,790
	0.1122	731	266	756	291	11	1,123
Brown trout	0.0975	254	207	146	416	-	1,023
	0.0588	357	299	259	238	-	584
Brook trout	0.0212	-	-	129	-	94	222
	0.0307	-	-	257	-	189	319
Carp	0.0278	220	71	-	-	-	291
	0.0433	440	98	-	-	-	450
Coho salmon	0.0047	49	-	-	-	-	49
	0.0094	98	-	-	-	-	98
Other	0.1191	250	948	51	-	-	1,249
	0.0910	247	882	102	-	-	922
<b>TOTAL RELEASED</b>	0.9977	2,306	3,110	3,847	1,103	99	10,465
	0.3252	1,284	1,390	1,866	582	189	2,727
<b>TOTAL CATCH</b>	1.0881	2,436	3,626	4,052	1,103	197	11,413
	0.3495	1,291	1,682	1,887	582	211	2,905
<b>ANGLER HOURS</b>		2,477	2,704	1,989	1,680	1,638	10,488
		1,071	837	1,185	774	605	2,054
<b>ANGLER TRIPS</b>		1,385	1,346	1,021	743	842	5,336
		630	516	705	579	357	1,274

Table 5. Estimated harvest, catch per hour, and fishing pressure for the Site 1, Mouth to Beitner Road, combined boat and shore fishery. Two standard errors are given below the estimates.

Species	C/H	May	June	July	August	September	Season
<b>HARVEST</b>							
Walleye	0.0083	44	45	-	-	-	89
	0.0142	87	89	-	-	-	124
Smallmouth Bass	0.0085	71	-	20	-	-	91
	0.0126	93	-	40	-	-	101
Rock Bass	0.0441	-	472	-	-	-	472
	0.0981	-	943	-	-	-	943
Rainbow Trout	0.0232	63	-	185	-	-	248
	0.0419	NAN	-	281	-	-	377
Brown Trout	-	-	-	-	-	-	-
Brook Trout	-	-	-	-	-	-	-
Chinook Salmon	0.0039	-	-	-	-	42	42
	0.0057	-	-	-	-	46	46
Coho Salmon	0.0052	-	-	-	-	55	55
	0.0091	-	-	-	-	82	82
TOTAL HARVEST	0.0932	178	516	205	-	97	997
	0.1460	NAN	947	284	-	93	1,223
<b>RELEASED</b>							
Northern pike	0.0055	-	59	-	-	-	59
	0.0123	-	118	-	-	-	118
Smallmouth bass	0.3267	1,309	586	1,319	279	-	3,494
	0.5962	NAN	622	1,045	414	-	5,393
Yellow Perch	0.0099	-	-	47	58	-	105
	0.0167	-	-	76	125	-	146
Rock bass	0.2408	76	1,105	1,343	51	-	2,575
	0.2735	117	764	1,291	102	-	1,509
Rainbow trout	0.1674	540	134	812	299	6	1,790
	0.1938	731	266	756	291	11	1,123
Brown trout	0.0956	254	207	146	416	-	1,023
	0.1079	357	299	259	238	-	584
Brook trout	0.0208	-	-	129	-	94	222
	0.0360	-	-	257	-	189	319
Carp	0.0272	220	71	-	-	-	291
	0.0498	440	98	-	-	-	450
Coho salmon	0.0046	49	-	-	-	-	49
	0.0102	98	-	-	-	-	98
Other	0.1168	250	948	51	-	-	1,249
	0.1427	247	882	102	-	-	922
TOTAL RELEASED	1.0154	2,698	3,110	3,847	1,103	99	10,857
	1.4302	NAN	1,390	1,866	582	189	11,057
TOTAL CATCH	1.1087	2,876	3,626	4,052	1,103	197	11,853
	1.4987	NAN	1,682	1,887	582	211	11,124
ANGLER HOURS		2,563	2,704	1,989	1,680	1,756	10,692
		NAN	837	1,185	774	649	10,403
ANGLER TRIPS		1,453	1,346	1,021	743	936	5,499
		NAN	516	705	579	405	5,920

Table 6. Estimated harvest, catch per hour, and fishing pressure for the Site 2, Beitner Road to Brown Bridge, shore fishery. Two standard errors are given below the estimates.

Species	C/H	May	June	July	August	September	Season
<b>HARVEST</b>							
Walleye	-	-	-	-	-	-	-
Smallmouth Bass	-	-	-	-	-	-	-
Rock Bass	-	-	-	-	-	-	-
Rainbow Trout	-	-	-	-	-	-	-
Brown Trout	-	-	-	-	-	-	-
Brook Trout	-	-	-	-	-	-	-
Chinook Salmon	-	-	-	-	-	-	-
Coho Salmon	-	-	-	-	-	-	-
TOTAL HARVEST	-	-	-	-	-	-	-
<b>RELEASED</b>							
Northern pike	-	-	-	-	-	-	-
Smallmouth bass	-	-	-	-	-	-	-
Yellow Perch	-	-	-	-	-	-	-
Rock bass	0.0462	-	-	98	-	-	98
	0.1857	-	-	NAN	-	-	393
Rainbow trout	0.1387	-	-	294	-	-	294
	0.5572	-	-	NAN	-	-	1,178
Brown trout	0.2721	578	-	-	-	-	578
	1.0929	NAN	-	-	-	-	2,310
Brook trout	-	-	-	-	-	-	-
Carp	-	-	-	-	-	-	-
Coho salmon	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-
TOTAL RELEASED	0.4571	578	-	393	-	-	970
	1.3265	NAN	-	NAN	-	-	2,793
TOTAL CATCH	0.4571	578	-	393	-	-	970
	1.3265	NAN	-	NAN	-	-	2,793
ANGLER HOURS		374	368	587	495	298	2,122
		235	388	415	345	314	772
ANGLER TRIPS		NAN	NAN	NAN	NAN	NAN	-
		NAN	NAN	NAN	NAN	NAN	-

Table 7. Estimated harvest, catch per hour, and fishing pressure for the Site 3, Brown Bridge to Forks, boat fishery. Two standard errors are given below the estimates.

Species	C/H	May	June	July	August	September	Season
<b>HARVEST</b>							
Walleye	-	-	-	-	-	-	-
Smallmouth Bass	-	-	-	-	-	-	-
Rock Bass	-	-	-	-	-	-	-
Rainbow Trout	-	-	-	-	-	-	-
Brown Trout	-	-	-	-	-	-	-
Brook Trout	-	-	-	-	-	-	-
Chinook Salmon	-	-	-	-	-	-	-
Coho Salmon	-	-	-	-	-	-	-
TOTAL HARVEST	-	-	-	-	-	-	-
<b>RELEASED</b>							
Northern pike	-	-	-	-	-	-	-
Smallmouth bass	-	-	-	-	-	-	-
Yellow Perch	-	-	-	-	-	-	-
Rock bass	-	-	-	-	-	-	-
Rainbow trout	-	-	-	-	-	-	-
Brown trout	0.3862	10	70	-	-	-	81
	1.8567	NAN	NAN	-	-	-	285
Brook trout	0.2178	10	35	-	-	-	46
	0.9997	NAN	NAN	-	-	-	147
Carp	-	-	-	-	-	-	-
Coho salmon	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-
TOTAL RELEASED	0.6039	21	106	-	-	-	126
	2.8525	NAN	NAN	-	-	-	430
TOTAL CATCH	0.6039	21	106	-	-	-	126
	2.8525	NAN	NAN	-	-	-	430
ANGLER HOURS		165	44	-	-	-	209
		NAN	NAN	-	-	-	683
ANGLER TRIPS		67	18	-	-	-	85
		NAN	NAN	-	-	-	277

Table 8. Estimated harvest, catch per hour, and fishing pressure for the Site 3, Brown Bridge to Forks, shore fishery. Two standard errors are given below the estimates.

Species	C/H	May	June	July	August	September	Season
<b>HARVEST</b>							
Walleye	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
Smallmouth Bass	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
Rock Bass	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
Rainbow Trout	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
Brown Trout	0.0096	-	18	-	-	5	22
	0.0126	-	26	-	-	9	28
Brook Trout	0.0779	-	-	-	-	179	179
	0.3133	-	-	-	-	NAN	717
Chinook Salmon	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
Coho Salmon	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
<b>TOTAL HARVEST</b>	0.0876	-	18	-	-	184	201
	0.3218	-	26	-	-	NAN	736
<b>RELEASED</b>							
Northern pike	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
Smallmouth bass	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
Yellow Perch	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
Rock bass	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
Rainbow trout	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
Brown trout	0.2236	-	373	71	11	59	514
	0.2186	-	422	142	22	118	461
Brook trout	0.5683	432	290	178	349	59	1,307
	0.9762	NAN	NAN	280	608	110	2,187
Carp	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
Coho salmon	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
<b>TOTAL RELEASED</b>	0.7918	432	663	249	360	118	1,821
	1.4425	NAN	NAN	314	608	161	3,241
<b>TOTAL CATCH</b>	0.8794	432	681	249	360	302	2,023
	1.4850	NAN	NAN	314	608	NAN	3,324
<b>ANGLER HOURS</b>		674	524	275	218	609	2,300
		483	378	331	310	470	895
<b>ANGLER TRIPS</b>		270	210	109	96	249	933
		217	194	149	142	197	407

Table 9. Estimated harvest, catch per hour, and fishing pressure for Site 3, Brown Bridge to Forks, combined boat and shore fishery. Two standard errors are given below the estimates.

Species	C/H	May	June	July	August	September	Season
<b>HARVEST</b>							
Walleye	-	-	-	-	-	-	-
Smallmouth Bass	-	-	-	-	-	-	-
Rock Bass	-	-	-	-	-	-	-
Rainbow Trout	-	-	-	-	-	-	-
Brown Trout	0.0088	-	18	-	-	5	22
	0.0182	-	26	-	-	9	28
Brook Trout	0.0715	-	-	-	-	179	179
	0.3088	-	-	-	-	NAN	717
Chinook Salmon	-	-	-	-	-	-	-
Coho Salmon	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
<b>TOTAL HARVEST</b>	0.0803	-	18	-	-	184	201
	0.3214	-	26	-	-	NAN	736
<b>RELEASED</b>							
Northern pike	-	-	-	-	-	-	-
Smallmouth bass	-	-	-	-	-	-	-
Yellow Perch	-	-	-	-	-	-	-
Rock bass	-	-	-	-	-	-	-
Rainbow trout	-	-	-	-	-	-	-
Brown trout	0.2371	10	444	71	11	59	595
	0.8102	NAN	NAN	142	22	118	1,785
Brook trout	0.5391	442	325	178	349	59	1,353
	1.2712	NAN	NAN	280	608	110	2,296
Carp	-	-	-	-	-	-	-
Coho salmon	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
<b>TOTAL RELEASED</b>	0.7762	452	769	249	360	118	1,948
	1.9269	NAN	NAN	314	608	161	3,636
<b>TOTAL CATCH</b>	0.8565	452	786	249	360	302	2,149
	2.0371	NAN	NAN	314	608	NAN	3,709
<b>ANGLER HOURS</b>		839	568	275	218	609	2,509
		NAN	NAN	331	310	470	4,106
<b>ANGLER TRIPS</b>		337	227	109	96	249	1,018
		NAN	NAN	149	142	197	1,650

Table 10. Estimated harvest, catch per hour, and fishing pressure for the Site 4, Forks to Kalkaska, shore fishery. Two standard errors are given below the estimates.

Species	C/H	May	June	July	August	September	Season
<b>HARVEST</b>							
Walleye	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
Smallmouth Bass	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
Rock Bass	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
Rainbow Trout	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
Brown Trout	0.0591	-	39	-	-	-	39
	0.0698	-	40	-	-	-	40
Brook Trout	0.2266	-	39	-	111	-	150
	0.2970	-	40	-	171	-	175
Chinook Salmon	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
Coho Salmon	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
<b>TOTAL HARVEST</b>	<b>0.2857</b>	<b>-</b>	<b>78</b>	<b>-</b>	<b>111</b>	<b>-</b>	<b>190</b>
	<b>0.3205</b>	<b>-</b>	<b>56</b>	<b>-</b>	<b>171</b>	<b>-</b>	<b>180</b>
<b>RELEASED</b>							
Northern pike	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
Smallmouth bass	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
Yellow Perch	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
Rock bass	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
Rainbow trout	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
Brown trout	0.9716	-	634	-	11	-	645
	1.0145	-	551	-	17	-	551
Brook trout	0.4491	66	65	-	167	-	298
	0.5811	191	122	-	256	-	342
Carp	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
Coho salmon	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
<b>TOTAL RELEASED</b>	<b>1.4207</b>	<b>66</b>	<b>699</b>	<b>-</b>	<b>178</b>	<b>-</b>	<b>943</b>
	<b>1.2966</b>	<b>191</b>	<b>564</b>	<b>-</b>	<b>256</b>	<b>-</b>	<b>648</b>
<b>TOTAL CATCH</b>	<b>1.7064</b>	<b>66</b>	<b>777</b>	<b>-</b>	<b>289</b>	<b>-</b>	<b>1,132</b>
	<b>1.4409</b>	<b>191</b>	<b>567</b>	<b>-</b>	<b>308</b>	<b>-</b>	<b>673</b>
<b>ANGLER HOURS</b>		<b>248</b>	<b>316</b>	<b>-</b>	<b>100</b>	<b>-</b>	<b>664</b>
		<b>335</b>	<b>178</b>	<b>-</b>	<b>122</b>	<b>-</b>	<b>398</b>
<b>ANGLER TRIPS</b>		<b>132</b>	<b>89</b>	<b>-</b>	<b>33</b>	<b>-</b>	<b>254</b>
		<b>263</b>	<b>72</b>	<b>-</b>	<b>49</b>	<b>-</b>	<b>277</b>



Table 11. Estimated harvest, catch per hour, and fishing pressure for the Boardman River all sites combined boat fishery. Two standard errors are given below the estimates.

Species	C/H	May	June	July	August	September	Season
<b>HARVEST</b>							
Walleye	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
Smallmouth Bass	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
Rock Bass	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
Rainbow Trout	0.1188	49	-	-	-	-	49
	0.5625	NAN	-	-	-	-	196
Brown Trout	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
Brook Trout	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
Chinook Salmon	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
Coho Salmon	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
<b>TOTAL HARVEST</b>	0.1188	49	-	-	-	-	49
	0.5625	NAN	-	-	-	-	196
<b>RELEASED</b>							
Northern pike	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
Smallmouth bass	0.9503	392	-	-	-	-	392
	4.5002	NAN	-	-	-	-	1,567
Yellow Perch	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
Rock bass	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
Rainbow trout	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
Brown trout	0.1958	10	70	-	-	-	81
	0.8501	NAN	NAN	-	-	-	285
Brook trout	0.1104	10	35	-	-	-	46
	0.4526	NAN	NAN	-	-	-	147
Carp	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
Coho salmon	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
<b>TOTAL RELEASED</b>	1.2565	412	106	-	-	-	518
	5.2155	NAN	NAN	-	-	-	1,703
<b>TOTAL CATCH</b>	1.3753	461	106	-	-	-	567
	5.4255	NAN	NAN	-	-	-	1,714
<b>ANGLER HOURS</b>		251	44	-	-	118	412
		NAN	NAN	-	-	235	1,045
<b>ANGLER TRIPS</b>		135	18	-	-	94	247
		NAN	NAN	-	-	192	579

Table 12. Estimated harvest, catch per hour, and fishing pressure for the Boardman River all sites combined shore fishery. Two standard errors are given below the estimates.

Species	C/H	May	June	July	August	September	Season
<b>HARVEST</b>							
Walleye	0.0057	44	45	–	–	–	89
	0.0080	87	89	–	–	–	124
Smallmouth Bass	0.0059	71	–	20	–	–	91
	0.0066	93	–	40	–	–	101
Rock Bass	0.0303	–	472	–	–	–	472
	0.0607	–	943	–	–	–	943
Rainbow Trout	0.0128	14	–	185	–	–	199
	0.0182	28	–	281	–	–	282
Brown Trout	0.0039	–	57	–	–	5	61
	0.0032	–	48	–	–	9	49
Brook Trout	0.0212	–	39	–	111	179	330
	0.0475	–	40	–	171	NAN	738
Chinook Salmon	0.0027	–	–	–	–	42	42
	0.0030	–	–	–	–	46	46
Coho Salmon	0.0035	–	–	–	–	55	55
	0.0053	–	–	–	–	82	82
TOTAL HARVEST	0.0860	129	612	205	111	281	1,339
	0.0981	131	949	284	171	NAN	1,514
<b>RELEASED</b>							
Northern pike	0.0038	–	59	–	–	–	59
	0.0076	–	118	–	–	–	118
Smallmouth bass	0.1991	918	586	1,319	279	–	3,102
	0.1033	843	622	1,045	414	–	1,536
Yellow Perch	0.0068	–	–	47	58	–	105
	0.0094	–	–	76	125	–	146
Rock bass	0.1716	76	1,105	1,441	51	–	2,673
	0.3745	117	764	NAN	102	–	5,818
Rainbow trout	0.1339	540	134	1,107	299	6	2,085
	0.2899	731	266	NAN	291	11	4,504
Brown trout	0.1771	831	1,214	217	438	59	2,759
	0.2221	NAN	756	296	240	118	3,433
Brook trout	0.1173	498	355	306	516	153	1,827
	0.1660	NAN	NAN	380	660	219	2,570
Carp	0.0187	220	71	–	–	–	291
	0.0291	440	98	–	–	–	450
Coho salmon	0.0031	49	–	–	–	–	49
	0.0063	98	–	–	–	–	98
Other	0.0802	250	948	51	–	–	1,249
	0.0605	247	882	102	–	–	922
TOTAL RELEASED	0.9117	3,381	4,471	4,488	1,641	217	14,199
	1.8506	NAN	NAN	NAN	880	248	28,739
TOTAL CATCH	0.9976	3,511	5,084	4,693	1,752	499	15,538
	1.8542	NAN	NAN	NAN	897	NAN	28,779
ANGLER HOURS		3,774	3,912	2,851	2,493	2,545	15,575
		1,244	1,012	1,299	910	828	2,403
ANGLER TRIPS		NAN	NAN	NAN	NAN	NAN	–
		NAN	NAN	NAN	NAN	NAN	–

Table 13. Estimated harvest, catch per hour, and fishing pressure for the Boardman River all sites and modes combined. Two standard errors are given below the estimates.

Species	C/H	May	June	July	August	September	Season
<b>HARVEST</b>							
Walleye	0.0056	44	45	–	–	–	89
	0.0111	87	89	–	–	–	124
Smallmouth Bass	0.0057	71	–	20	–	–	91
	0.0103	93	–	40	–	–	101
Rock Bass	0.0295	–	472	–	–	–	472
	0.0723	–	943	–	–	–	943
Rainbow Trout	0.0155	63	–	185	–	–	248
	0.0322	NAN	–	281	–	–	377
Brown Trout	0.0038	–	57	–	–	5	61
	0.0062	–	48	–	–	9	49
Brook Trout	0.0206	–	39	–	111	179	330
	0.0546	–	40	–	171	NAN	738
Chinook Salmon	0.0026	–	–	–	–	42	42
	0.0047	–	–	–	–	46	46
Coho Salmon	0.0035	–	–	–	–	55	55
	0.0071	–	–	–	–	82	82
TOTAL HARVEST	0.0868	178	612	205	111	281	1,388
	0.1613	NAN	949	284	171	NAN	1,669
<b>RELEASED</b>							
Northern pike	0.0037	–	59	–	–	–	59
	0.0090	–	118	–	–	–	118
Smallmouth bass	0.2185	1,309	586	1,319	279	–	3,494
	0.4578	NAN	622	1,045	414	–	5,393
Yellow Perch	0.0066	–	–	47	58	–	105
	0.0131	–	–	76	125	–	146
Rock bass	0.1672	76	1,105	1,441	51	–	2,673
	0.4342	117	764	NAN	102	–	5,818
Rainbow trout	0.1304	540	134	1,107	299	6	2,085
	0.3369	731	266	NAN	291	11	4,504
Brown trout	0.1776	842	1,284	217	438	59	2,840
	0.4599	NAN	NAN	296	240	118	6,155
Brook trout	0.1172	508	390	306	516	153	1,873
	0.2360	NAN	NAN	380	660	219	2,682
Carp	0.0182	220	71	–	–	–	291
	0.0382	440	98	–	–	–	450
Coho salmon	0.0031	49	–	–	–	–	49
	0.0075	98	–	–	–	–	98
Other	0.0781	250	948	51	–	–	1,249
	0.1248	247	882	102	–	–	922
TOTAL RELEASED	0.9206	3,794	4,577	4,488	1,641	217	14,717
	2.2753	NAN	NAN	NAN	880	248	29,809
TOTAL CATCH	1.0074	3,972	5,189	4,693	1,752	499	16,105
	2.3502	NAN	NAN	NAN	897	NAN	29,855
ANGLER HOURS		4,024	3,956	2,851	2,493	2,663	15,987
		NAN	NAN	1,299	910	861	22,645
ANGLER TRIPS		NAN	NAN	NAN	NAN	NAN	–
		NAN	NAN	NAN	NAN	NAN	–

Table 14. Estimated harvest, catch per hour, and fishing pressure for the Site 1a, mouth to Sabin boat fishery. Two standard errors are given below the estimates.

Species	C/H	April	October	Season
<b>HARVEST</b>				
Rainbow Trout	-	-	-	-
	-	-	-	-
Brown Trout	0.0192	7	-	7
	0.0679	14	-	14
Lake Trout	-	-	-	-
	-	-	-	-
Chinook Salmon	-	-	-	-
	-	-	-	-
Coho Salmon	-	-	-	-
	-	-	-	-
<b>TOTAL HARVEST</b>	0.0192	7	-	7
	0.0679	14	-	14
<b>RELEASED</b>				
Walleye	-	-	-	-
	-	-	-	-
Rainbow trout	0.1303	13	32	45
	0.5265	28	NAN	131
Brown trout	0.0192	7	-	7
	0.0641	12	-	12
Common White Sucker	-	-	-	-
	-	-	-	-
Lake trout	0.3438	84	36	120
	1.4290	NAN	NAN	365
Chinook salmon	0.0918	-	32	32
	0.4497	-	NAN	128
Coho salmon	0.0918	-	32	32
	0.4497	-	NAN	128
Other	-	-	-	-
	-	-	-	-
<b>TOTAL RELEASED</b>	0.6769	104	132	236
	2.7173	NAN	NAN	672
<b>TOTAL CATCH</b>	0.6961	111	132	243
	2.7562	NAN	NAN	672
<b>ANGLER HOURS</b>		172	177	349
		NAN	NAN	986
<b>ANGLER TRIPS</b>		67	69	136
		NAN	NAN	385

Table 15. Estimated harvest, catch per hour, and fishing pressure for the Site 1a, mouth to Sabin shore fishery. Two standard errors are given below the estimates.

Species	C/H	April	October	Season
<b>HARVEST</b>				
Rainbow Trout	0.0296	166	47	213
	0.0220	137	72	154
Brown Trout	–	–	–	–
	–	–	–	–
Lake Trout	0.1024	–	737	737
	0.0539	–	367	367
Chinook Salmon	0.0058	–	42	42
	0.0068	–	49	49
Coho Salmon	0.0072	–	52	52
	0.0074	–	52	52
<b>TOTAL HARVEST</b>	0.1450	166	877	1,043
	0.0614	137	381	405
<b>RELEASED</b>				
Walleye	0.0050	36	–	36
	0.0074	53	–	53
Rainbow trout	0.1758	1,020	244	1,264
	0.1202	801	244	838
Brown trout	0.1648	1,169	16	1,185
	0.1869	1,329	32	1,329
Common White Sucker	0.0131	94	–	94
	0.0198	141	–	141
Lake trout	0.0337	–	243	243
	0.0315	–	222	222
Chinook salmon	0.0052	19	19	37
	0.0075	39	37	54
Coho salmon	0.0071	36	16	51
	0.0109	71	32	78
Other	0.0150	108	–	108
	0.0166	118	–	118
<b>TOTAL RELEASED</b>	0.4197	2,482	536	3,018
	0.2337	1,566	336	1,601
<b>TOTAL CATCH</b>	0.5647	2,648	1,413	4,061
	0.2487	1,572	508	1,651
<b>ANGLER HOURS</b>		3,959	3,233	7,191
		779	932	1,215
<b>ANGLER TRIPS</b>		1,485	1,292	2,776
		407	418	583

Table 16. Estimated harvest, catch per hour, and fishing pressure for the Site 1a, mouth to Sabin combined boat and shore fishery. Two standard errors are given below the estimates.

Species	C/H	April	October	Season
<b>HARVEST</b>				
Rainbow Trout	0.0282	166	47	213
	0.0827	137	72	154
Brown Trout	0.0009	7	–	7
	0.0031	14	–	14
Lake Trout	0.0977	–	737	737
	0.2818	–	367	367
Chinook Salmon	0.0055	–	42	42
	0.0169	–	49	49
Coho Salmon	0.0069	–	52	52
	0.0207	–	52	52
<b>TOTAL HARVEST</b>	0.1392	172	877	1,049
	0.3990	137	381	405
<b>RELEASED</b>				
Walleye	0.0047	36	–	36
	0.0152	53	–	53
Rainbow trout	0.1737	1,034	276	1,310
	0.5256	802	NAN	1,364
Brown trout	0.1580	1,176	16	1,192
	0.4824	1,329	32	1,329
Common White Sucker	0.0125	94	–	94
	0.0402	141	–	141
Lake trout	0.0481	84	279	362
	0.2061	NAN	NAN	1,164
Chinook salmon	0.0092	19	51	69
	0.0378	39	NAN	206
Coho salmon	0.0111	36	48	83
	0.0414	71	NAN	204
Other	0.0143	108	–	108
	0.0436	118	–	118
<b>TOTAL RELEASED</b>	0.4316	2,586	668	3,254
	1.8740	NAN	NAN	10,684
<b>TOTAL CATCH</b>	0.5708	2,758	1,545	4,304
	2.1543	NAN	NAN	10,691
<b>ANGLER HOURS</b>		4,130	3,410	7,540
		NAN	NAN	21,423
<b>ANGLER TRIPS</b>		1,552	1,361	2,912
		NAN	NAN	8,255

Table 17. Creel survey angler trip estimates for 37 Michigan streams or stream segments.

<b>Stream</b>	<b>Year</b>	<b>Estimated Angler Trips</b>
Tahquamenon River	2015	70
Sucker River	2005	389
Huron River (Belleville Dam to Jefferson Access)	2007	4,483
Menominee River (Menominee River Park to Ansul Island)	2005	8,164
Clinton River	2005	8,776
Boardman River (Lower only)	2005	8,955
<b>Boardman River</b>	<b>2015</b>	<b>9,683</b>
AuSable (Mio Impoundment down to McKinley Bridge)	2009	11,140
Kalamazoo River (Allegan Dam to New Richmond)	2004	19,092
Betsie River	2010	31,391
Pere Marquette (M37 to Old US31)	2011	50,921
Manistee River	2016	62,394

