Adult Steelhead Assessment 2012

By: Jon George (MNR), (NWSI), ion.george@ontario.ca (939-3113)

Co-op Angler 2012

(A partnership in science between the Ontario Ministry of Natural Resources and the North Shore Steelhead Association)

Introduction

- Three steelhead assessment projects were conducted during the spring of 2012.
- They are:

  A) McIntyre River Steelhead Population Assessment

  B) Portage Creek Steelhead Population Assessment

  C) Co-op Angler Study
- All studies were conducted in partnership with the North Shore Steelhead Association (NSSA) and the Ontario Ministry of Natural Resources (OMNR).
- This report summarizes the three studies and discusses the overall health of steelhead stocks from Thunder Bay to Marathon (Lake Superior).

Steelhead Assessment 2012 (A partnership between MNR and the NSSA)

Methods

A) McIntyre River Steelhead Population Assessment

Four experienced anglers biologically sampled, fin clipped and tagged adult steelhead they captured while angling during the spring spawning migration (April and May).

B) Portage Creek Steelhead Population Assessment

OMNR staff and anglers from the NSSA angled, biologically sampled, fin clipped and tagged adult steelhead during the spring spawning migration (April and May)

C) Co-op Angler Study

Steelhead anglers from the North Shore Steelhead Association, in conjunction with the Ontario Ministry of Natural Resources, collected 1307 adult steelhead data samples (fork length, sex and scales) from twenty Lake Superior tributary streams from Thunder Bay to Marathon (April and May 2012). Two tributaries, McIntyre River (Thunder Bay) and Portage Creek (Black Bay), were used as 'Index Streams' to estimate the steelhead population size in each basin. Sampling kits (knife, measuring tape, gloves, scale envelopes, pencil and instructions) were supplied to interested anglers. Anglers were requested to sample adult steelhead during their angling endeavours between April and June. Names and email addresses were recorded from anglers receiving kits. Samples were to be returned to OMNR by mid-June.

Notes:

Life history data (Appendix 1), extracted from the scale samples (Figure 1) and the data entry in an Excel data base were conducted by North Shore Environmental Services (NSES). On the McIntyre River and Portage Creek, the adult population size was determined using an annular fin clip series shown in Appendices 2 and 3.

The population estimates were based on a 'Petersen Population Estimate' shown in Appendices 4 and 5. Adult steelhead are fin clipped in year one and recaptured in year two. The repeat spawners with fin clips in year two complete the formula.

Collecting the data

Sample Kit

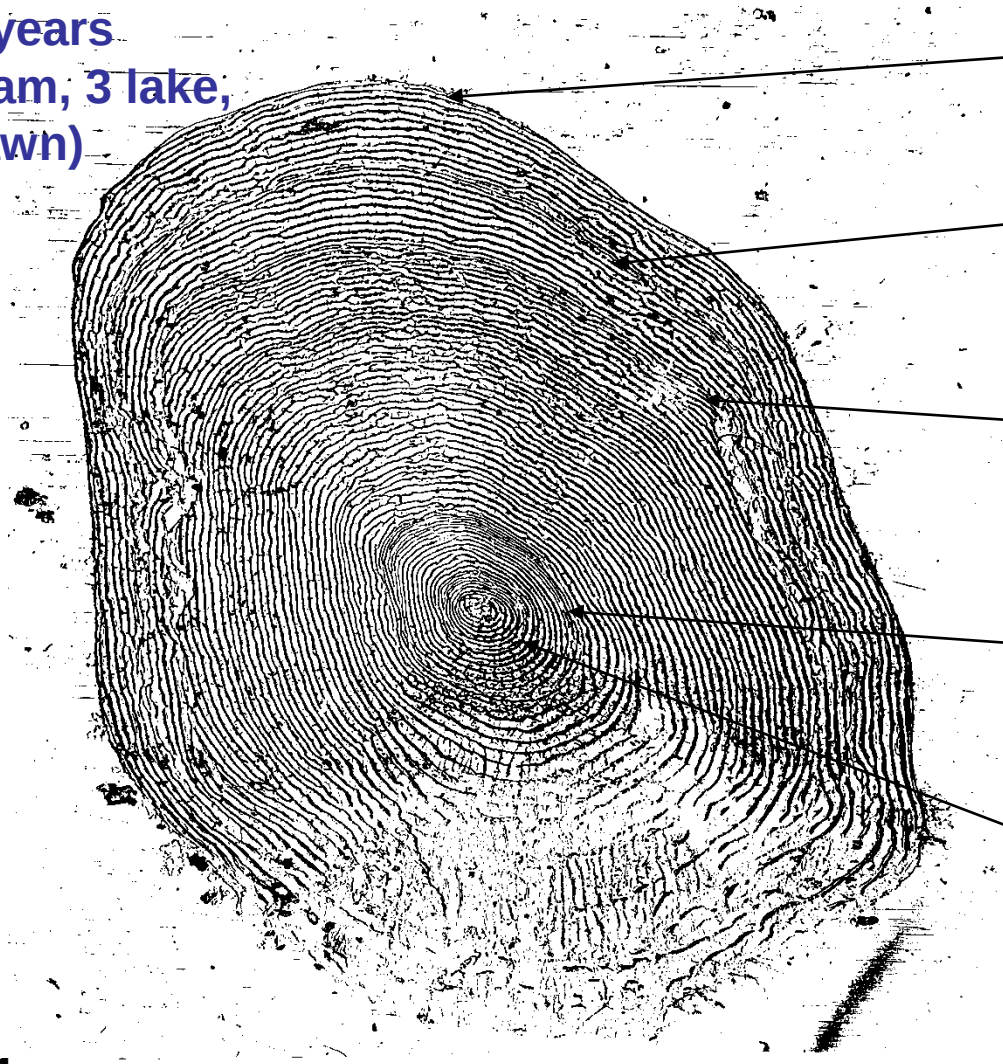
Measuring length

Gender (male or female ?)

Scale Sample

Life History Extrapolation

Steelhead Scale:
Age 5 years
(2 stream, 3 lake, 3rd spawn)



Third Lake Year, Third Spawn

Second Lake Year, Second Spawn

First Lake Year, First Spawn

Second Stream Year

First Stream Year

Figure 1.

Table 1

Steelhead Samples by Tributary 2012

	Basin	Tributary	Sample Size
A	Thunder Bay	Cloud River	1
		Whitefish River	42
		Neebing River	10
		McIntyre River	410
		McVicar Creek	84
		Current River	3
		Blind Creek	6
		MacKenzie River	22
		Sibley Creek	4
B	Black Bay	Portage Creek	150
		Coldwater River (Spring Creek)	36
		Wolf and Black Sturgeon Rivers	18
C	Nipigon to Marathon	Jack Pine River	125
		Cypress River	330
		McInnis Creek	3
		Little Gravel River	2
		Big Gravel River	11
		Hewittson River	2
		Steel River	20
		Prairie River	28

McIntyre, Portage Creek Population Trends

These two graphs indicate the trends in adult steelhead population size up to the present time. Figure A is the McIntyre River, Thunder Bay, Figure B is Portage Creek, Black Bay.

Figure A

The McIntyre River maintained a population size of approximately 400 adults from 1999 to 2003. In 2004, the adult population shows an increase to 900,1500 in 2008 and to over 2000 in 2010 and 2011.

Catch limits were reduced from five per day to two per day (one over 50cm, one under 50 cm) in 1996, and to one per day (maximum size of 69 cm) in the spring of 1999.

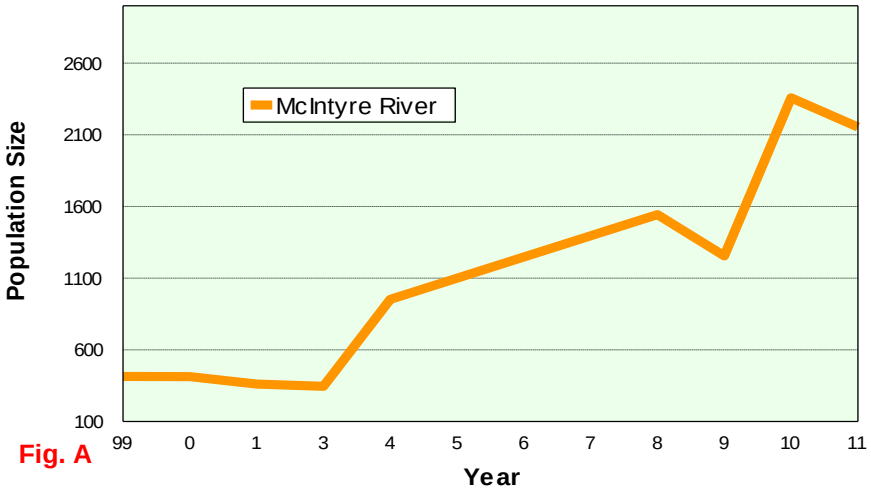


Fig. A

Note: 1999 to 2004 (Counting Fence), 2008 to 2011 (Petersen est.)

Figure B

The dominant angling locations on Portage Creek were closed to angling in 1994. From 1994 to 2000,the adult steelhead population slowly rose with the increase in survival to older ages. Strong recruitment from the 1998, 2000 and 2001 year classes dramatically increased the adult population size to over 2000 individuals by 2004. The adult population remained over 1600 until 2008. From 2008 to the present, the population has declined and stabilized at 600 individuals.

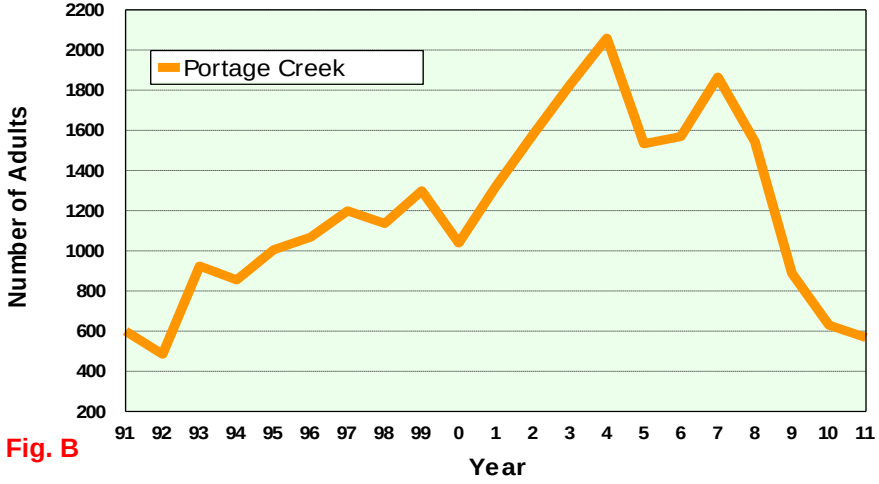


Fig. B

Thunder Bay

In the Thunder Bay basin, the following tributaries were sampled: Whitefish River, McIntyre River, McVicar Creek and the MacKenzie River.

Figure A

Years 2008 and 2009 were the cool, wet summers that tend to produce large numbers of juvenile steelhead. This is illustrated in Figure A as age four and age three. The age three or 2009 year class are just entering the spawning population and will be most abundant in 2013. The 2007 year class was also strong in all tributaries with the exception of the McIntyre.

Figure B

In Thunder Bay, most of the larger tributaries (Kam, Neebing and McIntyre Rivers) support juvenile steelhead for two years prior to migrating (smolting) to Lake Superior.

Smaller streams, i.e. Wildgoose and Blind Creeks, have a dominance of age one smolts. The MacKenzie River is an exception….a larger river with age one smolts dominant in the adult population.

Age Structure 2012

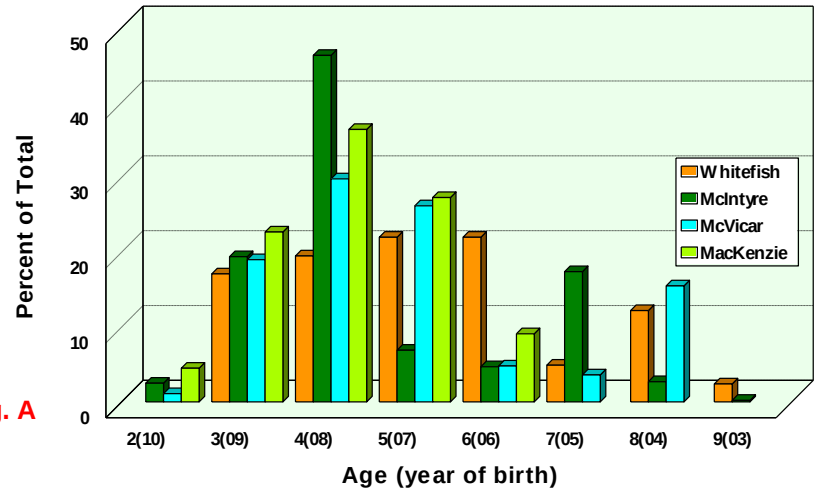


Fig. A

Number of Stream Years 2012

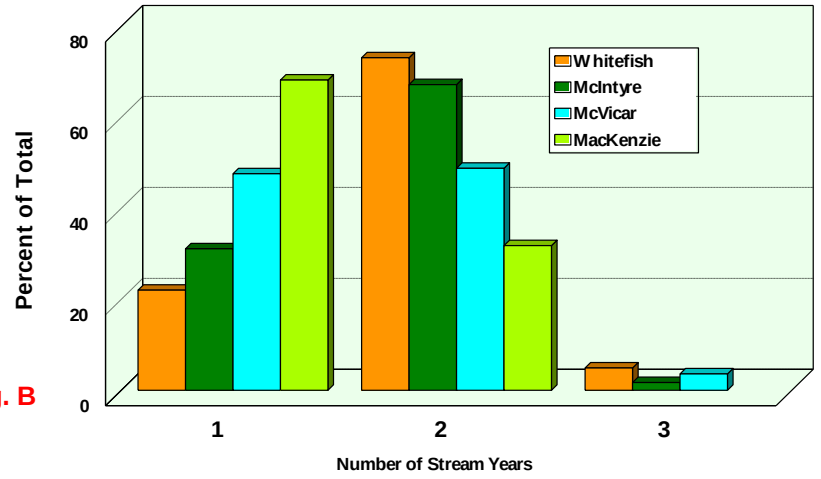


Fig. B

Black Bay

Three Black Bay tributaries were sampled in the spring of 2012: Portage Creek, Coldwater River and Wolf River.

Figure A

The two cool, wet summers of 2008 and 2009 were strongly represented in the spawning runs this spring. The 2004 year class (now age eight years) still has significant representation in the Coldwater River and Portage Creek. The Wolf River showed strength in age seven adults from the 2005 year class.

Figure B

Stream life was divided between one and two years in both the Coldwater and Wolf Rivers. Portage Creek was dominated by age one smolts.

Age Structure 2012

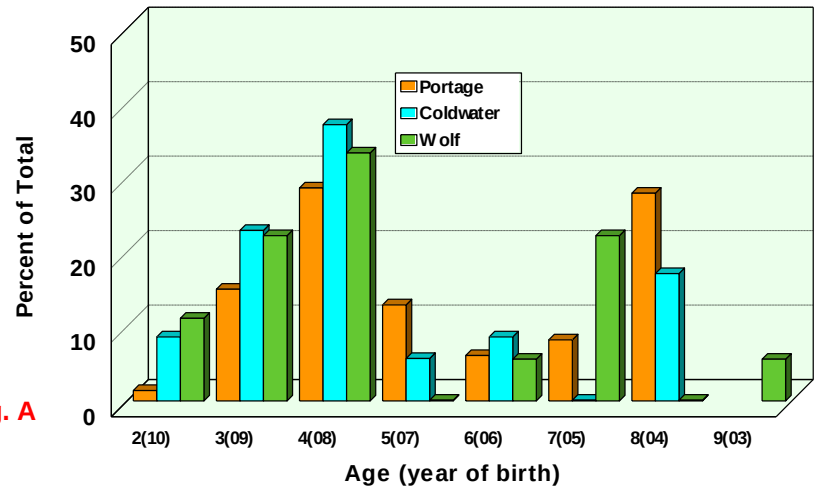


Fig. A

Number of Stream Years 2012

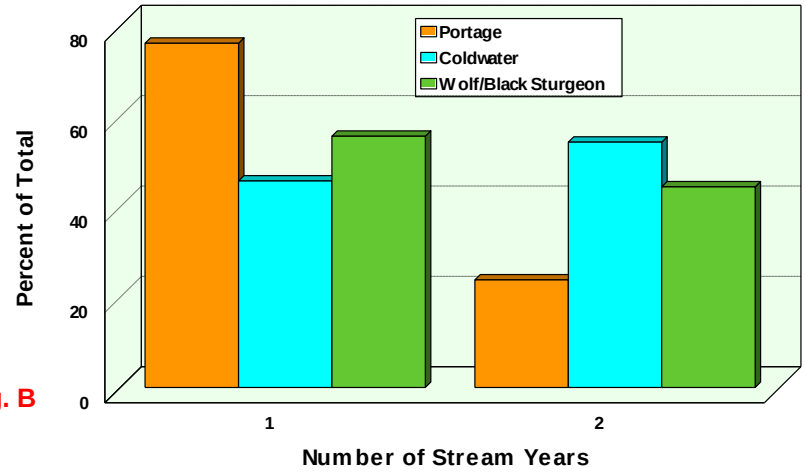


Fig. B

Nipigon to Marathon

The Nipigon to Marathon shoreline of Lake Superior is represented by three larger tributaries: Jackpine, Cypress and Prairie Rivers.

Figure A

The 2009 year class (age three) in the Jackpine and Cypress Rivers was predictably strong (cool, wet summer). The strength of the 2006 year class (drought year) was surprising, especially in the Jackpine and Cypress Rivers. The Cypress River has had six year classes with significant representation in the spawning population, which may have resulted in the high angler success observed in 2012.

Figure B

The Jackpine and Cypress River steelhead have mostly one year of stream life before migrating to Lake Superior. The Prairie River had a dominance of two year smolts. Age three year smolts were rare (Fig. B).

Small tributaries (e.g. McInnis, Little Gavel Creeks) had mostly age one smolts.

Age Structure 2012

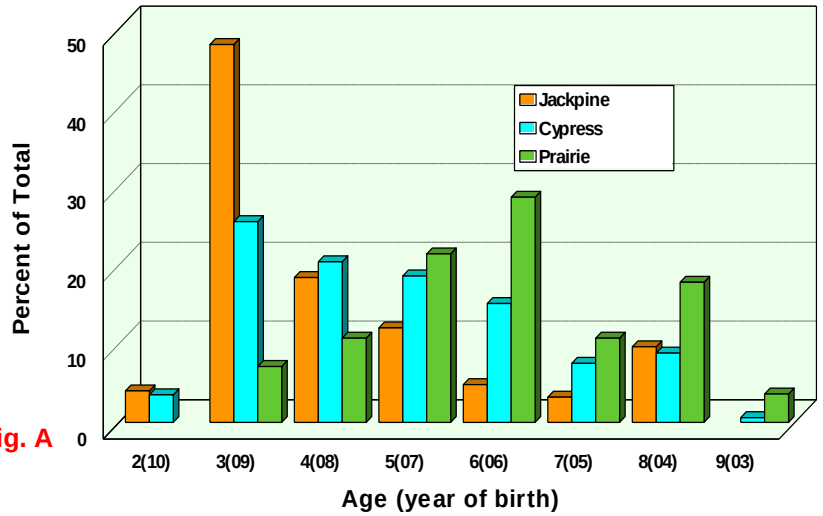


Fig. A

Number of Stream Years 2012

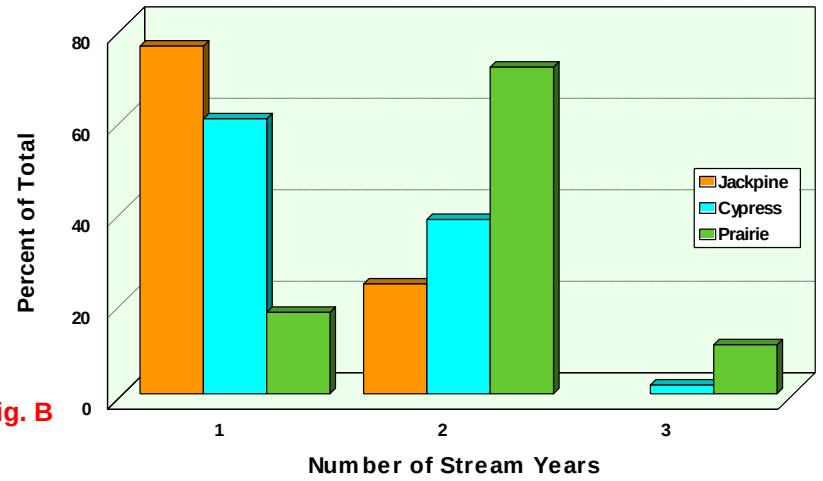


Fig. B

Thunder Bay Steelhead

Figure A

The four Thunder Bay tributaries with larger sample size indicated that maturity occurs at ages three and four. Males matured mostly at age two and three, with females three, four and five years. Ages five and six for first spawn were mainly females.

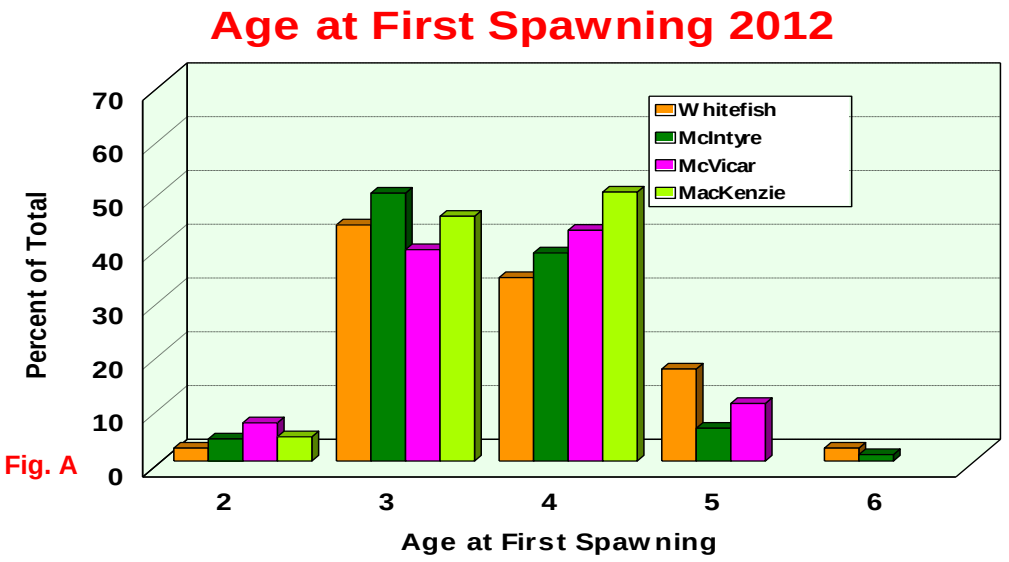


Fig. A

Figure B

In Thunder Bay tributaries, there was a high rate of repeat spawning. The MacKenzie River was the the only one to have less than 50% repeat spawning. Spawning for the fourth, fifth and sixth time was found in all four tributaries. McVicar Creek, with heavy suspected angling pressure in the lower reaches, had an amazing 65.5% repeat spawning rate.

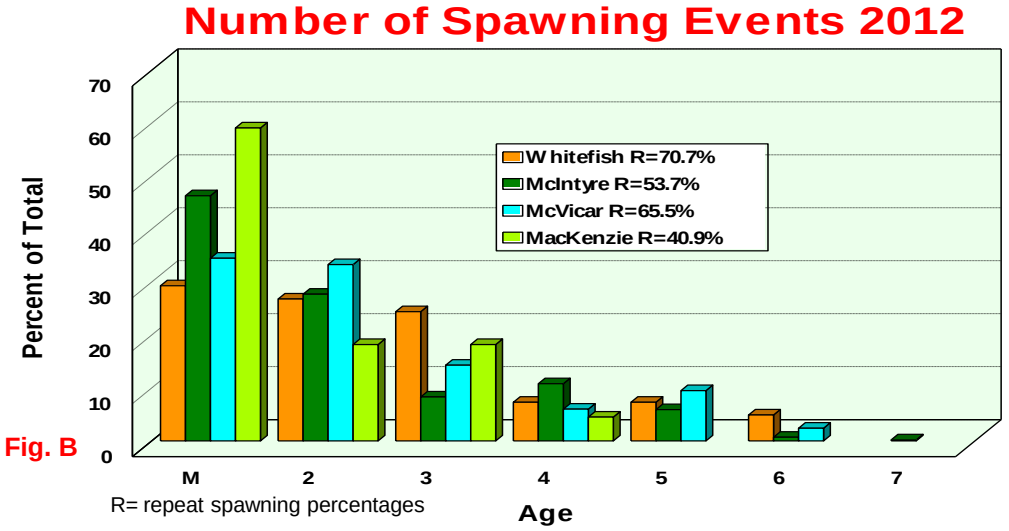


Fig. B

R= repeat spawning percentages

Black Bay Steelhead

Figure A

In the Black Bay tributaries, steelhead matured mostly at three and four years of age. Age two fish were mostly males and steelhead aged five at maturity were predominantly females.

Age at first spawning 2012

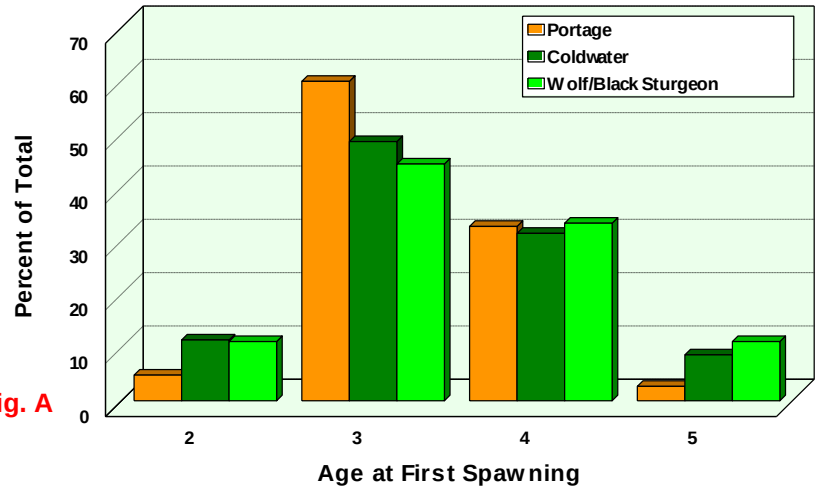


Fig. A

Figure B

All three Black Bay tributaries had repeat spawning rates greater than 50%. Some adult steelhead had spawned up to six times. Portage Creek had an extremely high repeat spawning rate of 75%, probably due to the lack of fishing mortality.

Number of Spawning Events 2012

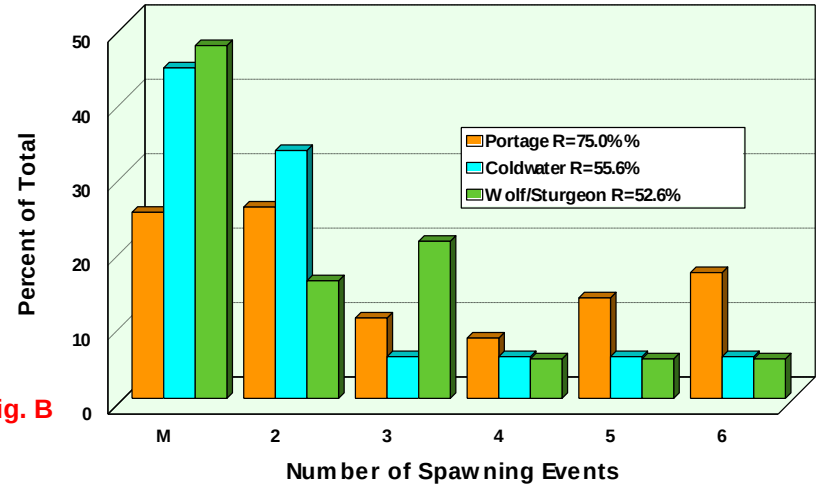


Fig. B

R= repeat spawning percentages

Nipigon to Marathon

Figure A

Maturity occurred at ages three to five, with the exception of the Prairie River where mostly age four and five year old first-time spawners were present. The occasional steelhead in the Cypress and Prairie Rivers delayed maturity until six years of age. Males in all tributaries spawned a year earlier than females.

Age at First Spawning 2012

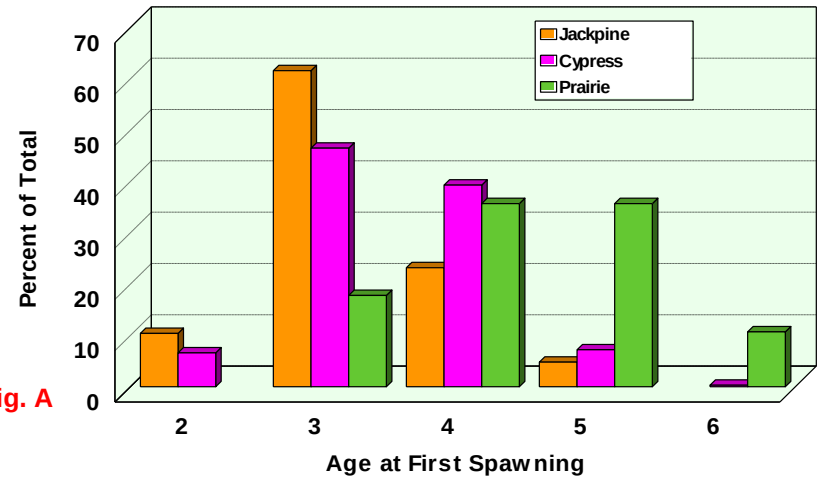


Fig. A

Figure B

Repeat spawning rates exceeded 60% in the Cypress and Prairie Rivers. The Jackpine River had 39% repeat spawners, probably due to the strength of the new recruits from the 2009 year class. Spawning four to six times occurred in all three rivers.

Small streams in the Rossport area had repeat spawning rates of over 50%.

Number of Spawning Events 2012

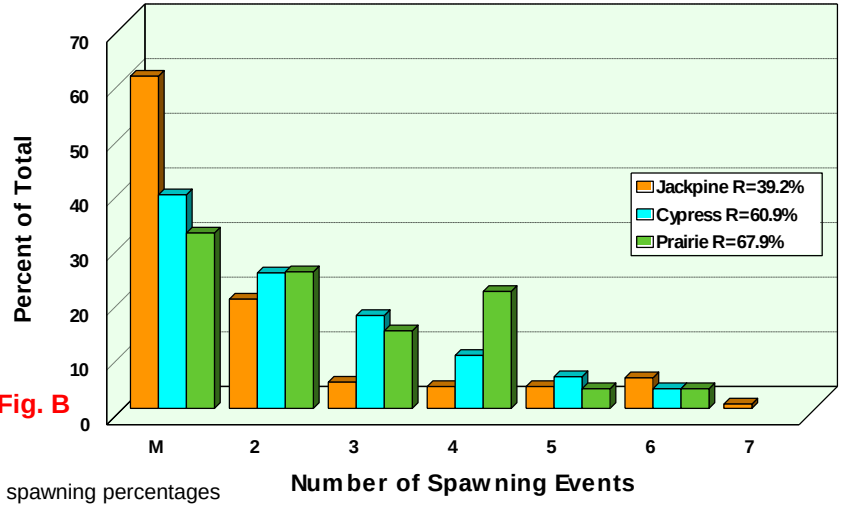


Fig. B

R= repeat spawning percentages

Weight and Age of your Steelhead

Figure A

This graph illustrates the fork length of steelhead (in cm) versus the round weight (in kg). The weight vs. length of Lake Superior steelhead varies considerably. Spawning adults can loose close to 30% of their weight during their spawning migration. Temperature conditions and food supply in Lake Superior affect the condition of steelhead and cause considerable variation in weight. This chart is, therefore, a general guide.

Lake Superior Steelhead

Weight for Length Categories

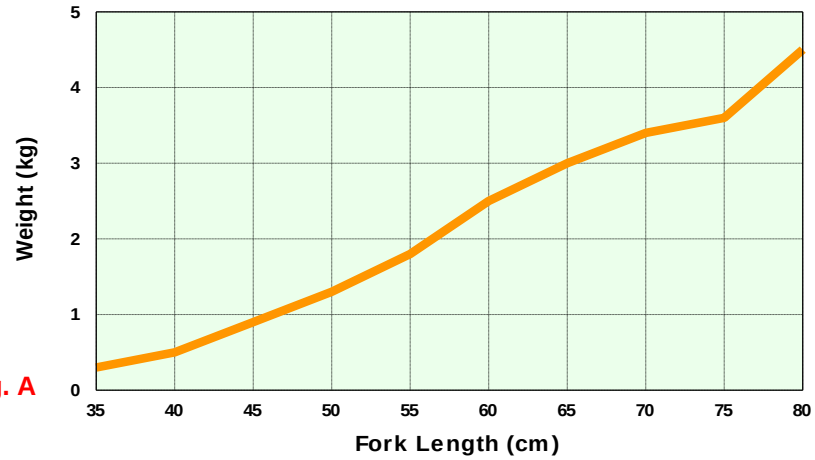


Fig. A

Note: 2.54 cm = 1 in ; 1 kg = 2.2 lb

Figure B

In this graph, the age of steelhead for their fork length (in cm) is shown. Once steelhead reach maturity, their growth in subsequent years slows considerably.

Note: Small steelhead can be very old (matured at young age) and some large steelhead can be quite young (reached maturity later in life).

Lake Superior Steelhead

Fork Length at Age

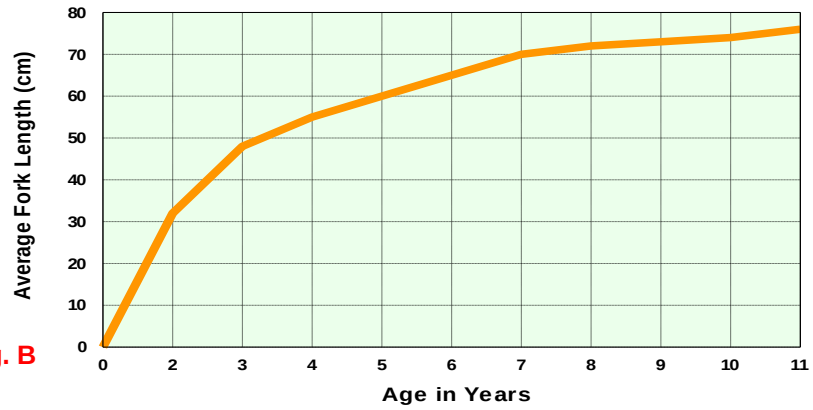


Fig. B

Note: This is s general guide. Growth will vary considerably with maturity, stream life and feeding behavior.

Thunder Bay and Black Bay Population Trends

Figure A

The McIntyre River (Thunder Bay) and Portage Creek (Black Bay) can be used to 'index' the abundance of steelhead in these two basins.

Black Bay (Portage Creek) reached a peak in adult abundance in 2004. The population has now declined to levels seen in the early 1990's. The opposite has occurred in Thunder Bay (McIntyre River). A steady increase in the adult steelhead population has occurred since the mid-2000's. Regulations controlling harvest appears to have benefited Thunder Bay streams.

Black Bay has undergone a change in the fish community…more perch and walleye, which may be affecting the steelhead survival.

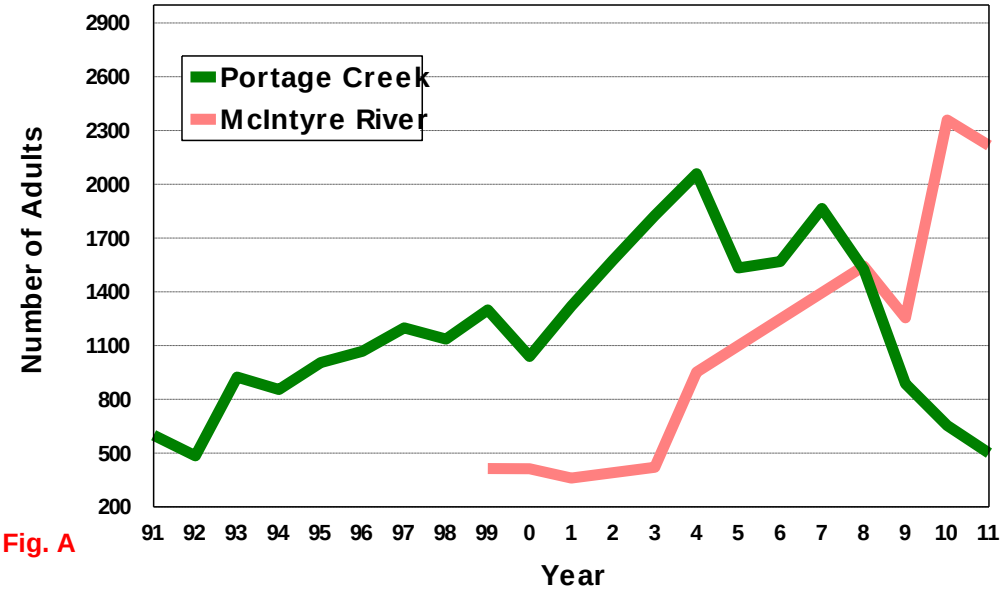


Fig. A

Figure B

This figure illustrates the number of age three year adult steelhead in Portage Creek, by year. The 2004 strong year class is illustrated in Figure B as age three adults in 2007. Since then, no strong year classes have occurred.

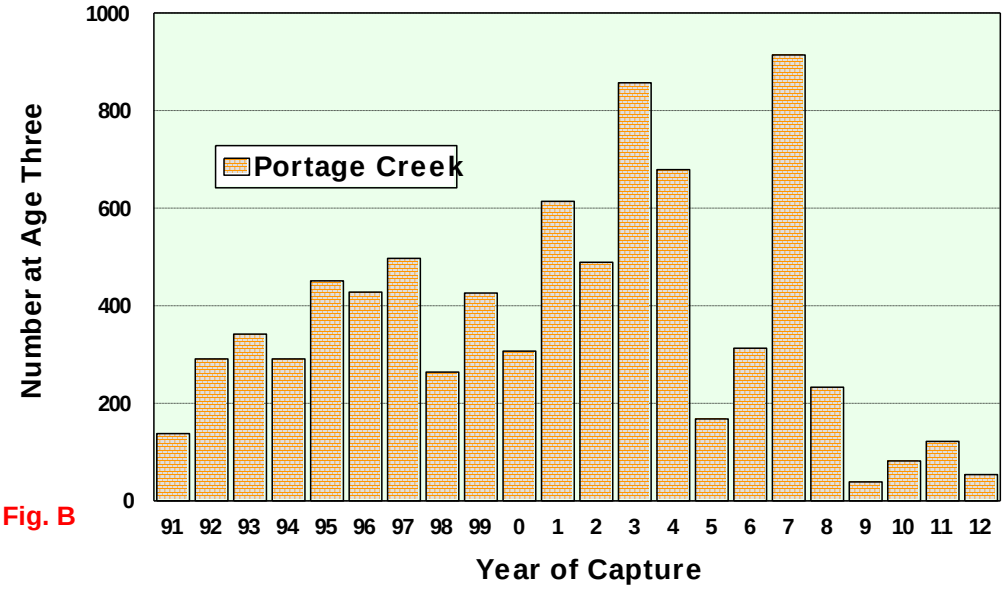


Fig. B

What is happening in Black Bay ??

Figure A

Figure A illustrates age structure as a percent of the total catch. Age distribution in Portage Creek is similar to the McIntyre River with the exception of age four steelhead.

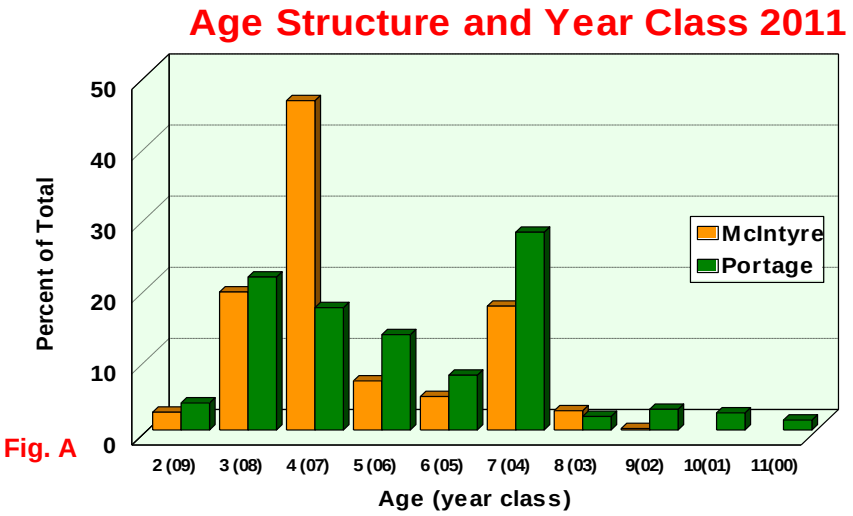


Fig. A

Figure B

Figure B is the age distribution expressed in estimated number of steelhead calculated from the population size. The Portage Creek numbers, by age, are considerably lower due to a smaller population size.

Note: Adult Population estimates for 2011 are based on recaptures from 2012.

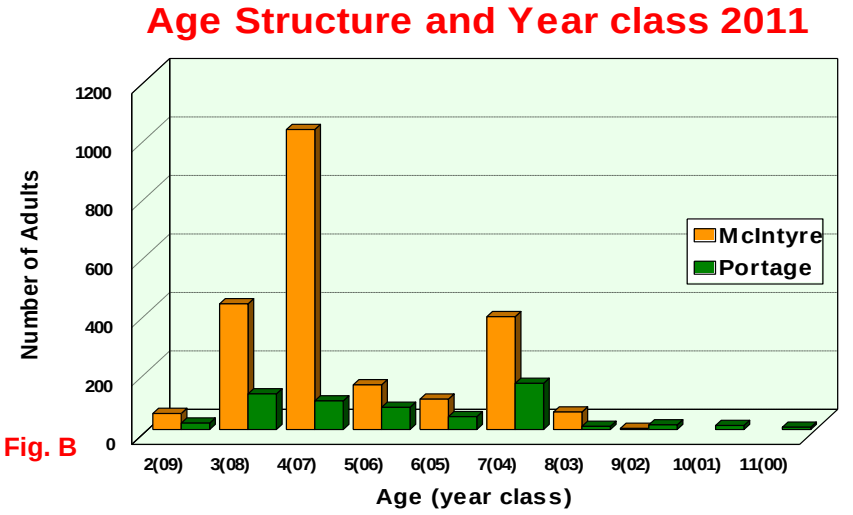


Fig. B

Summary

- The status of the steelhead population in Thunder Bay is a good news story. Based on the present population size in the McIntyre River, the age structure and angler catches, steelhead populations are in better shape than they have been in a long time. This can be attributed to the reduced harvest limits (1996 and 1999) and the strong year classes of 2004, 2007, 2008 and 2009. In order to maintain populations at a high level, we need to continue to minimize harvest so strong year classes can be maintained into the older years and buffer poor year classes with the larger more fecund (high egg production) repeat spawners.

- In the Rossport to Marathon section of Lake Superior, angler success was excellent this spring. Combined with strong recruitment (2009) and high repeat spawning rates, the adult steelhead stocks appear to be in excellent shape.

- Black Bay steelhead populations appear to have declined significantly since the mid 2000's. Portage Creek presently has an adult population size estimated at 600 fish, down from over 2000 adults in 2004. Anglers that fish the Wolf and Coldwater Rivers on a regular basis are observing downward trends, similar to Portage Creek. Environmental conditions are generally similar over large geographic expanses of Lake Superior. The very strong steelhead year classes of 2000 and 2004 were widespread along the north shore of western Lake Superior. With that in mind, the 2007, 2008 and 2009 year classes that were strong in Thunder Bay and the Nipigon / Marathon tributaries should have strength throughout our study area. However, these year classes had poor survival to adults in Black Bay (see Portage Creek 2012 age data). Changes in the Black Bay fish community (increases in walleye, perch and smelt abundance) may be responsible for a decreased survival of juvenile steelhead in the lake environment, resulting in lower recruitment into the spawning population.

Acknowledgements

The author of this report would like to thank the following persons and groups for all their hard work in making these projects successful.

McIntyre River Population Study
Randy Beamish, Wes Bender, Keith Ailey and Terry Kosolowski

Portage Creek Population Study
Tom Kleinboeck (DFO). Mike Deschamps and Davis Viehbeck (OMNR) and NSSA membership

Co-op Angler Steelhead Data Collection
Thanks to all the steelheaders that collected the data.

Aging and Data Management:
Jon Tost, NSES

Funding:
NSSA, Community Fisheries Involvement Program (CFIP)

Corporate Sponsorship:
Yakima Bait Company and Normark Inc., Canada

Web Site:
Frank Edgson

Editing and proofing data report:
Laurie McMillan, OMNR

Appendix 1.

Steelhead life history information from scale samples (recorded on Excel Database)

Coldwater River 2012 data

Flen	Sex	Spw	Lk/Sp	St.	Lk.	Age	Mat.
450	2	1	2	1	2	3	3
380	1	1	1	2	1	3	3
470	1	2	1	2	2	4	3
510	1	2	1	2	2	4	3
580	2	1	2	2	2	4	4
600	2	2	3	2	4	6	5
540	1	2	1	2	2	4	3
340	1	1					
680	2	5	2	2	6	8	4
470	2	1	2	2	2	4	4
510	1	2	1	2	2	4	3
610	2	6	2	1	7	8	3
690	9	4	3	2	6	8	5
640	2	3	2	2	4	6	4
490	1	2	2	1	3	4	3
580	2	1	3	1	3	4	4

Legend: Flen. (fork length), Spw. (# of spawns), Lk/Sp (# lake years @ first spawn), St. (# stream years), Lk. (# lake years), Age (total age), Mat. (age at maturity)

Appendix 2.

McIntyre River Population Study 2008 to 2012
Sampling Procedure

2008 Adipose clip, Sampling: Fork length, sex and scale sample

2009 Right Ventral clip, Sampling: Fork length, sex and scale sample

2010 Left Pectoral clip, Sampling: Fork length, sex and scale sample

2011 Front Dorsal clip, Sampling: Fork length, sex and scale sample, tag

2012 Front Anal clip, Sampling: Fork length, sex and scale sample, tag

Appendix 3.

Portage Creek Tagging and Clipping Summary 2000 to 2012

2000 352 sampled and tagged (pink Floy MNR 26000, Adipose clipped)
2001 376 sampled and tagged (red Floy MNR 28000, Front Dorsal clipped)
2002 605 sampled and tagged (dark blue Floy MNR 30000, Left Ventral clipped)
2003 758 sampled and tagged (yellow Floy MNR 33000, Front Anal clipped)
2004 832 sampled and tagged (green Floy MNR 35000, Right Pectoral clipped)
2005 654 sampled and tagged (orange Floy MNR 39000, Adipose clipped)
2006 627 sampled and tagged (purple Floy MNR 40000, Front Dorsal clipped)
2007 938 sampled and tagged (red Floy MNR 42000, Right Ventral clipped)
2008 707 sampled and tagged (lt. blue Floy MNR 47000, Left Pectoral clipped)
2009 380 sampled and tagged (green Floy MNR 38000, Anal clipped)
2010 289 sampled and tagged (white Floy MNR 44000, Adipose clipped)
2011 211 sampled and tagged (copper Floy MNR 43000, Left Ventral clipped)
2012 150 sampled and tagged (yellow Floy MNR 49000, Right Pectoral clipped)

Appendix 4.

2010 / 2011 McIntyre River Adult Steelhead Estimates

2010 Population Estimate
marked 2010 (LP) X # repeat spawners 2011 / recaps from 2010 (LP)
290 (LP) X (53.7% of 408) 219 / 26 (LP)
2010 POP. = **2358 + - 810** (95% confidence)

2011 Population Estimate
marked 2011 (FD) X # repeat spawners 2012 / recaps from 2011 (FD)
410 (FD) X (67% of 339) 227 / 40 (FD)
2011 pop.= 2216 + - 600 (95% confidence)

LP = Left Pectoral Clip

FD = Front Dorsal Clip

Appendix 5.

McIntyre River Steelhead Population Calculations

McIntyre River										
Population Estimates 2008 to 2011										
Year		#Marked		Repeats		Clips yr. 1		Pop.		95% conf.
		Yr. 1		Yr.2		in Yr. 2		Size		
2008		147		105		10		1543		+- 878
2009		164		199		26		1255		+- 412
2010		280		219		26		2358		+- 810
2011		410		227		42		2216		+- 573