Lower McKenzie River Wild Trout Population Study

2013 End of Season Report and Summary of Years 1-4

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2013 End of Season Report

The study was initiated in 2010 with the intention to be carried out over 5 years. The initial year began after the cessation of planting hatchery-bred triploid rainbow trout in the study section and serves as a baseline. The purpose of the study was to assess the native trout populations within the study section and determine what effects the removal of hatchery trout would have. It was also intended to validate the study methodology. The study section spanned a 5.1 mile section of the McKenzie River: Hendricks Wayside to Bellinger Landing (river mile 24.1 – 19.0).

This report examines trends over the first four years of the study (2010-2013), and is intended as a progress report although we will be discussing with participations opportunities to evolve the study into a longer term surveillance of the health of this trout fishery.

Due to a lawsuit regarding McKenzie River Spring Chinook salmon, the Oregon Department of Fish and Wildlife management denied permission to sample wild trout in 2014; the planned fifth and final year of the study. However, we believe that the four years of data now available allow us to make conclusions regarding the health of the wild trout fishery in the study section.

We encourage questions and comments. Please visit our website at http://www.mckenzietroutstudy.org/ or email redside@mckenzietroutstudy.org

STUDY DETAILS

Our goal going into the 2013 study season was to increase participation and concentrate angler effort in a two-month window. Volunteer participation was better in 2013 than in 2012; more volunteers were involved over more hours and more trips. Good weather and water conditions in 2013 were a welcome change from the two previous years of cold weather and high water. Anglers found substantial success in 2013 as well, with 65 out of 66 trips recording capture of a wild trout.

108 different volunteer anglers have participated in the study as of the end of the 2013 season. Over the four years we have now recorded a total of 1,949 wild trout and 1,156 other fish in 2,558.5 hours of volunteer angling effort and 30.8 hours of electrofishing.

Electrofishing by ODFW played a relatively minor part in generating study data. It was interesting to note that when comparing the length of wild trout captured by either angling or electrofishing there was essentially no difference.

TABLE 1: DATES

	2010	2011	2012	2013
First Angling Trip	March 4	April 29	May 6	May 1
Last Angling Trip	June 25	July 8	August 1	June 29
Days Elapsed	113	70	87	59

TABLE 2: EFFORT

	2010	2011	2012	2013
Angling Trips	80	77	53	66
Participants	48	38	20	35
Angler Hours	756.3	704.9	491.2	606.1
Average Trip Duration	5.06 hours	5.37 hours	5.71 hours	5.12 hours
Electrofishing Hours	10.0	10.5	10.3	6.0[1]

TABLE 3: ANGLER CATCH

	2010	2011	2012	2013
Wild Rainbow Trout	149	200	286	502
Cutthroat Trout	80	224	144	196
Hatchery Rainbow Trout	50	253	142	221
Whitefish	56	26	11	2
Other	3	21	21	13
Total Angler Catch	338	724	604	934

[1] No electrofishing took place in 2013 during the study dates. An ODFW crew attempted to capture fish via seine nets on 6/24/2013; this trip was only somewhat successful with two rainbow trout captured in six hours of effort. ODFW staff conducted one electrofishing / seining survey trip outside of the study dates; since no fish were tagged and no fish recaptured, it is excluded from these results.

STUDY RESULTS

Excellent water conditions and extended periods of good weather spurred anglers into fishing more often in 2013. We captured a total of 700 wild trout in 2013, up from 473 wild trout the previous year.

The aggregate fish captured by both electrofishing/seining and angling for each year are provided in Table 4 below.

TABLE 4: AGGREGATE CATCH (INCLUDES ELECTROFISHING/SEINING)

	2010		2011		2012		2013	
Species	Number	Percent	Number	Percent	Number	Percent	Number	Percent
RB	197	40%	235	26%	312	40%	504	54%
CT	100	20%	244	27%	161	21%	196	21%
Wild Trout	297	60%	479	53%	473	61%	700	75%
WF	83	17%	92	10%	73	10%	2	0%
ChS	11	2%	18	2%	37	5%	13	1%
ChS-H	1	0%	5	1%	2	0%	0	0%
BT	1	0%	1	0%	0	0%	0	0%
Other	6	1%	9	1%	18	2%	0	0%
Other Fish	102	21%	125	14%	130	17%	15	2%
RB-H	56	11%	257	28%	168	22%	221	24%
StS[2]	38	8%	44	5%	0	0%	0	0%
Hatchery	94	19%	301	33%	168	22%	221	24%
Total	493		905		771		936	

RB = Rainbow Trout (Wild)
CT = Cutthroat Trout
WF = Whitefish
ChS = Chinook Salmon Smolt (Wild)
ChS-H = Chinook Salmon Smolt (Hatchery)
BT = Bull Trout (Wild)
Other = Other species
RB-H = Rainbow Trout (Hatchery)
StS = Steelhead Smolt (Hatchery)

[2] In 2011 and beyond, anglers were asked to record StS as RB-H, as it is difficult to distinguish between the two species in the field. ODFW electrofishing crews recorded StS in 2010 and 2011, and began recording as RB-H in 2012.

POPULATION ESTIMATE

The following table shows the number of fish marked and recaptured each year. Numbers in parentheses indicate fish tagged in a previous year.

Some trout were not tagged as they did not meet minimum size requirements (>= 150mm) or were injured and unlikely to survive.

TABLE 5: MARK AND RECAPTURE SUMMARY

	2010			2011			2012			2013		
Species	Tagged	Untagged	Recap.	Tagged	Untagged	Recap.	Tagged	Untagged	Recap.	Tagged	Untagged	Recap.
RB	170	22	5	215	9	11 (3)	259	46	8 (0)	458	46	18 (6)
CT	83	13	4	227	7	10	137	17	6 (1)	175	21	10 (4)

From the mark/recapture results, we can calculate a statistical estimate of the underlying population of species tagged and recaptured (RB and CT).

The Chapman Modified Schnabel Method of population estimation produces the results displayed in Tables 6A-6D on the following page.

TABLE 6A: POPULATION ESTIMATES OF RAINBOW AND CUTTHROAT TROUT IN THE STUDY SECTION: 2010

Species	Pop. Estimate	95% C.L.	Density Per Mile
Native Rainbow Trout	2,736	1,577 – 10,328	536
Cutthroat Trout	820	457 – 3,980	161

TABLE 6B: POPULATION ESTIMATES OF RAINBOW AND CUTTHROAT TROUT IN THE STUDY SECTION: 2011

Species	Pop. Estimate	95% C.L.	Density Per Mile
Native Rainbow Trout	2,667	1,647 – 7,003	523
Cutthroat Trout	2,402	1,533 – 5,538	471

TABLE 6C: POPULATION ESTIMATES OF RAINBOW AND CUTTHROAT TROUT IN THE STUDY SECTION: 2012

Species	Pop. Estimate	95% C.L.	Density Per Mile
Native Rainbow Trout	3,963	2,449 – 10,393	777
Cutthroat Trout	1,904	1,096 – 7,213	373

TABLE 6D: POPULATION ESTIMATES OF RAINBOW AND CUTTHROAT TROUT IN THE STUDY SECTION: 2013

Species	Pop. Estimate	95% C.L.	Density Per Mile
Native Rainbow Trout	8,225	5,399 – 17,266	1,613
Cutthroat Trout	2,346	1,388 – 7,575	460

These results indicate that from 2010's baseline to the 2013 season, trout populations have increased approximately threefold.

The data for each year was also pooled to yield a composite estimate of the wild trout population in the study section. The same Chapman Modified Schnabel Method produces the following estimates:

TABLE 7A: POPULATION ESTIMATES OF WILD TROUT IN THE STUDY SECTION: 2010

Species	Pop. Estimate	95% C.L.	Density Per Mile
Wild Trout	3,717	2,337 – 9,077	729

TABLE 7B: POPULATION ESTIMATES OF WILD TROUT IN THE STUDY SECTION: 2011

Species	Pop. Estimate	95% C.L.	Density Per Mile
Wild Trout	5,331	3,705 – 9,500	1,045

TABLE 7C: POPULATION ESTIMATES OF WILD TROUT IN THE STUDY SECTION: 2012

Species	Pop. Estimate	95% C.L.	Density Per Mile
Wild Trout	6,289	4,175 – 12,735	1,233

TABLE 7D: POPULATION ESTIMATES OF WILD TROUT IN THE STUDY SECTION: 2013

Species	Pop. Estimate	95% C.L.	Density Per Mile
Wild Trout	10,929	7,598 – 19,462	2,143

Figures 1A, 1B, and 1C on the following pages display the population estimates for rainbow, cutthroat, and total wild trout. Though confidence limits are wide throughout the four-year sampling period, the populations of rainbow trout, and wild trout as a whole, trend sharply upward. Figures 1 and 2 below show these population numbers plotted for each species, both species aggregated, and then as estimated fish per mile.

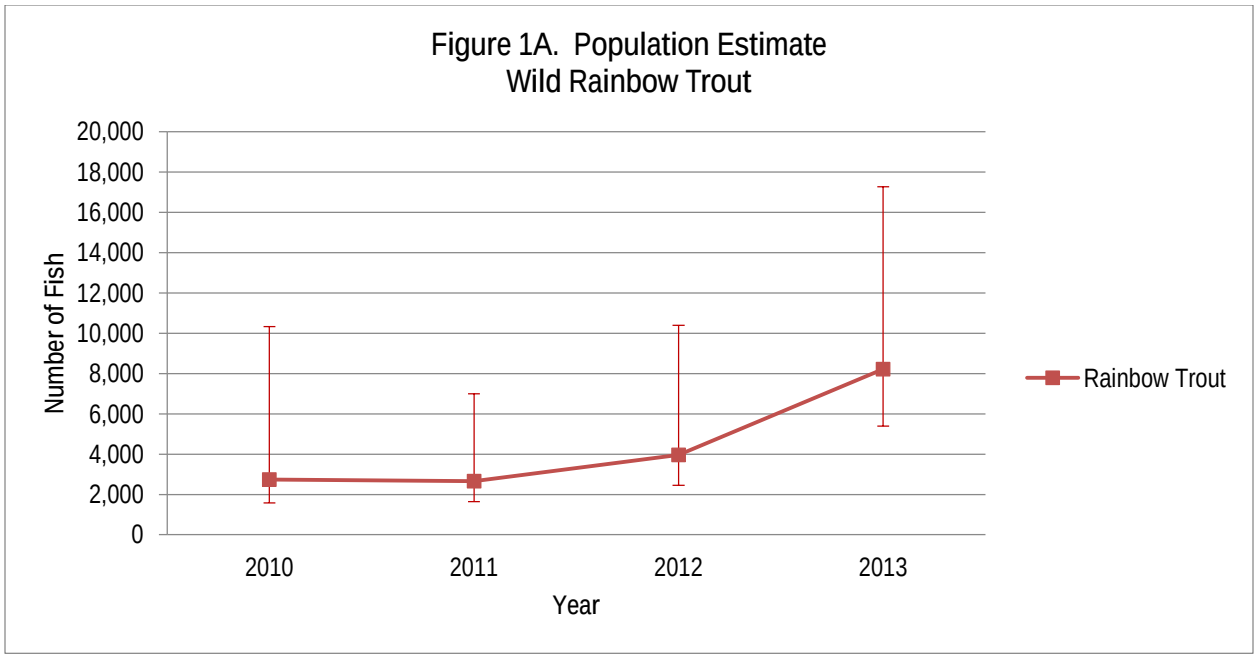


Figure 1A. Population Estimate
Wild Rainbow Trout
20,000
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
Number of Fish
2010
2011
2012
2013
Year
Rainbow Trout

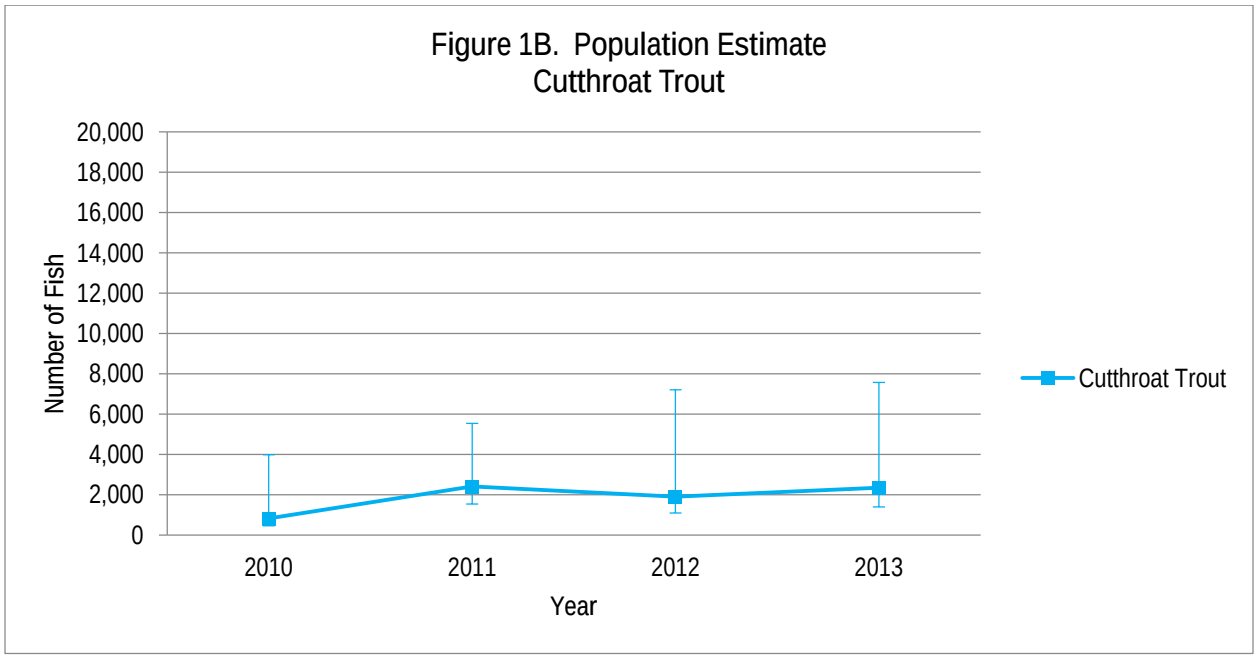


Figure 1B. Population Estimate
Cutthroat Trout
20,000
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
Number of Fish
2010
2011
2012
2013
Year
Cutthroat Trout

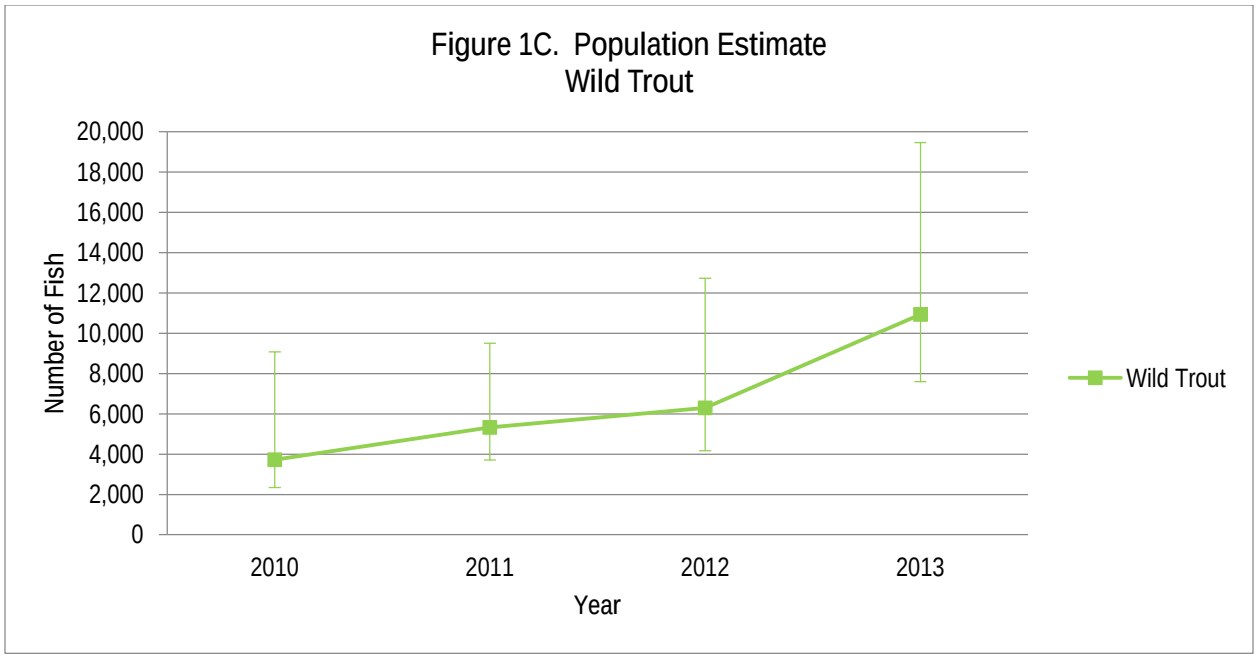
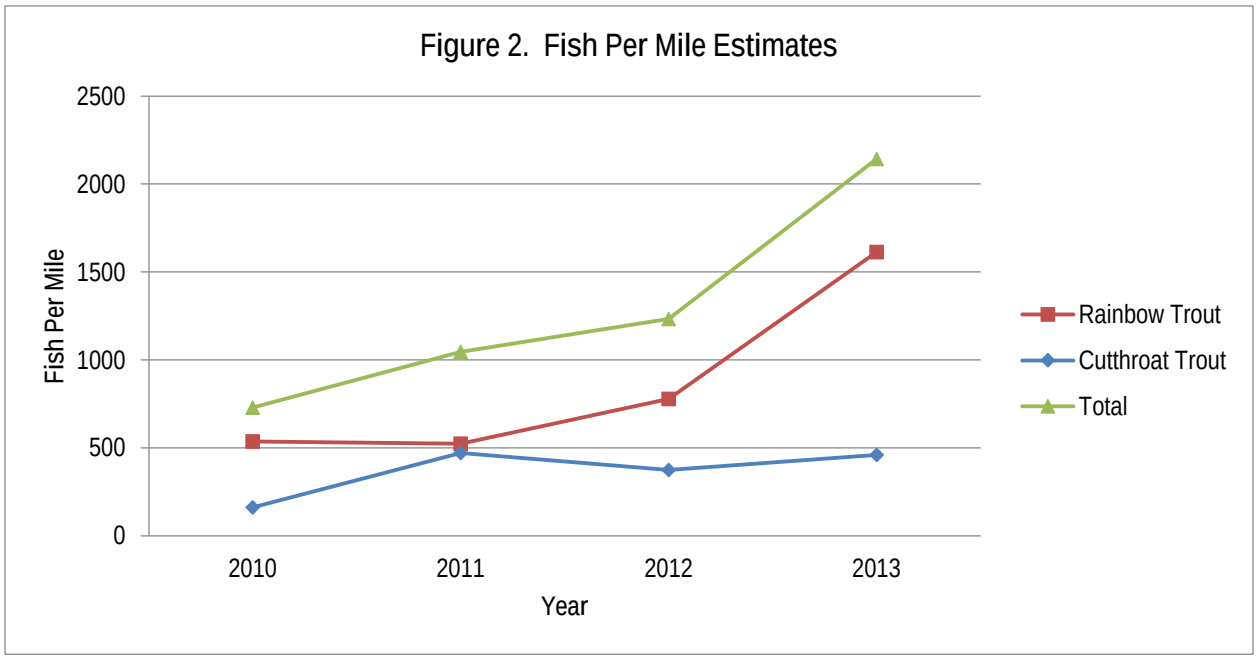
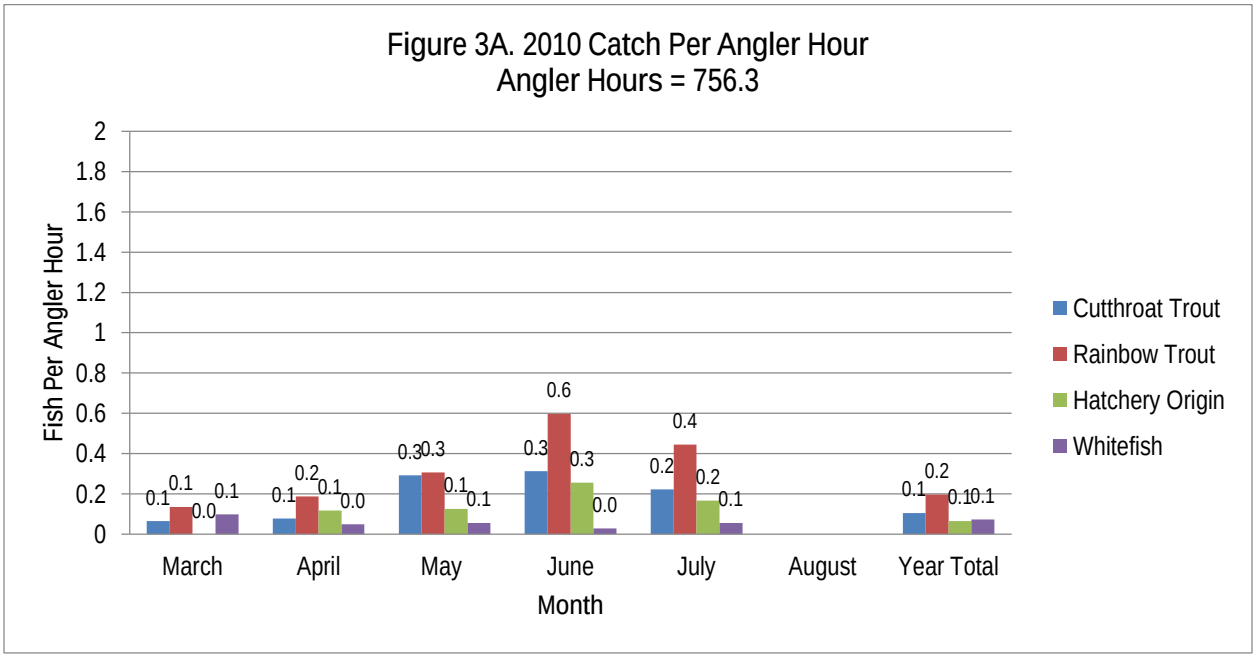


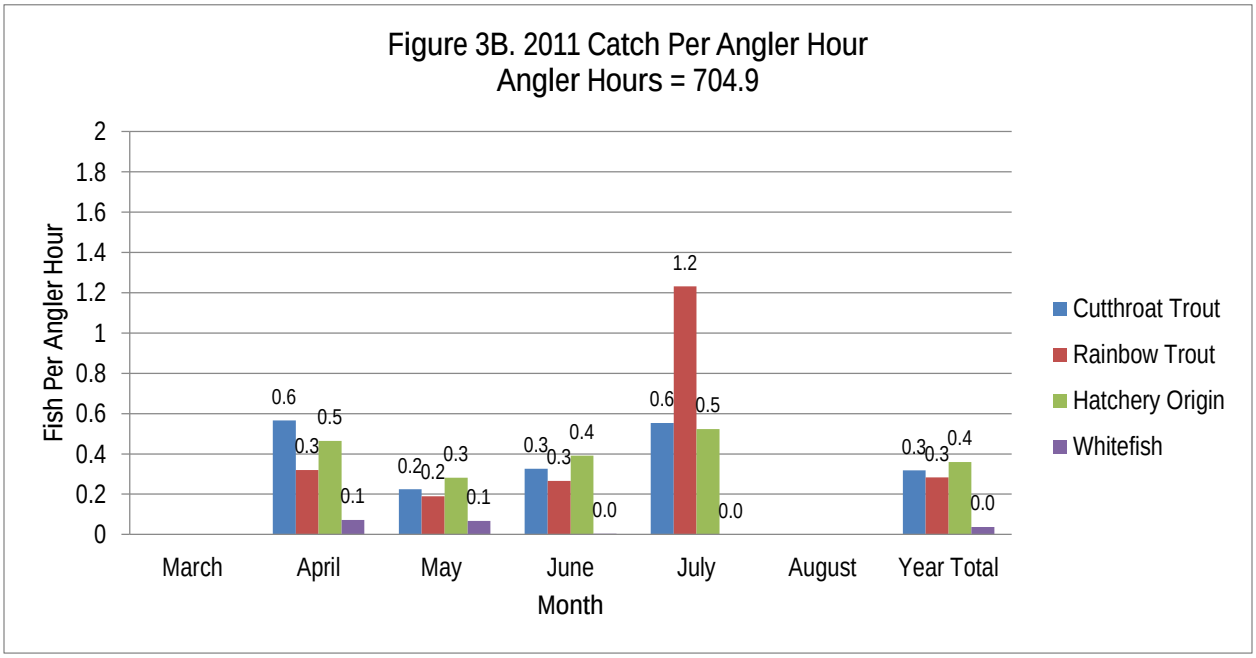
Figure 2 displays the approximate fish per mile in the study section (estimated population divided by 5.1 river miles).



FISHING PRODUCTIVITY: FISH PER ANGLER HOUR

The following figures show how anglers have fared in each month of each year of the study. Success appears to increase later in the season for trout and decrease for whitefish. There is also an apparent trend of increasing productivity of wild rainbow trout capture from year to year consistent with the estimates of increasing populations of wild trout.





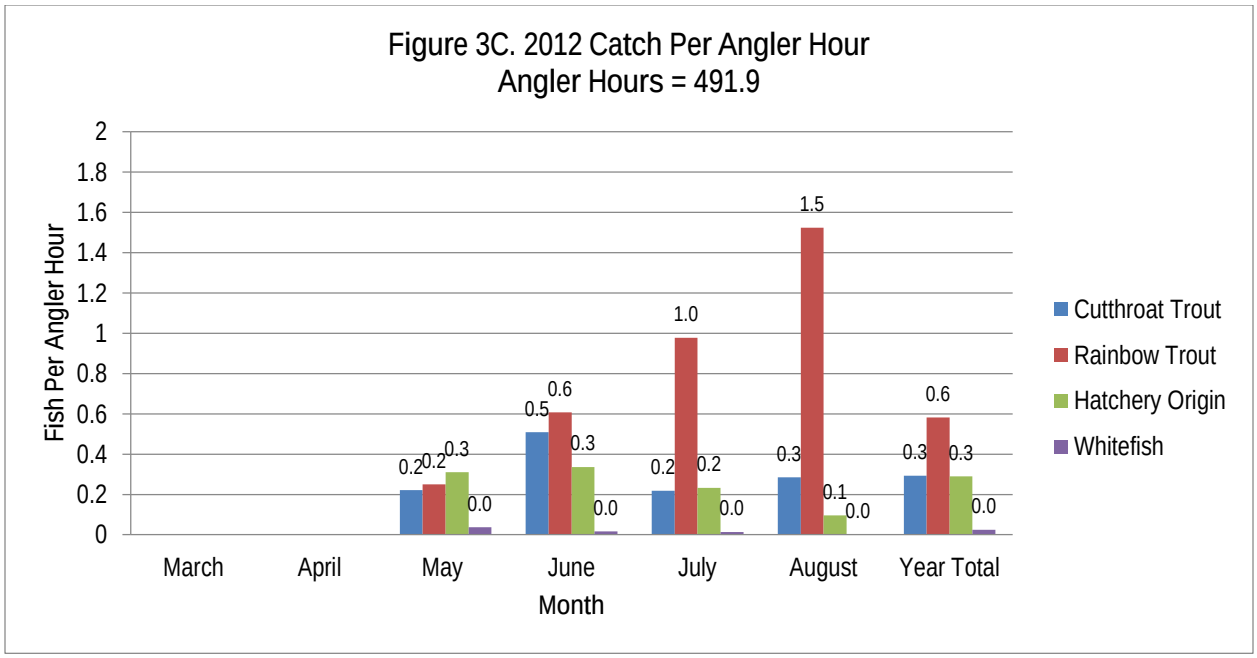


Figure 3C. 2012 Catch Per Angler Hour
Angler Hours = 491.9
Fish Per Angler Hour
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
March
April
May
June
July
August
Year Total
Month
0.2
0.2
0.3
0.0
0.5
0.6
0.3
0.0
0.2
1.0
0.2
0.0
0.3
1.5
0.1
0.0
0.3
0.6
0.3
0.0
Cutthroat Trout
Rainbow Trout
Hatchery Origin
Whitefish

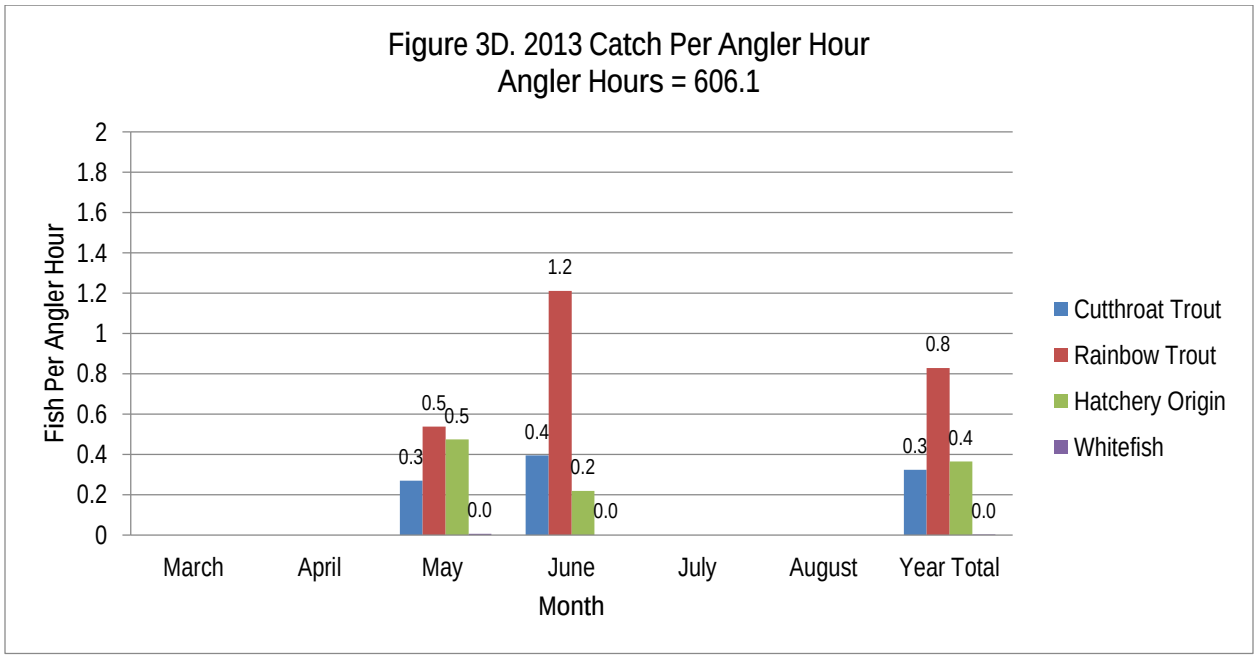
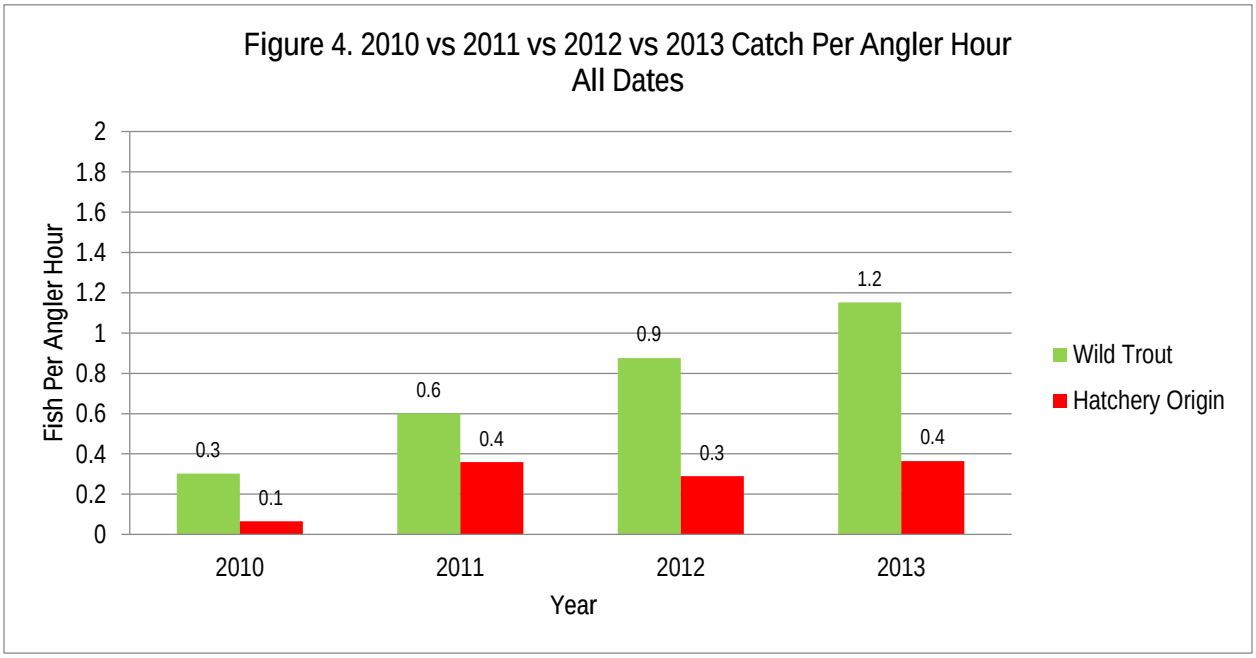


Figure 3D. 2013 Catch Per Angler Hour
Angler Hours = 606.1
Fish Per Angler Hour
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
March
April
May
June
July
August
Year Total
Month
0.3
0.5
0.5
0.0
0.4
1.2
0.2
0.0
0.3
0.8
0.4
0.0
Cutthroat Trout
Rainbow Trout
Hatchery Origin
Whitefish

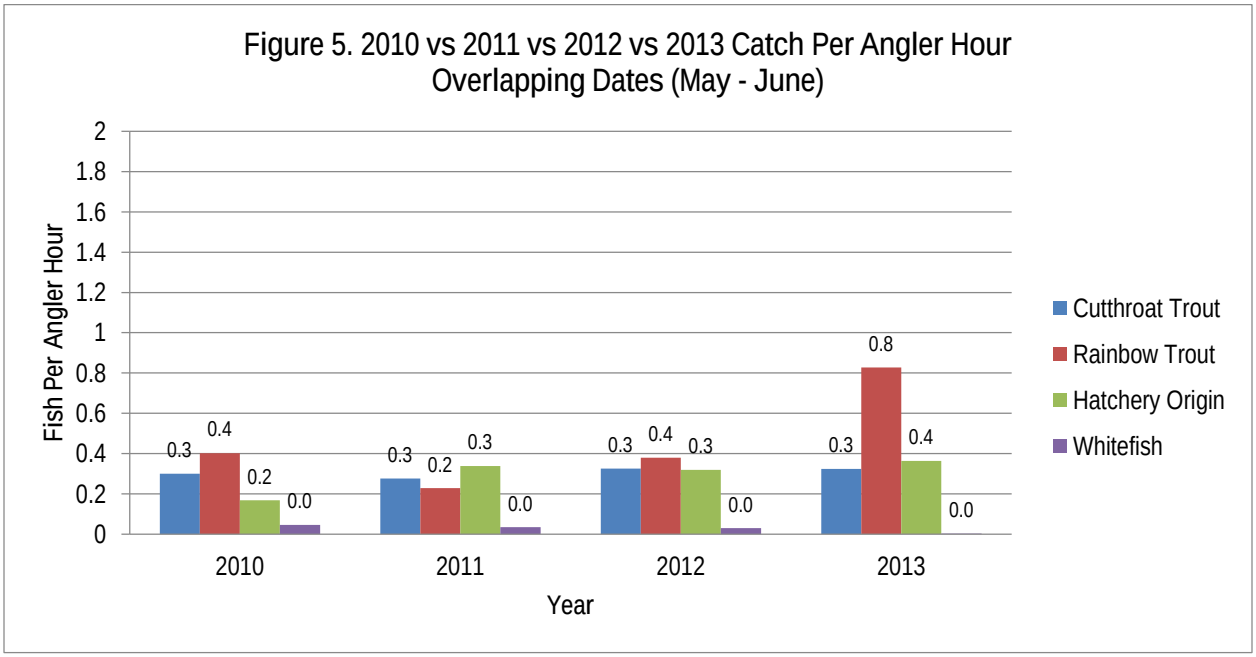
Figure 4 (below) indicates that anglers caught more fish per hour in 2013 than in previous years; continuing an upward trend in year-to-year productivity.



This does not take into account the shift in the timing of angler effort over the course of the study's four years. 2010 had most effort concentrated early in the spring. 2011, 2012, and 2013 had the majority of effort from May onward. As Figures 3A-3D demonstrated, angling for trout is generally more successful in the later months.

FISHING PRODUCTIVITY: FISH PER ANGLER HOUR, OVERLAPPING DATES

To examine and emphasize the importance of temporal variation in success, we examined trips that took place during the months of May and June, which were in common to all four years of the study. Anglers experienced very similar levels of success during May and June of 2010, 2011, and 2012. A jump in productivity was observed in the 2013 season. 2011 and 2012 were marked by very poor fishing conditions in May and June, with abnormally high water and cold temperatures, whereas 2010 and 2013 had relatively mild springs. Figure 5 shows a general trend of the catch rates per hour increasing when compared across this common effort period. When the catch rates of both wild species are pooled (Figure 6) this trend increasing trend becomes even more apparent.



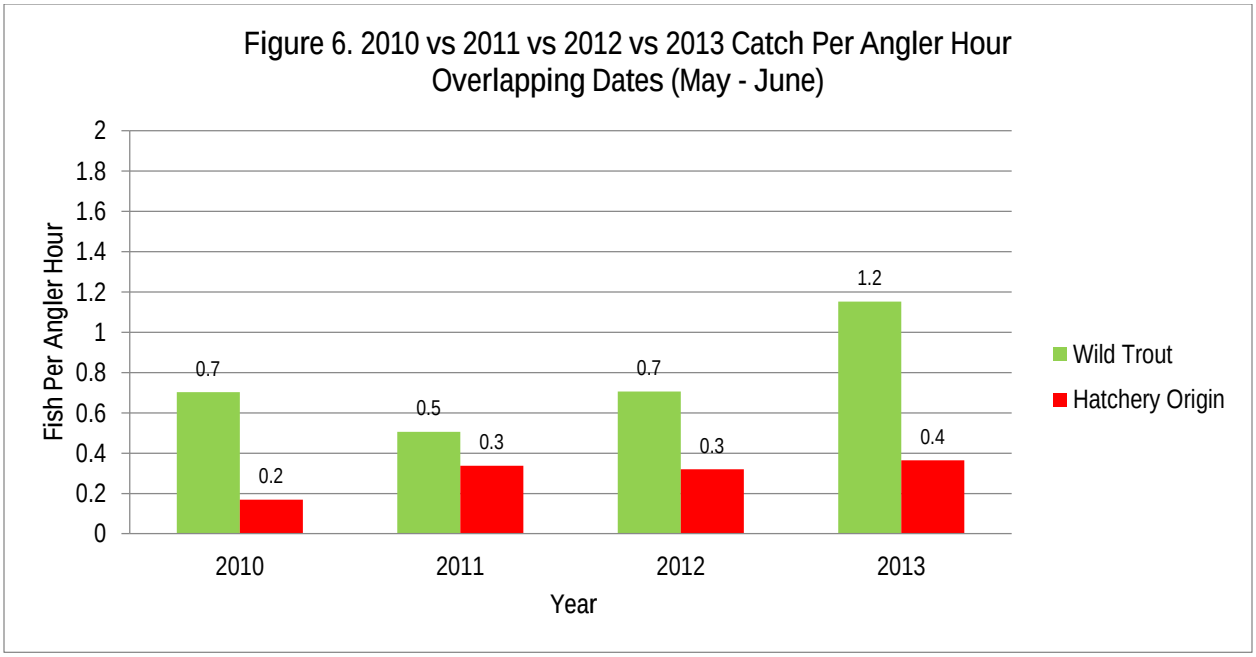


Figure 6. 2010 vs 2011 vs 2012 vs 2013 Catch Per Angler Hour
Overlapping Dates (May - June)
Fish Per Angler Hour
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0.7
0.2
0.5
0.3
0.7
0.3
1.2
0.4
2010
2011
2012
2013
Year
Wild Trout
Hatchery Origin

FISHING PRODUCTIVITY: FISH PER TRIP

The 2013 season was excellent from the angler's perspective. Study participants were rewarded for their dedication, and we saw success both in terms of numbers and size of fish caught.

- A new record of 68 wild trout (and 7 additional hatchery fish) in a single trip, on 6/19/2013, surpassing the previous record of 40 fish from 2012. This trip is even more remarkable considering the two anglers were only on the water from 3:30pm until dusk.

- 33 out of 66 trips (50%) caught 10 or more wild trout.

- 47 out of 66 trips (71%) caught 5 or more wild trout.

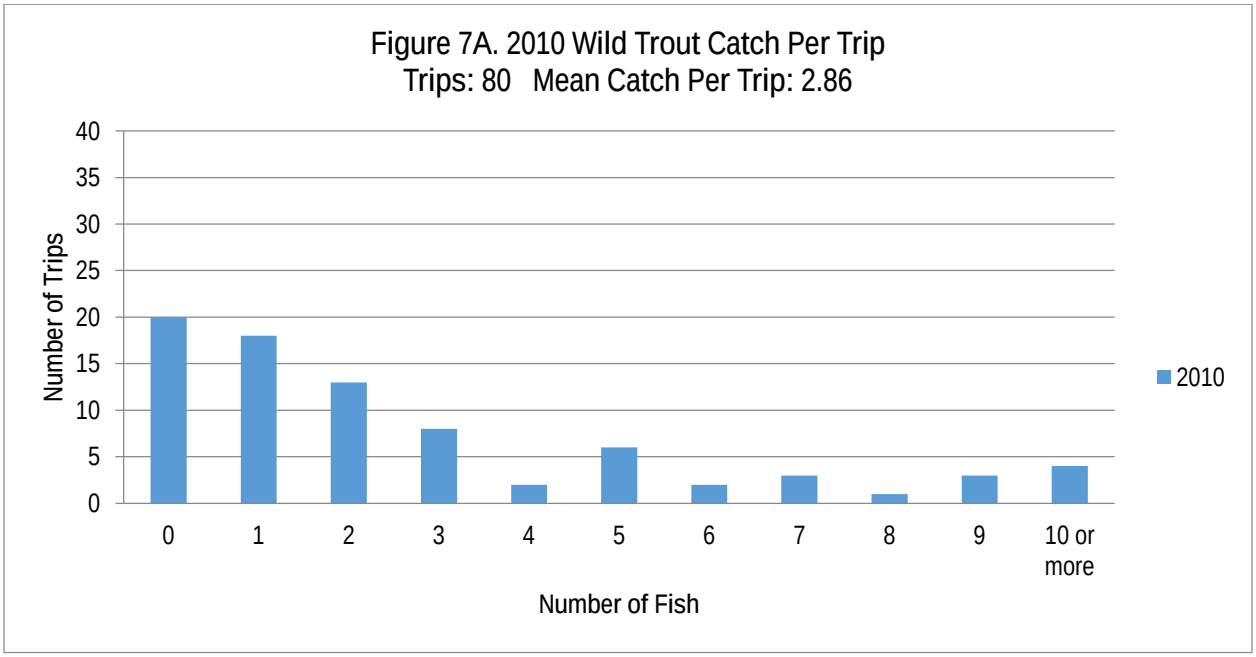
- 65 out of 66 trips (99%) caught at least one wild trout.

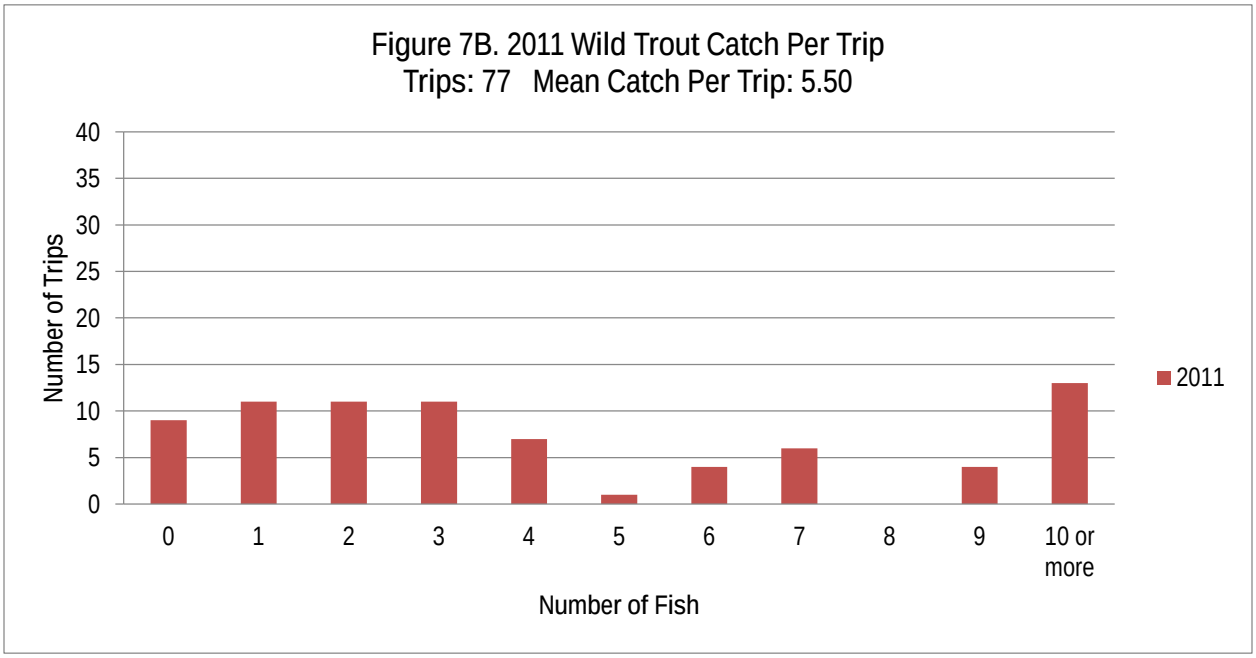
- 2013 saw only a single 'skunking' for wild trout (1%) – and even on that trip, the angler recorded several other fish. This 'skunking rate' is far lower than in previous years. 9% of trips in 2012, 12% of trips in 2011, and 25% of trips in 2010 did not record a wild fish.

- Some truly fantastic specimens were caught in 2013; including a 495mm (19.5") rainbow trout on 5/27/2013 and a 480mm (18.9") rainbow trout on 5/14/2013. These two fish are the largest rainbow trout recorded to date in this study.

- Several cutthroat trout over 300mm (12.0") were caught, with a large fish of 364mm tagged on 5/27/2013.

When the distributions of angler catch of wild trout per trip are plotted for each year (Figure 7A-D) the trend of increasing trend is quite apparent. Figures 7A-7D (below) show that the number of trips with few or no fish has changed dramatically from 2010 to 2013.





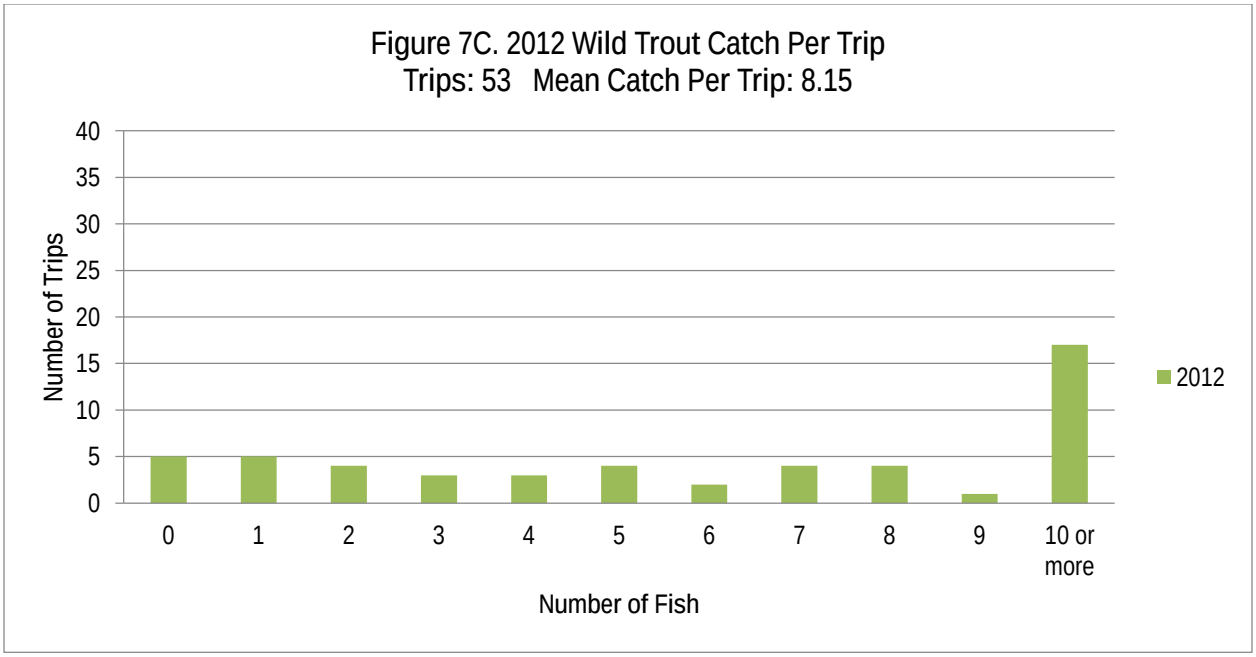


Figure 7C. 2012 Wild Trout Catch Per Trip
Trips: 53 Mean Catch Per Trip: 8.15
Number of Trips
40
35
30
25
20
15
10
5
0
0
1
2
3
4
5
6
7
8
9
10 or more
Number of Fish
2012

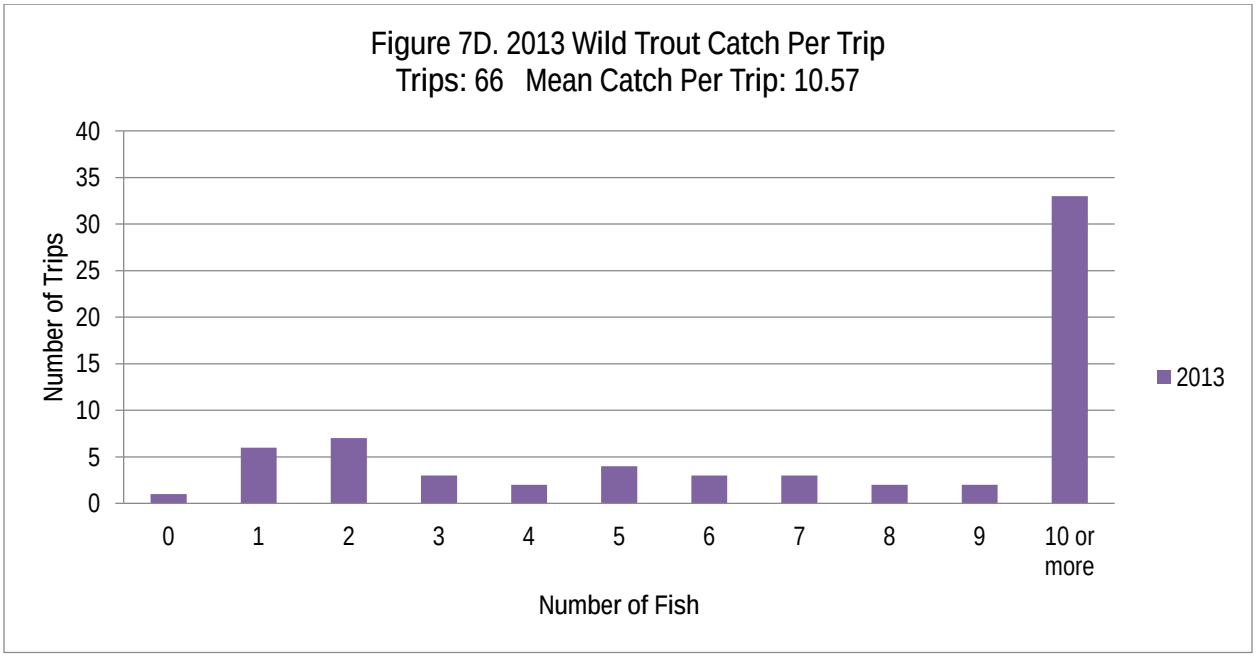
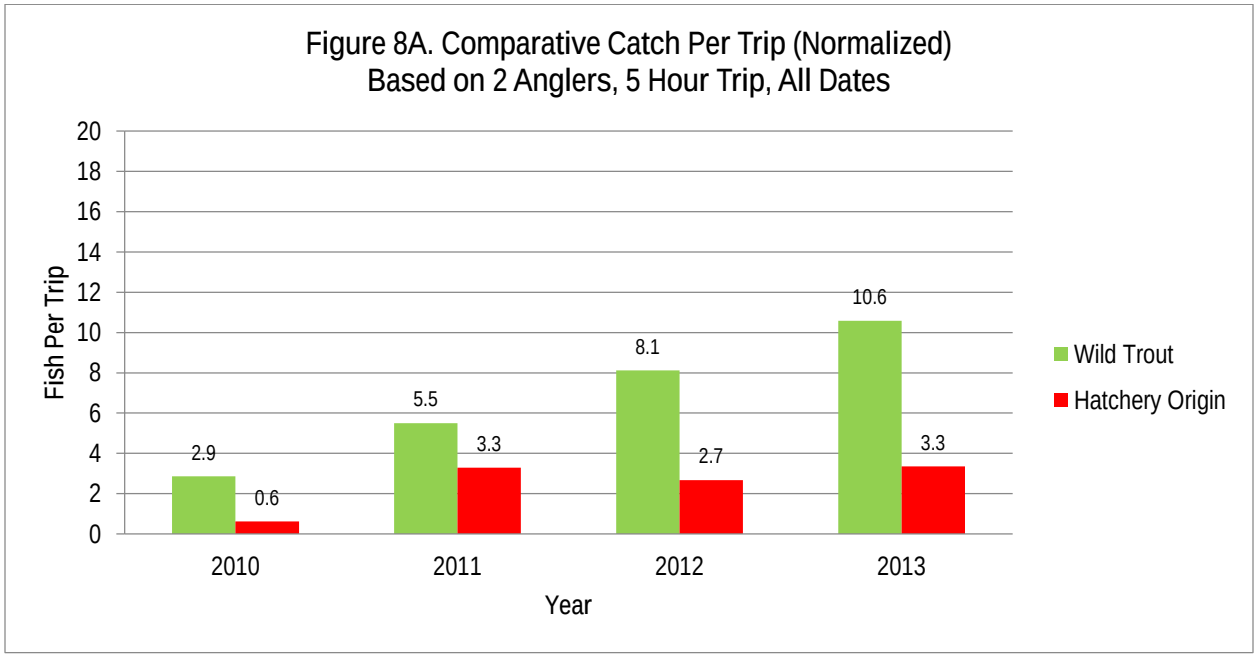


Figure 7D. 2013 Wild Trout Catch Per Trip
Trips: 66 Mean Catch Per Trip: 10.57
Number of Trips
40
35
30
25
20
15
10
5
0
0
1
2
3
4
5
6
7
8
9
10 or more
Number of Fish
2013

FISHING PRODUCTIVITY: FISH PER STANDARDIZED TRIP

As river users know, variation in weather conditions, water conditions, and fishing success can affect the duration of a trip. The duration of the average trip, as well as the number of anglers on each trip, has varied from year to year and this variation could potentially bias the per-trip statistics in the previous section. Thus, the following (Figures 8A-C) provide a more 'user-friendly' view of fishing productivity on the study section –a standard five-hour trip, with two anglers. Examining the changes in composition of the catch displayed in Figure 8C the loss of whitefish over time is a striking finding.



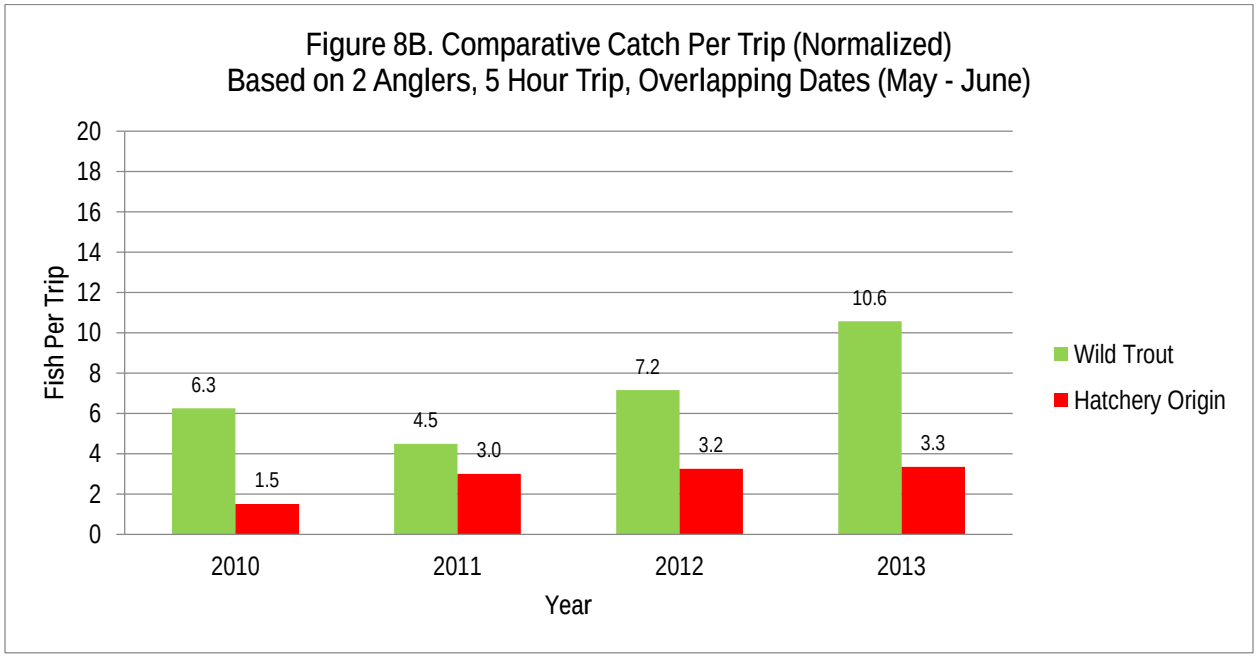
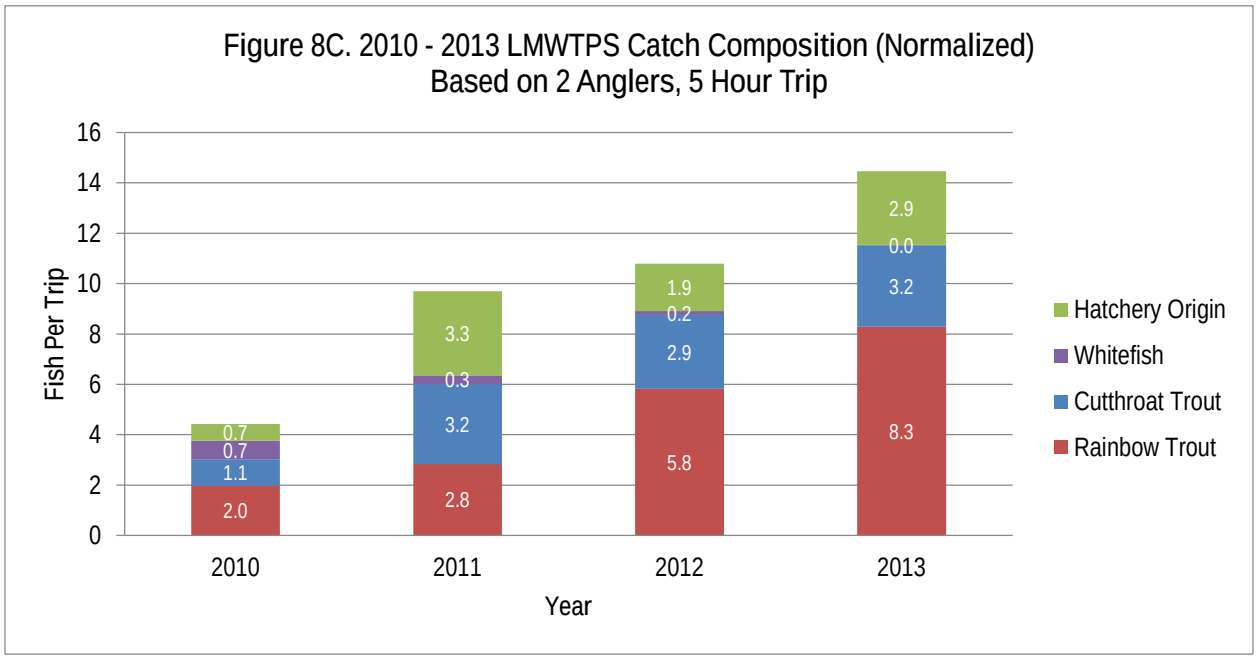
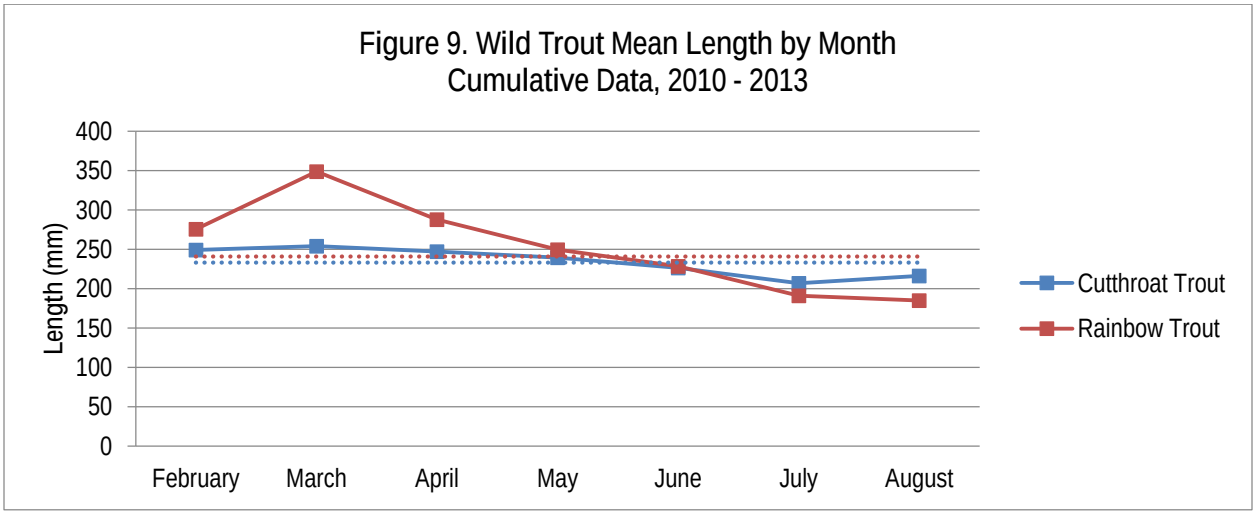


Figure 8C displays the composition of the catch on an average two-angler, five-hour trip:



POPULATION CHARACTERISTICS

Many anglers feel that early-season effort produces fish which are larger than average. Four years of data have confirmed this hypothesis, at least for rainbow trout, as shown in Figure 9.



With this in mind, variation in the timing of angler effort may affect the observed distribution of fish lengths. Years with early-season angler effort such as 2010 may bias towards a longer mean length, whereas late-season effort as in 2012 may bias towards shorter mean lengths.

Tables 8A and 8B show the distribution of fork lengths of cutthroat and rainbow trout in the study section.

TABLE 8A: DISTRIBUTION OF FORK LENGTH (mm) OF CUTTHROAT TROUT IN THE STUDY SECTION

Year	Caught	Mean	S.D.	Min	Max	No Length Recorded
2010	100	247.6327	40.48734	159	355	2
2011	244	237.2881	43.38106	135	375	1
2012	161	226.3608	38.61062	150	307	3
2013	196	224.5969	46.25069	137	364	5

TABLE 8B: DISTRIBUTION OF FORK LENGTH (mm) OF NATIVE RAINBOW TROUT IN THE STUDY SECTION

Year	Caught	Mean	S.D.	Min	Max	No Length Recorded
2010	197	295.3590	83.23581	101	478	2
2011	235	259.6426	77.95128	110	457	0
2012	312	210.9518	71.95238	95	447	11
2013	504	225.7980	60.49009	105	495	4

In 2011, it was hypothesized that the removal of hatchery trout could potentially differentially affect age classes, resulting in a temporary reduction of average length.

Tables 8C and 8D display fish caught in May and June of each year. After controlling for angler effort timing, both cutthroat and rainbow trout average lengths appear to be declining.

TABLE 8C: DISTRIBUTION OF FORK LENGTH (mm) OF CUTTHROAT TROUT IN THE STUDY SECTION (May-June)

Year	Caught	Mean	S.D.	Min	Max	No Length Recorded
2010	32	248.9333	38.96943	200	355	2
2011	167	237.5422	43.85066	135	375	1
2012	109	232.4623	39.23147	150	307	3
2013	196	224.5969	46.25069	137	364	5

TABLE 8D: DISTRIBUTION OF FORK LENGTH (mm) OF NATIVE RAINBOW TROUT IN THE STUDY SECTION (May-June)

Year	Caught	Mean	S.D.	Min	Max	No Length Recorded
2010	43	264.4524	79.88321	120	410	1
2011	138	256.1594	73.652	150	457	0
2012	127	249.9587	76.29115	95	432	6
2013	504	225.798	60.49009	105	495	4

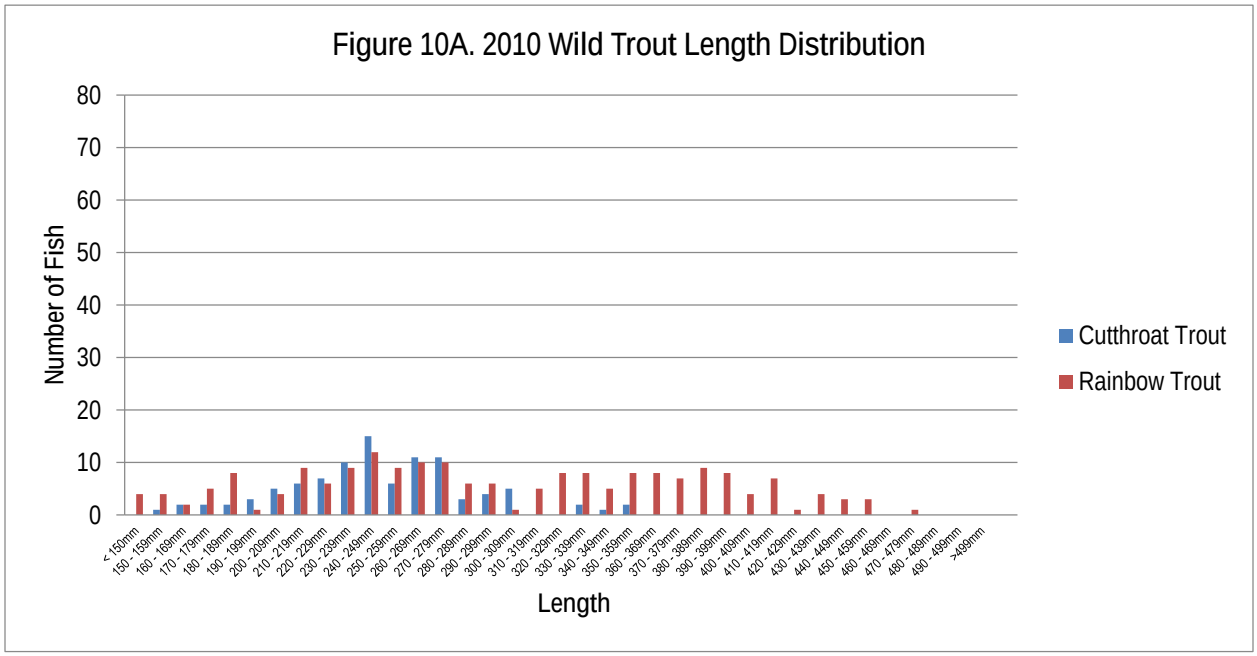
It may be that the apparent temporal variation is size is a product of seasonal movement. However, an increase in the number of smaller and medium-sized fish in the wild trout populations is consistent with increased recruitment from younger age classes and may be the results of decreased competition with and/or predation by hatchery trout. Note also that large fish were still caught in later years of the study (for example, the largest fish of the four year study, a 495mm rainbow trout, was caught in 2013).

LENGTH DISTRIBUTION: OVERALL

The distribution of rainbow trout lengths has varied over the four years of the study, whereas cutthroat lengths have remained more consistent. Some of this variation may be attributed to sampling effort timing.

Many small rainbow trout (< 200mm) were caught in 2012, and these smaller fish were still present in the 2013 catch. However, an increased number of fish in the 200-250mm class was observed, which, when coupled with more large fish (> 400mm) led to an increase in overall average size. The average length for wild rainbow caught in the study section in 2013 was 225.8mm (8.9”).

More large cutthroat (> 300mm) were present in 2013 than in 2012, though more small cutthroat showed in the catch as well, leading to little change in the average length. The average cutthroat caught in 2013 was 224.6mm (8.8”).



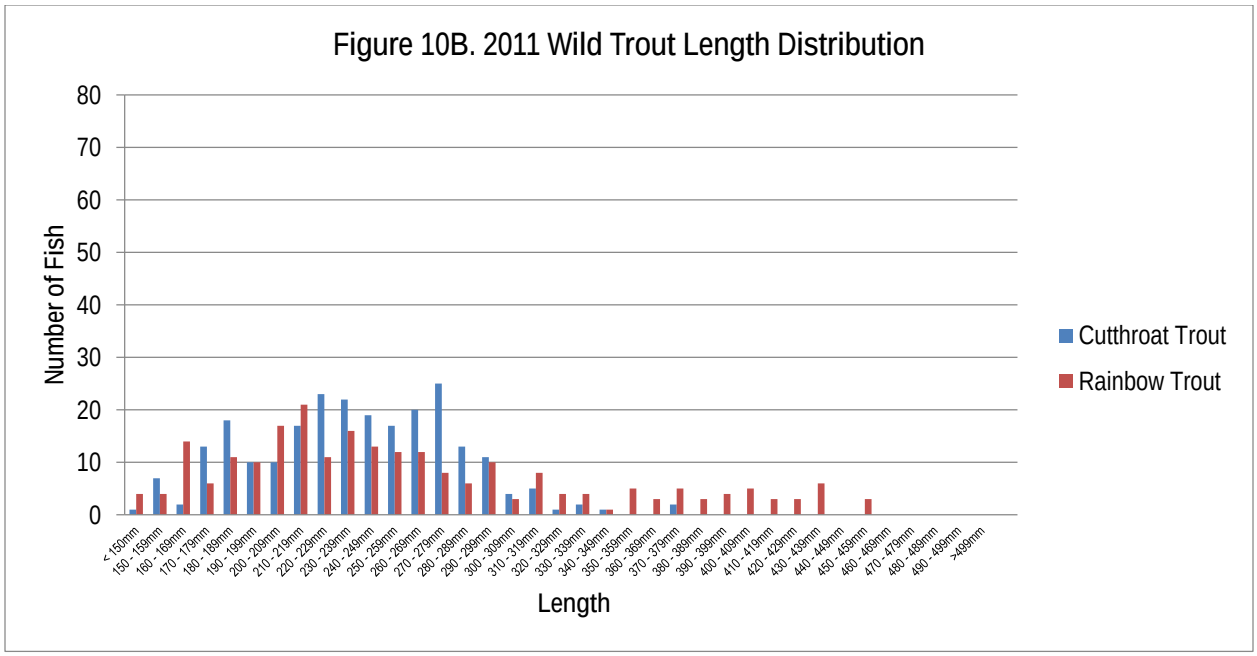


Figure 10B. 2011 Wild Trout Length Distribution
Number of Fish
80
70
60
50
40
30
20
10
0
< 150mm
150 - 159mm
160 - 169mm
170 - 179mm
180 - 189mm
190 - 199mm
200 - 209mm
210 - 219mm
220 - 229mm
230 - 239mm
240 - 249mm
250 - 259mm
260 - 269mm
270 - 279mm
280 - 289mm
290 - 299mm
300 - 309mm
310 - 319mm
320 - 329mm
330 - 339mm
340 - 349mm
350 - 359mm
360 - 369mm
370 - 379mm
380 - 389mm
390 - 399mm
400 - 409mm
410 - 419mm
420 - 429mm
430 - 439mm
440 - 449mm
450 - 459mm
460 - 469mm
470 - 479mm
480 - 489mm
490 - 499mm
>499mm
Length
Cutthroat Trout
Rainbow Trout

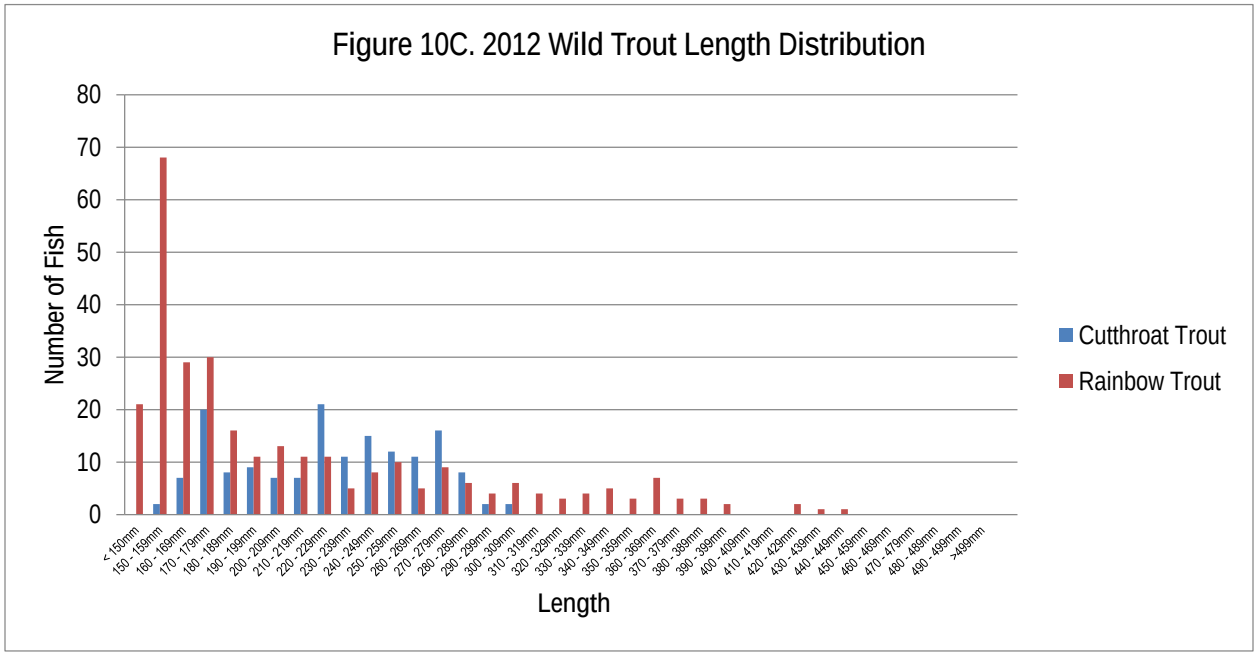


Figure 10C. 2012 Wild Trout Length Distribution
Number of Fish
80
70
60
50
40
30
20
10
0
< 150mm
150 - 159mm
160 - 169mm
170 - 179mm
180 - 189mm
190 - 199mm
200 - 209mm
210 - 219mm
220 - 229mm
230 - 239mm
240 - 249mm
250 - 259mm
260 - 269mm
270 - 279mm
280 - 289mm
290 - 299mm
300 - 309mm
310 - 319mm
320 - 329mm
330 - 339mm
340 - 349mm
350 - 359mm
360 - 369mm
370 - 379mm
380 - 389mm
390 - 399mm
400 - 409mm
410 - 419mm
420 - 429mm
430 - 439mm
440 - 449mm
450 - 459mm
460 - 469mm
470 - 479mm
480 - 489mm
490 - 499mm
>499mm
Length
Cutthroat Trout
Rainbow Trout

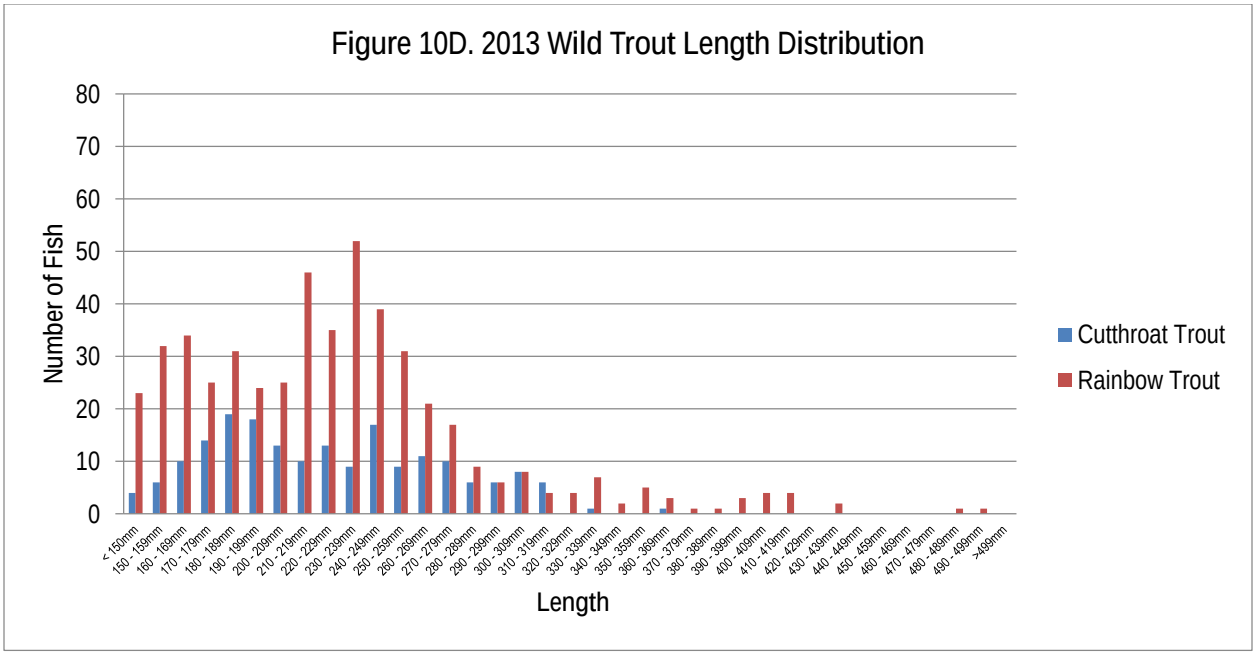


Figure 10D. 2013 Wild Trout Length Distribution
Number of Fish
80
70
60
50
40
30
20
10
0
< 150mm
150 - 159mm
160 - 169mm
170 - 179mm
180 - 189mm
190 - 199mm
200 - 209mm
210 - 219mm
220 - 229mm
230 - 239mm
240 - 249mm
250 - 259mm
260 - 269mm
270 - 279mm
280 - 289mm
290 - 299mm
300 - 309mm
310 - 319mm
320 - 329mm
330 - 339mm
340 - 349mm
350 - 359mm
360 - 369mm
370 - 379mm
380 - 389mm
390 - 399mm
400 - 409mm
410 - 419mm
420 - 429mm
430 - 439mm
440 - 449mm
450 - 459mm
460 - 469mm
470 - 479mm
480 - 489mm
490 - 499mm
>499mm
Length
Cutthroat Trout
Rainbow Trout

LENGTH DISTRIBUTION: BY PERCENTAGE OF CATCH

The following charts examine the distribution of wild trout lengths based on the percentage of catch. This method of displaying length frequency data helps highlight the shift in the rainbow trout population from 2010 to 2013.

An easy way to read these charts is “If I were to catch a wild rainbow trout in (year), it had a (percentage) likelihood of being (length).” For example, in 2010, if you caught a cutthroat trout, it had a 15% likelihood of being 240-249mm.

Figure 11A. 2010 Wild Trout Length Distribution

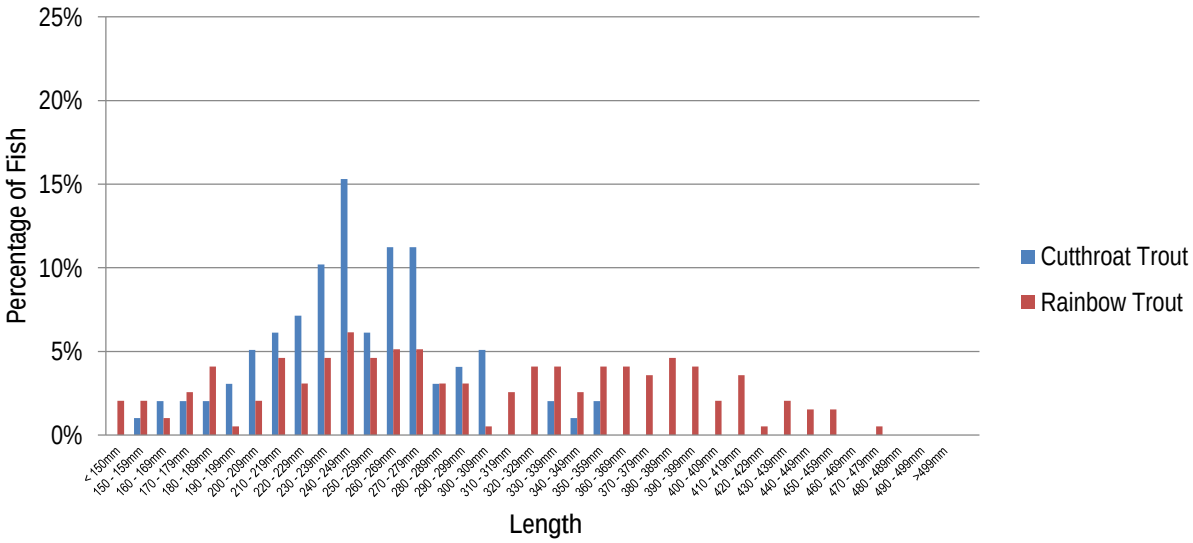


Figure 11B. 2011 Wild Trout Length Distribution

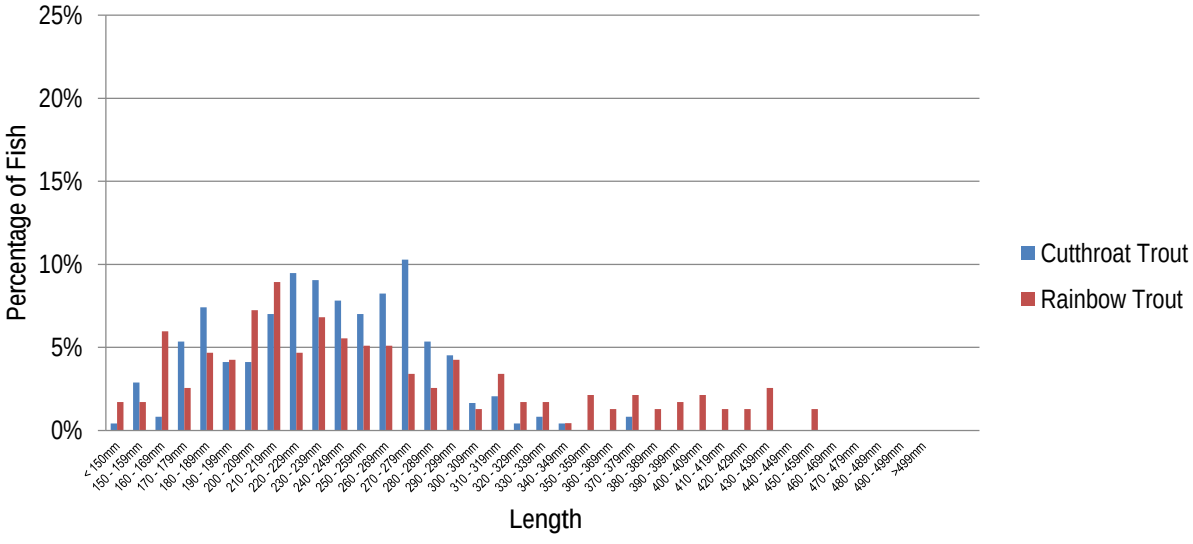


Figure 11C. 2012 Wild Trout Length Distribution

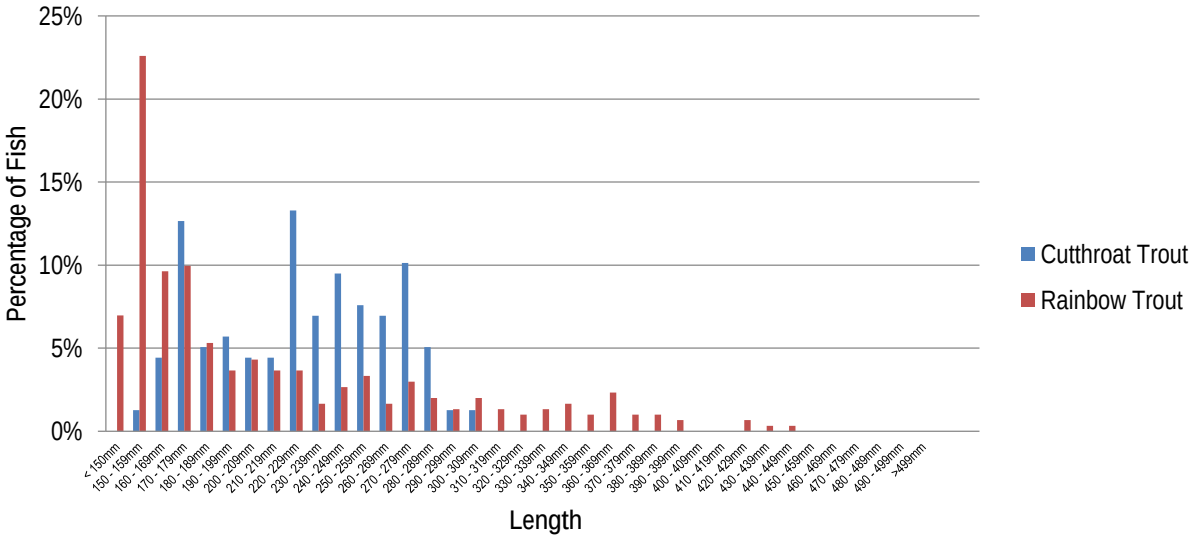
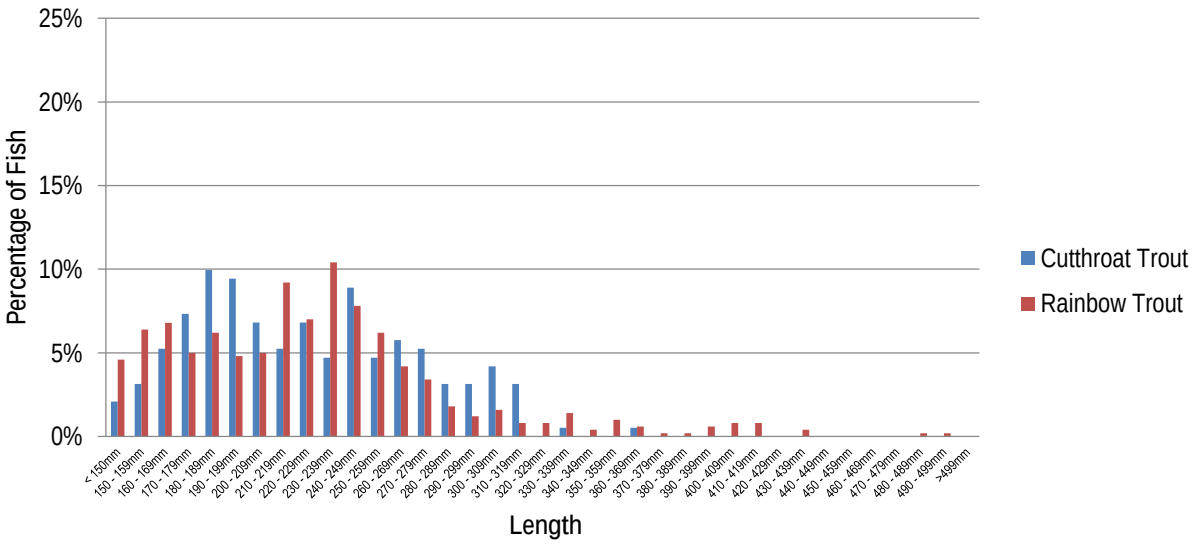


Figure 11D. 2013 Wild Trout Length Distribution



RECAPTURED FISH

We have now recaptured (caught & tagged, then subsequently re-caught at a later date) a total of 20 cutthroat trout and 24 rainbow trout. The tables that follow reflect the date of original mark, date of recapture, and the growth and movement of each fish.

Very little movement was observed between mark location and recapture location, even for those fish that were recaptured in different years.

TABLE 9A: CUTTHROAT TROUT RECAPTURED IN THE STUDY SECTION

Species	Tag Number	Original Date	Recapture Date	Original Length	Recapture Length	Original Location	Recapture Location	Days Lapsed	Growth (MM)	Movement (Miles)
CT	01529	6/13/2013	6/29/2013	220	218	19.5	19.4	16	-2	0.1
CT	00699	5/18/2013	6/22/2013	284	293	22.3	22.3	35	9	0.0
CT	00523	5/13/2012	6/21/2013	272	275	20.2	20.3	404	3	0.1
CT	02763	5/19/2013	6/15/2013	171	199	20	20.1	27	28	0.1
CT	02761	5/19/2013	6/14/2013	171	190	20.2	20.2	26	19	0.0
CT	01953	6/20/2012	6/5/2013	283	296	20	20	350	13	0.0
CT	01078	5/20/2011	6/5/2013	248	311	23	22.8	747	63	0.2
CT	02725	5/17/2013	5/30/2013	222	219	20.9	20.9	13	-3	0.0
CT	01668	6/20/2012	5/24/2013	227	260	24.1	24.1	338	33	0.0
CT	01148	5/28/2012	10/9/2012	162	204	23.2	20.7	134	42	2.5
CT	01122	7/30/2012	8/7/2012	225	224	20.3	20.1	8	-1	0.2
CT	01234	6/1/2012	8/7/2012	240	239	22.8	22.6	67	-1	0.2
CT	01929	7/9/2012	7/25/2012	274	281	20	20	16	7	0.0
CT	01675	6/20/2012	6/27/2012	257	243	20	20	7	-14	0.0
CT	00524	5/13/2012	6/20/2012	239	244	20.2	20	38	5	0.2
CT	01478	7/1/2011	6/20/2012	192	266	20.1	20	355	74	0.1
CT	01201	6/29/2011	7/1/2011	255	258	19.4	19.4	2	3	0.0
CT	00345	5/11/2011	6/29/2011	225	255	20.7	21.5	49	30	0.8
CT	00345	5/11/2011	6/18/2011	225	245	20.7	20.7	38	20	0.0
CT	00184	6/11/2011	6/15/2011	295	295	19.3	19.3	4	0	0.0
CT	00609	4/29/2011	6/11/2011	280	292	19.1	19.3	43	12	0.2
CT	00334	5/1/2011	5/13/2011	235	270	21	21.6	12	35	0.6
CT	01063	4/30/2011	5/13/2011	260	270	21	21	13	10	0.0
CT	01050	4/30/2011	5/11/2011	250	270	21	21	11	20	0.0
CT	01065	4/30/2011	5/1/2011	375	375	21	21	1	0	0.0
CT	00049	4/22/2011	4/30/2011	189	191	20.2	19.25	8	2	1.0
CT	00100	4/29/2010	6/25/2010	245	235	20.3	20.5	57	-10	0.2
CT	00097	4/29/2010	5/24/2010	270	240	20.3	20.6	25	-30	0.3
CT	00252	4/15/2010	5/12/2010	250	250	19.25	19.2	27	0	0.0
CT	00980	4/15/2010	4/23/2010	220	260	19.3	19.5	8	40	0.2

TABLE 9B: WILD RAINBOW TROUT RECAPTURED IN THE STUDY SECTION

Species	Tag Number	Original Date	Recapture Date	Original Length	Recapture Length	Original Location	Recapture Location	Days Lapsed	Growth (MM)	Movement (Miles)
RB	02656	6/10/2013	6/27/2013	260	263	20.1	20.1	17	3	0.0
RB	00187	6/12/2011	6/26/2013	238	415	20.3	20.4	745	177	0.1
RB	02052	10/17/2012	6/24/2013	172	244	22.7	22.1	250	72	0.6
RB	02488	6/19/2013	6/23/2013	193	200	22.4	22.5	4	7	0.1
RB	01947	7/24/2012	6/23/2013	159	276	22.5	22.5	334	117	0.0
RB	02682	5/27/2013	6/22/2013	206	217	23.6	23.6	26	11	0.0
RB	01502	5/8/2013	6/20/2013	250	248	23.2	23.5	43	-2	0.3
RB	02517	6/16/2013	6/19/2013	250	252	20.8	20.7	3	2	0.1
RB	01845	6/13/2013	6/19/2013	222	223	21.6	21.7	6	1	0.1
RB	00446	5/30/2013	6/19/2013	186	194	19.5	21.9	20	8	2.4
RB	01503	5/8/2013	6/19/2013	195	223	22.7	22.8	42	28	0.1
RB	00487	6/12/2012	6/19/2013	242	400	21.6	21.1	372	158	0.5
RB	01155	6/5/2013	6/16/2013	150	156	22.5	22.5	11	6	0.0
RB	01646	7/9/2012	6/15/2013	151	243	22.6	22.7	341	92	0.1
RB	02811	10/30/2012	6/10/2013	297	318	20.4	20.4	223	21	0.0
RB	02750	5/14/2013	6/5/2013	195	217	20	20	22	22	0.0
RB	02753	5/17/2013	6/1/2013	182	199	20	20.2	15	17	0.2
RB	01511	5/8/2013	6/1/2013	200	220	20.1	20	24	20	0.1
RB	02071	5/16/2013	5/24/2013	268	279	21.3	21.3	8	11	0.0
RB	01970	6/27/2012	10/30/2012	194	254	21.5	21.1	125	60	0.4
RB	00395	7/22/2012	10/15/2012	210	247	20.1	20	85	37	0.1
RB	01101	7/25/2012	8/1/2012	188	197	20.3	20.1	7	9	0.2
RB	01716	7/25/2012	8/1/2012	150	152	20	20	7	2	0.0
RB	00411	7/10/2012	8/1/2012	160	165	22	22.3	22	5	0.3
RB	01114	7/27/2012	7/31/2012	195	195	22	22	4	0	0.0
RB	01928	7/9/2012	7/24/2012	162	165	20	20	15	3	0.0
RB	01974	6/27/2012	7/24/2012	269	271	20	20	27	2	0.0
RB	01951	6/20/2012	7/24/2012	272	281	20	20	34	9	0.0
RB	01955	6/20/2012	6/27/2012	211	216	20	20	7	5	0.0
RB	00181	6/11/2011	7/8/2011	150	166	19.3	19.6	27	16	0.3
RB	00818	5/6/2011	7/8/2011	405	417	22.6	22.6	63	12	0.0
RB	01092	6/9/2011	7/1/2011	162	186	19	19.2	22	24	0.2
RB	00994	5/25/2010	6/20/2011	330	287	20.9	20.9	391	-43	0.0
RB	00182	6/11/2011	6/15/2011	250	250	19.3	19.3	4	0	0.0
RB	00183	6/11/2011	6/12/2011	233	240	19.3	19.3	1	7	0.0
RB	00918	6/22/2010	6/11/2011	150	252	19.4	19.3	354	102	0.1
RB	00043	4/22/2011	5/24/2011	312	310	22.3	22.6	32	-2	0.3
RB	00027	4/19/2011	4/22/2011	330	329	23.2	23.1	3	-1	0.1
RB	00029	4/19/2011	4/22/2011	302	301	23.2	23.1	3	-1	0.1
RB	00921	6/25/2010	4/22/2011	315	382	20.5	20	301	67	0.5
RB	00255	5/7/2010	6/18/2010	285	303	22.25	23	42	18	0.8
RB	00751	3/20/2010	5/16/2010	325	350	23.2	23	57	25	0.2
RB	02867	2/19/2010	4/29/2010	168	184	19.7	19.3	69	16	0.4
RB	00121	4/12/2010	4/20/2010	245	240	21.8	21.9	8	-5	0.1
RB	00173	3/5/2010	3/14/2010	265	265	20.4	20.5	9	0	0.1

HOW MUCH DOES ANGLER KNOWLEDGE / SKILL MATTER?

Some have conjectured that a few increasingly knowledgeable anglers could be responsible for the increased year-to-year catch rates in this study, and that perhaps the 'average' angler may not see any difference in the fishery from 2010 to 2013.

We decided to examine these hypotheses by running an A/B test based on the presence of one of the study's top four anglers. Top anglers were determined by the number of tagged fish during the four years of the study. Trips were segmented as follows:

Group A (1383.3 angler hours)

Any trip including:

- Angler 1 (938 fish)
- Angler 2 (371 fish)
- Angler 3 (202 fish)
- Angler 4 (191 fish)

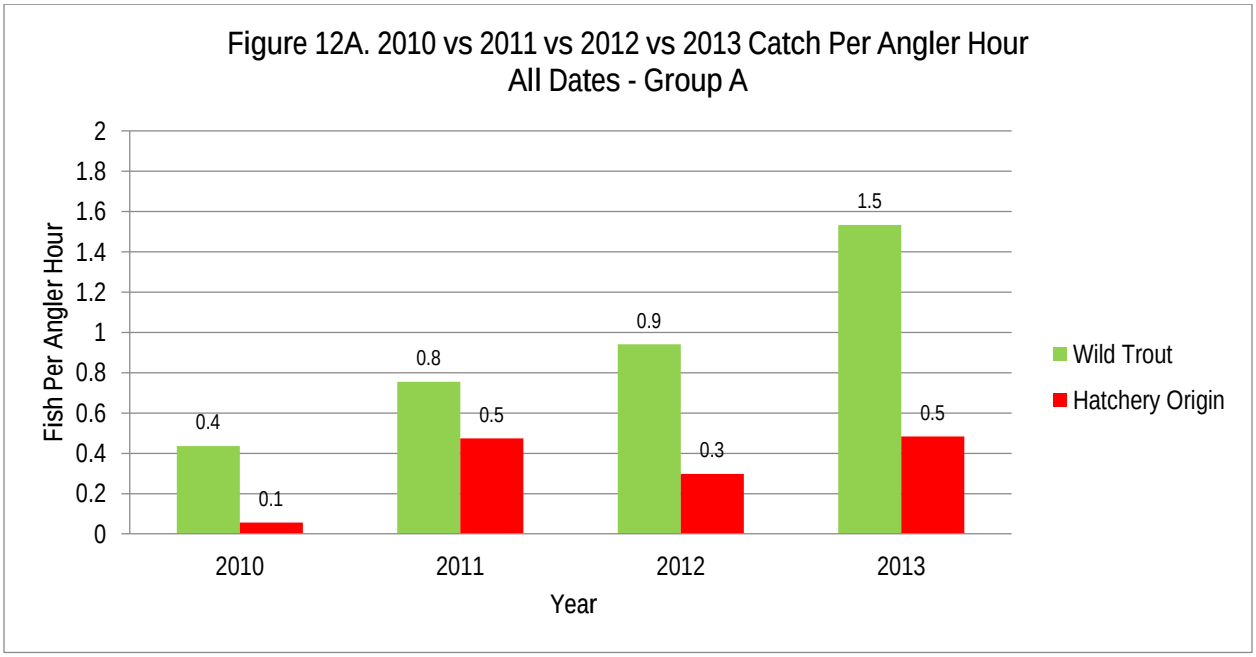
Angler 6 fished exclusively with Angler 1, so all trips for Angler 6 are included in Group A.

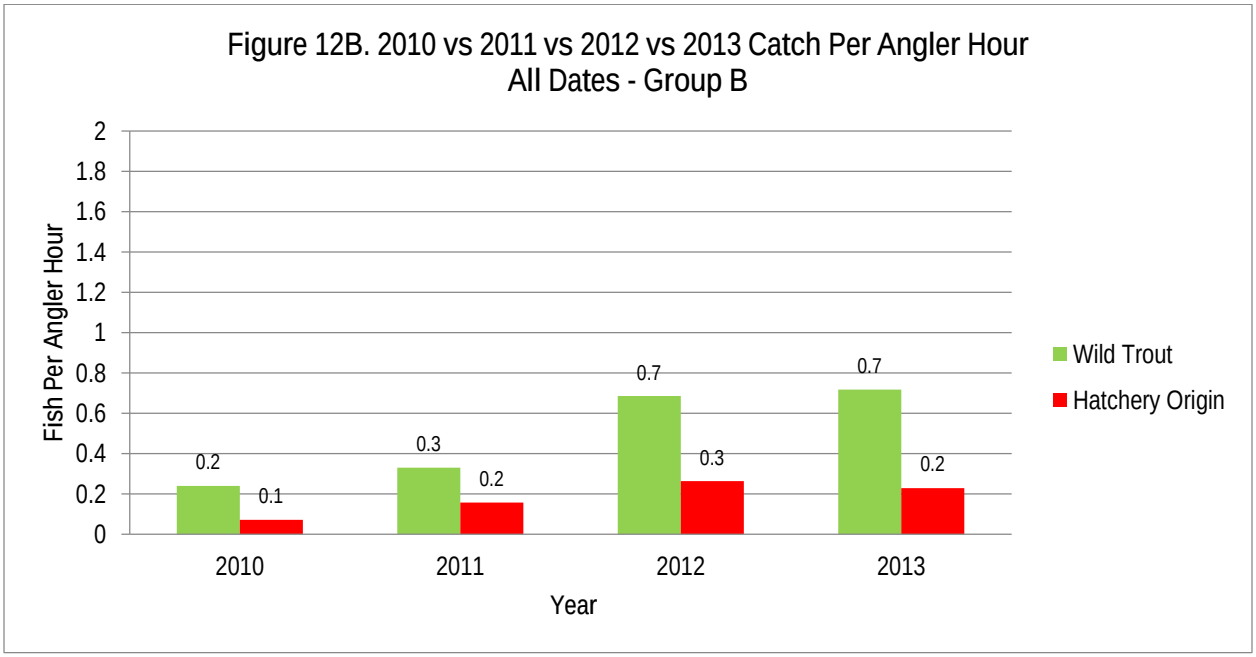
Additionally, Angler 5 fished often with Angler 2, so most trips for Angler 5 are included in Group A.

Group B (1175.2 angler hours)

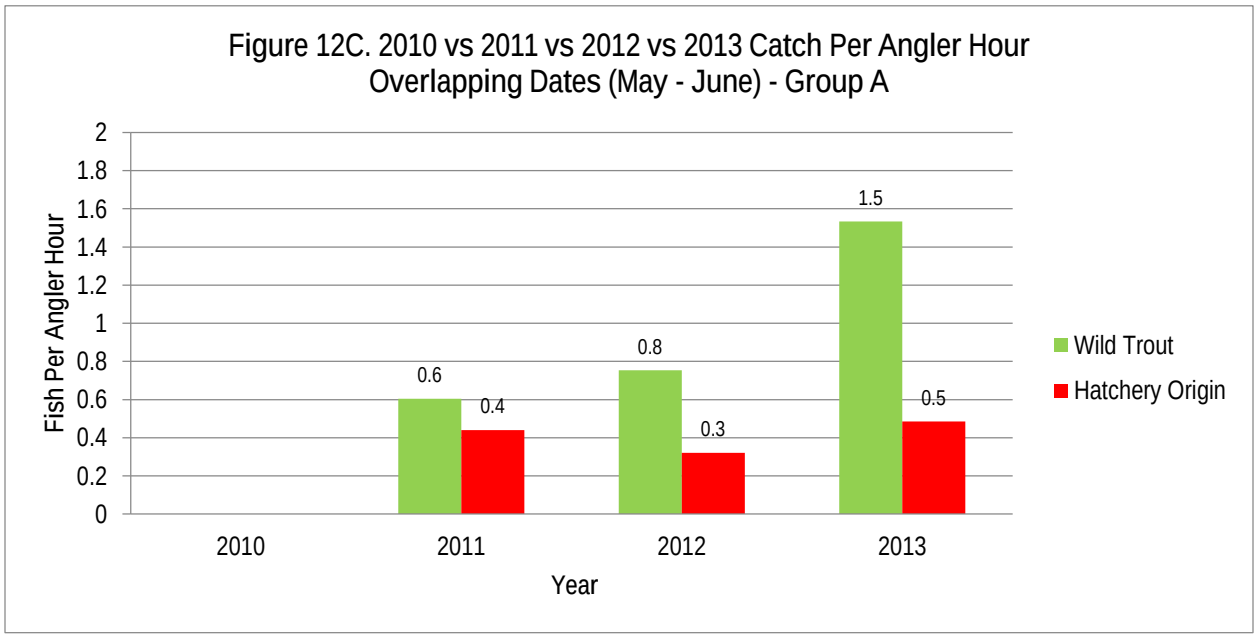
- All other trips not involving Angler 1,2,3, 4, or 6.

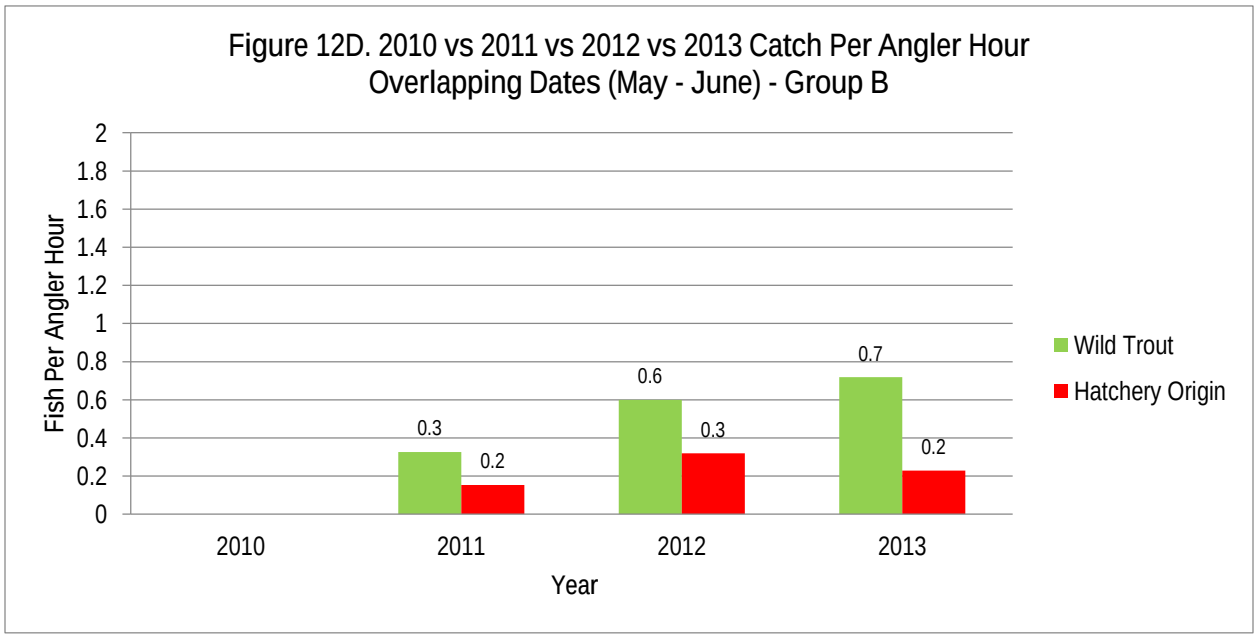
Though there is an expected difference in overall success between Group A and Group B, both groups appear to be catching more fish per hour as the study progresses. In fact, the increase in both groups is strikingly close to the threefold increase in wild trout population shown in figure 1C.





The patterns hold true for overlapping May-June dates as well, at least for the 2011-2013 period where sufficient data for segmentation analysis exists.





SPATIAL DISTRIBUTION OF NATIVE, TROUT

The distribution of fish captured in different portions of the study section are elegantly displayed (thanks to Scott Kinney) in Attachment I. Figure 1A shows the distribution of cutthroat trout caught along the study section in 2010, 2011, 2012, and 2013. In Figure 1B, the same information is provided for wild rainbow trout. Notable in these data are the changes in distribution of fish from year-to-year. This is something anglers commonly notice in their favorite haunts, but it's nice to see it documented so carefully. This information is extended in Figure 2, which shows the distribution of tagged cutthroat and wild rainbow trout overlaying images of the river in each year. This figure includes information on the size of the fish caught. The remodeling of the river over the course the four years is notable in these images.