

Nelson Creek 2013 summary report

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State of California

Department of Fish and Wildlife

Heritage and Wild Trout Program



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Introduction

Nelson Creek, tributary to the Middle Fork Feather River (Plumas County), is located in the northern Sierra Nevada Mountains approximately ten miles southeast of Quincy, CA (Figure 1). Nelson Creek is a designated Wild Trout Water and contains wild populations of coastal rainbow trout (*Oncorhynchus mykiss irideus*) and brown trout (*Salmo trutta*). This designation includes approximately six miles from the Middle Fork Feather River upstream to the confluence of East Nelson and West Branch Nelson creeks. Wild Trout Waters:

- support self-sustaining wild trout populations
- are aesthetically pleasing and environmentally productive
- provide adequate catch rates in terms of numbers or size of trout
- are open to public angling
- may not be stocked with catchable-sized hatchery trout (Bloom and Weaver 2008)

In 2013, the California Department of Fish and Wildlife (CDFW) Heritage and Wild Trout Program (HWTP) conducted Phase 4 monitoring assessments in Nelson Creek. The HWTP collected information on the fishery and habitat including:

- species composition
- abundance
- size class structure
- angler catch rates
- angler use and satisfaction

These assessments follow the recommendations as outlined in the Nelson Creek Wild Trout Management Plan (WTMP; Inland Fisheries Branch 1979) and were designed to monitor the current status of the fishery and habitat, as well as provide updated information to revise the WTMP.

Methods

Direct observation

Direct observation surveys were conducted on Nelson Creek on October 2nd and 3rd, 2013 using snorkeling methods, an effective survey technique in many small streams and creeks in California and the Pacific Northwest (Hankin and Reeves 1988). Sections were spaced approximately every one-half mile and the start of each section was selected at random (Figures 2-3). Specific section boundaries were located at distinct breaks in habitat type and/or stream gradient. Surveys were conducted in an upstream direction with two to three divers. The number of divers per section was determined based on wetted width, water visibility, and habitat complexity.

Divers maintained an evenly-spaced line perpendicular to the current and counted fish by species. All observed trout were further categorized and counted by size class. Size

classes were divided into the following categories: young of year (YOY); small (< 6 inches); medium (6-11.9 inches); large (12-17.9 inches); and extra-large (\geq 18 inches). YOY are defined by the HWTP as age 0+ fish, emerged from the gravel in the same year as the survey effort. Depending on species, date of emergence, relative growth rates, and habitat conditions, the size of YOY varies greatly, but is generally between zero and three inches in total length. If a trout was observed to be less than six inches in total length but it was difficult to determine whether it was an age 0+ or 1+ fish, by default it was classified in the small (< 6 inches) size class.

Divers were instructed in both visual size class estimation and proper snorkel survey techniques (establishing a dominant side, determining the extent of their visual survey area, how and when to count (or not count) fish observed, safety considerations, etc.) prior to starting the survey. Surveyors measured water and air temperature ($^{\circ}$ C), average wetted width and water depth (ft), and water visibility (ft). Habitat type (flatwater, riffle, or pool) was identified following Level 2 protocol as defined in the California Salmonid Stream Habitat Restoration Manual (Flosi et al. 1998). Representative photographs were taken and geographic coordinates of the section boundaries were recorded using a Global Positioning System hand-held unit (North American Datum 1983). To calculate estimates of abundance, the HWTP summed all observed fish by species in all sections and divided by the total survey length (fish per mile; fish/mi).

Angling

Angling assessments were conducted by HWTP personnel in Nelson Creek on October 2nd, 2012 (Figures 2-3). Anglers recorded total fishing effort (hrs) and the number of fish caught by species and size class using a calibrated landing net (using the same size classes defined above for direct observation surveys). Catch per unit effort (CPUE; fish/hr) was calculated for each effort and was averaged across all anglers.

Angler surveys

The HWTP maintains and monitors two angler survey boxes in the area; one at La Porte Road Bridge and the other at the confluence of Nelson Creek and the Middle Fork Feather River (Figures 2-3). Voluntary angler data from these ASB were examined to better understand angler use, catch rates, catch sizes and angler satisfaction. Forms missing pertinent information (date, number of hours fished, and/or fish size classes) were not included in the analysis; all complete forms were examined. Anglers were asked to rate their satisfaction level related to overall fishing experience, size of fish, and number of fish. From 1993 to 2002, the ratings ranged between less satisfied (0) and more satisfied (5). In 2003, the rating system numbers changed to range between - 2 (least satisfied) and +2 (most satisfied), with a neutral rating of zero. Catch per unit effort (CPUE; fish/hr) was calculated for each angler and was averaged per year.

Results

Direct observation

Nelson Creek was surveyed at eight locations (Sections 113-813), from Harrison Flat downstream 6.4 miles (3.1% of the Wild Trout-designated area). The eight sections totaled 982.9 ft in length with mean wetted width and water depth of 35.0 and 1.2 ft, respectively. Weather conditions were cool and sunny. Water visibility ranged from two to ten feet. Surveyed habitat was 28% riffle, 57% flatwater, and 15% pool (Figure 4). Water temperature ranged from 4 to 8 °C and air temperature was measured between 8 and 18 °C, depending on time of day. Divers observed a total of 46 coastal rainbow trout (Table 1). Divers also observed one dead sculpin YOY (*Cottus* sp.). Coastal rainbow trout size class distribution was 26% YOY, 61% small-, 7% medium-, and 7% large-sized fish (Figure 5). Estimated abundance was 247 coastal rainbow trout/mi.

During the survey effort, small, well-established mining claims, equipment, tailings and water diversions were observed between Sections 413 and 513 (Figure 15). Nelson Creek is highly mineralized and extensive gold mining has occurred throughout this drainage.

A potential barrier to upstream fish migration was observed between Sections 213 and 313 (Figure 16). The barrier was approximately 12 feet high with a maximum depth of 8 ft, pool length of 50 ft and mean wetted width of approximately eight feet. This is likely a seasonal barrier, preventing fish passage during low-flow conditions.

Angling

Two anglers participated in the angling assessment in Nelson Creek and captured one rainbow trout in two hours effort (Table 2). Catch per unit effort ranged from zero to one fish/hr with an average of 0.5 fish/hr. The captured fish was 13 inches in total length (large size class).

Data from the two ASB were examined for the years 1993 through 2011 (except for 1998 when zero forms were collected). A total of 255 forms were evaluated with a reported effort of 748.75 hrs and a catch of 1314 trout (1285 coastal rainbow trout, 16 brook trout, and 13 brown trout). Mean CPUE ranged from 0.5 fish/hr (1996) to 5 fish/hr (2002) with an average of 1.6 fish/hr (Figure 6 and Table 3). Coastal rainbow trout were the dominant species reported caught for all years (98%) and medium-size fish were the dominant size class (Figure 7). Relatively few brown trout were reported, ranging from zero to four fish each year, with the majority in the medium-size class (Figure 8). Brook trout also comprised a relatively small number of the catch and were only reported in five of the survey years (Figure 9). Size class distribution was 37.5% small- and 62.5% medium-sized fish. Reported gear type was 66% flies, 16% bait, 9% lures, and 9% unknown (Table 4). Anglers appeared relatively satisfied with their overall angling experience, size of fish, and numbers of fish (Figures 10-12; Table 5).

Discussion

Coastal rainbow trout were observed in all direct observation sections except Section 813 and appear to be distributed throughout Nelson Creek. One extra-large brown trout (≥ 18 inches) was observed directly downstream of the La Porte Road Bridge while hiking.

Previous fisheries assessments in Nelson Creek were conducted by the HWTP using multiple-pass electrofish methods. Historically, one section located at the Road 23N10 crossing (Section 3) was surveyed. In 2001, a new section was established in the vicinity of the La Porte Road Bridge (Section 5; Figures 2-3). Average coastal rainbow trout abundance was estimated at 4289 fish/mi (1988), 2953 fish/mi (1993), and 5216 fish/mi (2001; Figure 13 and Table 6). Brown trout were only observed in Section 5 with an abundance estimate of 207 fish/mi (2001). Although the survey techniques differed, in 2013, estimated abundance was 247 coastal rainbow trout/mi and 0 brown trout/mi. The aggregated average abundance estimate for all years (1988-2001) is 3176 fish/mi (Figure 13).

It appears coastal rainbow trout abundance in 2013 was much less than observed during previous years. This may be due to poor fish detection because of cold water temperatures, complex cover, and/or surveyor experience. There is evidence that, at lower water temperatures (7-10°C), juvenile and adult trout exhibit concealment behaviors during the day. When temperatures drop below this threshold, trout tend to move into interstitial spaces, and this may decrease snorkeler detection (Mullner and Hubert 1998; Meyer and Gregory 2000). All eight of the direct observation survey sections had boulders and cobble that provided sufficient fish cover. Some sections had woody debris and aquatic vegetation that provided increased concealment opportunities. The average water temperature was 5.3 °C and, coupled with complex cover, it may explain comparatively low numbers of trout observed. In addition, three of the four divers had less than ten hours practice performing snorkel surveys and observer experience can influence the accuracy of population estimates (Hagen and Baxter 2005).

Additionally, cold water temperatures made it difficult for observers to keep their bodies and heads submerged for the entire survey which likely contributed to lower fish detection. It is also worth noting that, while the direct observation surveys conducted in 2013 covered a much larger geographic area than previous assessments, only the two direct observation survey sections located in close proximity to the historic electrofish sections had relatively high counts and estimated abundance, suggesting there may be varying levels of fish occupancy throughout the stream system.

One dead sculpin was observed in 2013. Past data show four riffle sculpin (*Cottus gulosus*) were captured during an electrofish survey in 2001 near the La Porte Road Bridge, in proximity to the dead sculpin observed in 2013 and the confluence with the Middle Fork Feather River.

The dominant size class of coastal rainbow trout reported from ASB forms (1993 to 2011) was medium-sized fish, whereas the 2013 direct observation survey detected mostly small-sized fish (Figure 14).

Conclusion

The 1979 Nelson Creek WTMP outlines the following management goals:

- Protect the aquatic environment
- Perpetuate a self-sustaining rainbow trout population
- Provide a backcountry angling experience

Currently, the open fishing season on Nelson Creek is from the last Saturday in April through November 15 with a five-fish daily bag limit and possession limit of ten. Suction dredging is prohibited within 100 yards of any California river, stream or lake (Fish and Game Code § 5653 subd. (d)).

A long-standing dataset on Nelson Creek allows the HWTP to compare fish abundance, species composition, and size class structure over time. Trout abundance observed in 2013 was comparatively low, although survey methods differed among years. The HWTP recommends continued Phase 4 monitoring of Nelson Creek including:

- Replicate historic electrofish surveys
- Increase the geographic extent of surveys
- Maintain ASB and evaluate sport fish regulations.
- Evaluate potential impacts of mining on the wild trout fishery

Depletion electrofish techniques may be difficult due to the remote nature and limited access in portions of the watershed. Direct observation surveys typically require less resources and time, allowing for increased spatial distribution of sampling. If direct observation is used in future Nelson Creek surveys, HWTP should consider the following:

- Use electrofish surveys to calibrate the accuracy of dive counts.
- Survey in warmer, summer months.
- Include experienced divers.

Information gathered from these recommendations should be incorporated into an updated Nelson Creek WTMP, per California Fish and Game Commission policy.

References

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Hagen, J. and J. S. Baxter. 2005. Accuracy of diver counts of fluvial rainbow trout relative to horizontal underwater visibility. *North American Journal of Fisheries Management*. 25:1367-1377.

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Meyer, K. A. and J. S. Gregory. 2000. Evidence of concealment behavior by adult rainbow trout and brook trout in winter. *Ecology of Freshwater Fish*. 9: 138-144.

Mullner, S. A. and W. A. Hubert. 1998. Snorkeling as an alternative to depletion electrofishing for estimating abundance and length-class frequencies of trout in small streams. *North American Fisheries Management*. 18: 947-953.

Figure 1. Vicinity map of 2013 Nelson Creek survey location

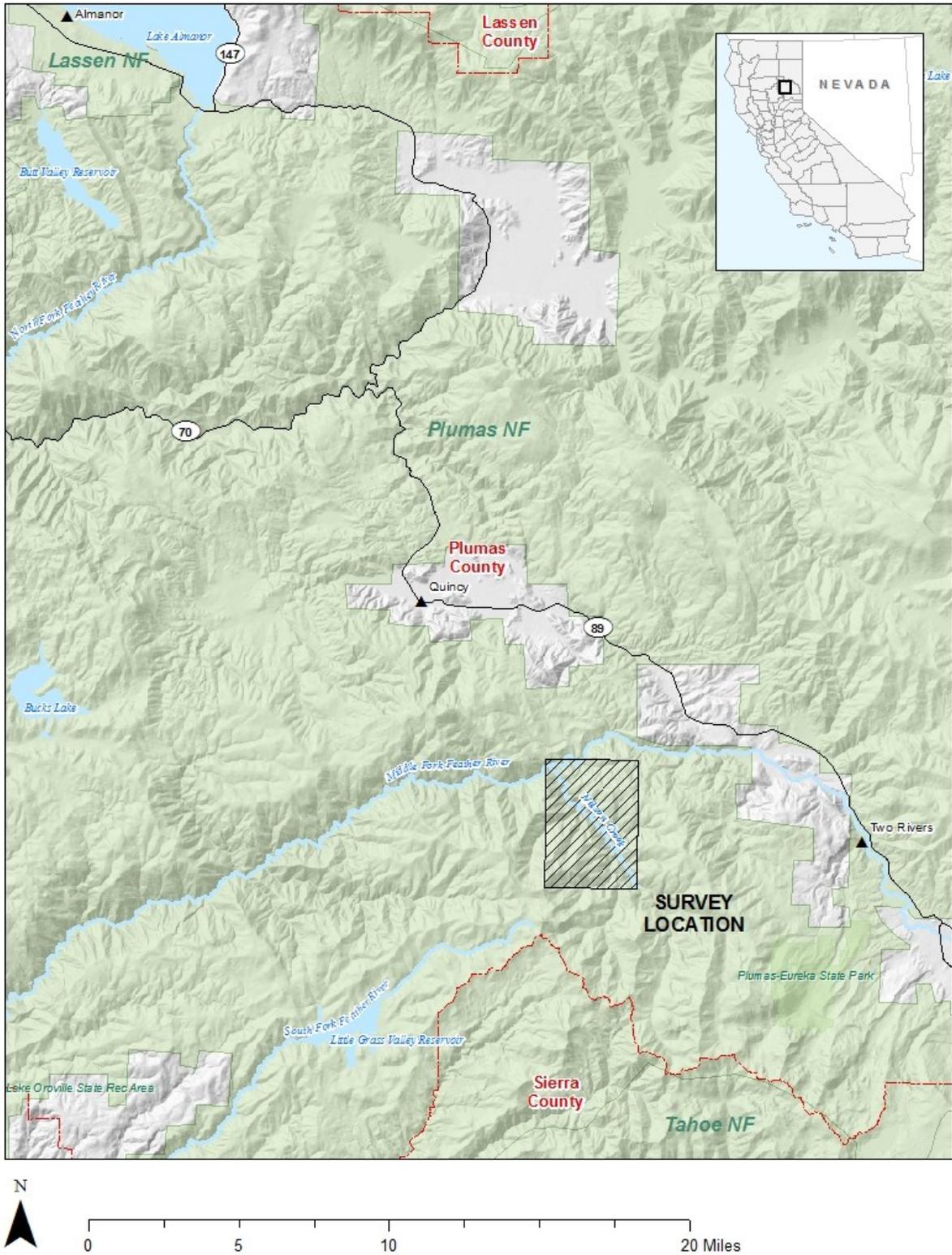


Figure 2. Detail map of 2013 Nelson Creek direct observation survey sections, angling survey location, historical electrofishing sections and ASB locations

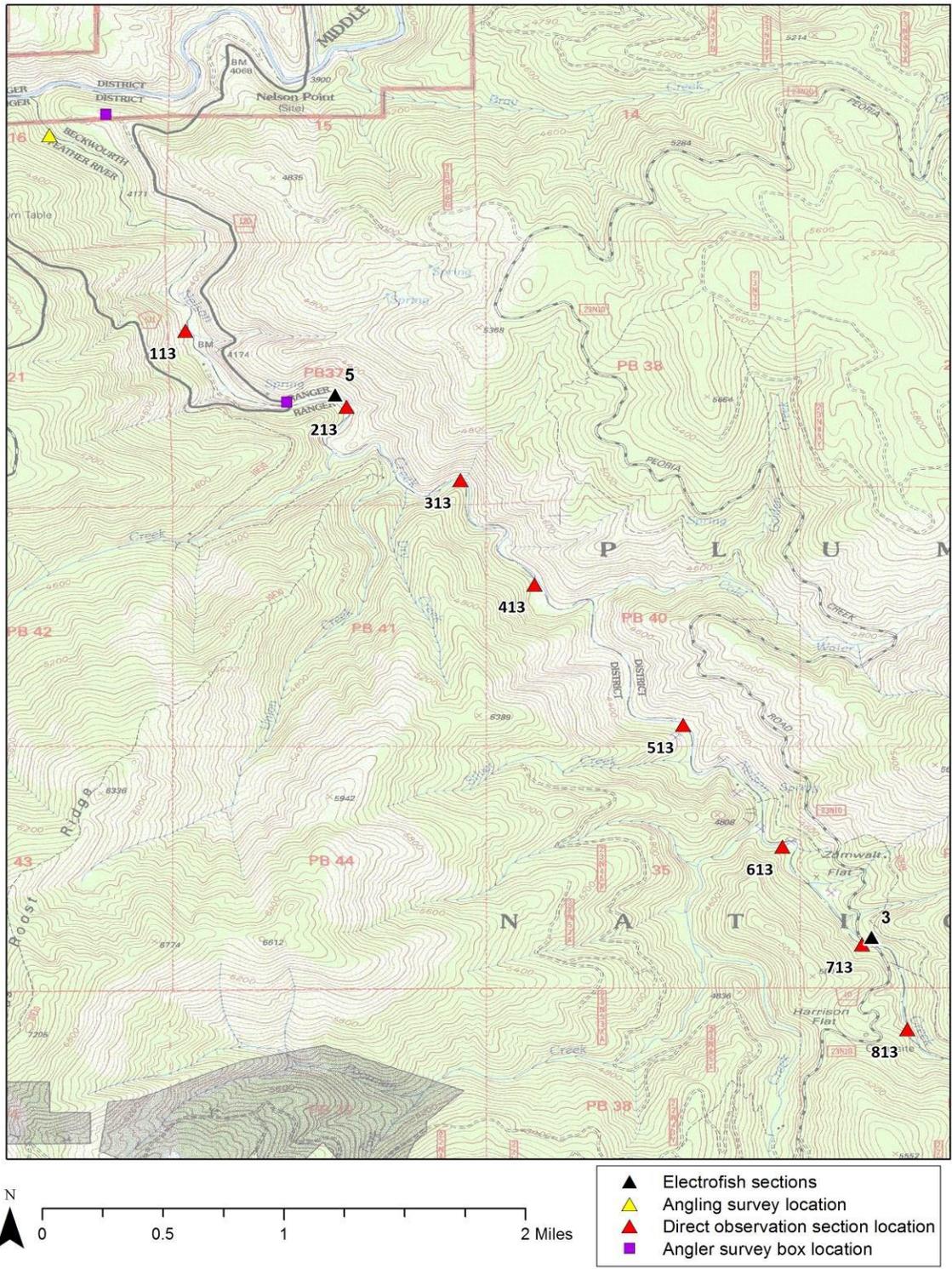


Figure 3. Aerial map of 2013 Nelson Creek direct observation survey sections, angling survey location, historical electrofishing sections, and ASB locations

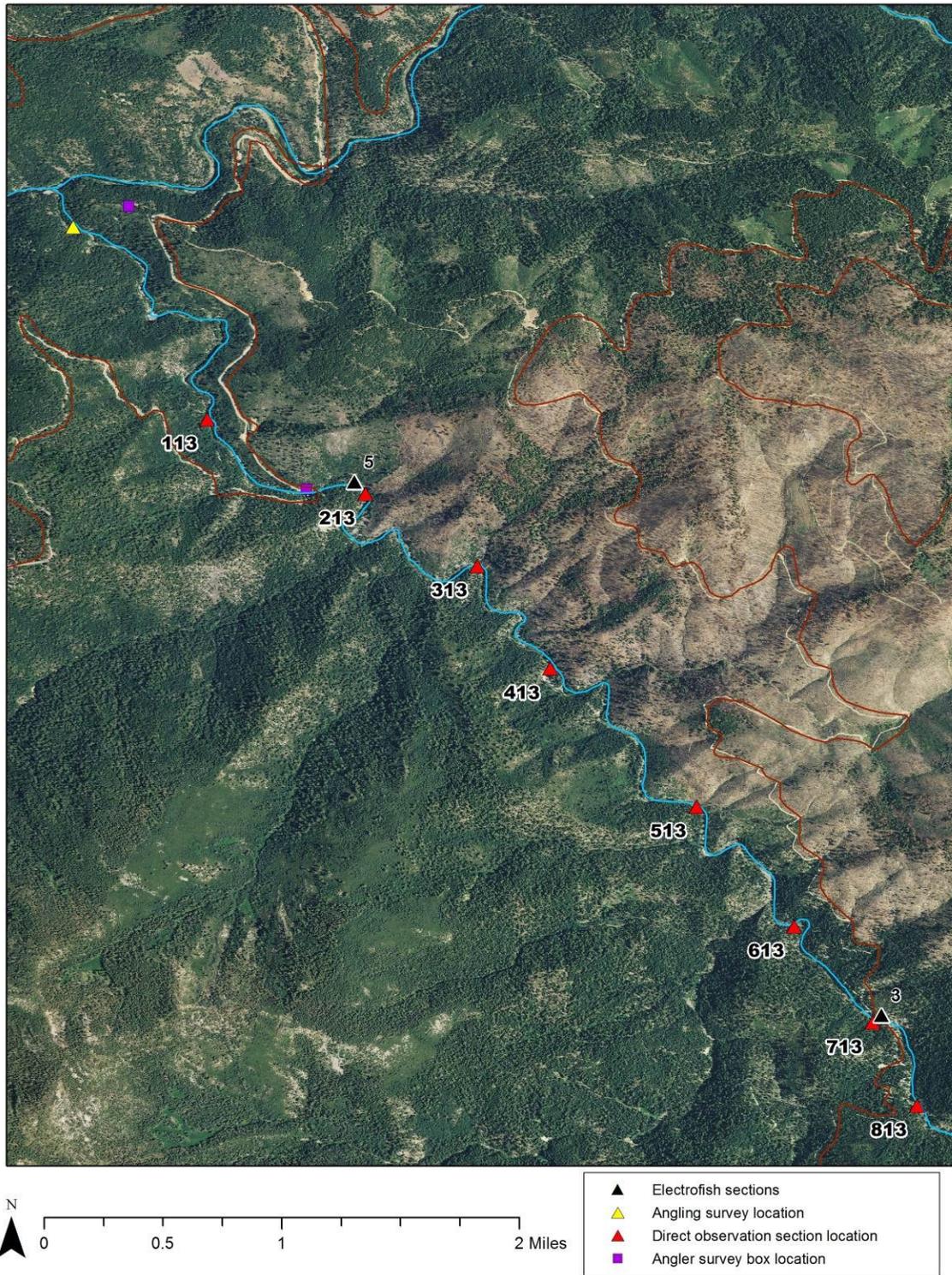


Figure 4. Representative photographs of Nelson Creek in 2013



Figure 5. Graph of 2013 Nelson Creek direct observation survey data: observed coastal rainbow trout distribution results

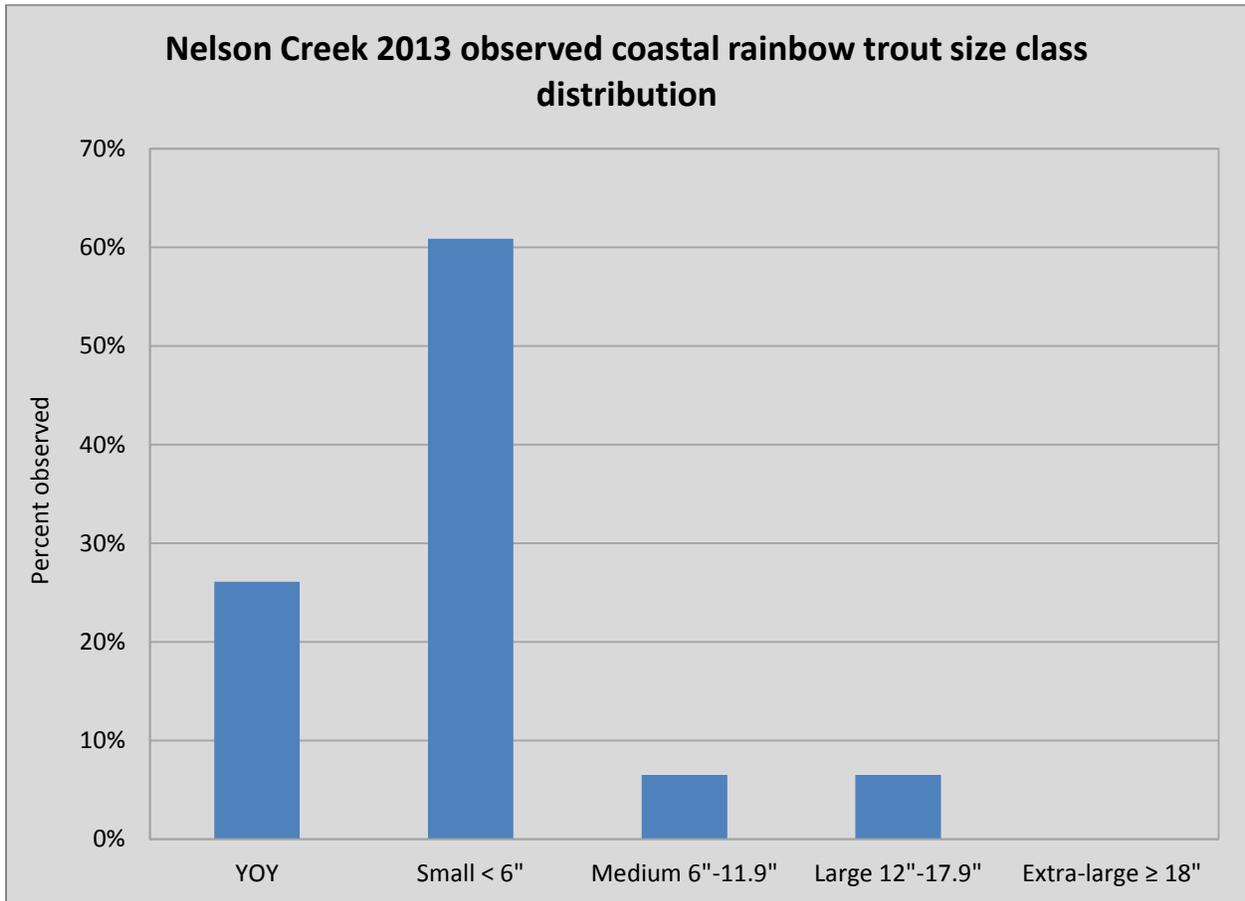


Figure 6. Graph of Nelson Creek ASB reported CPUE (fish/hr) from 1993-2011

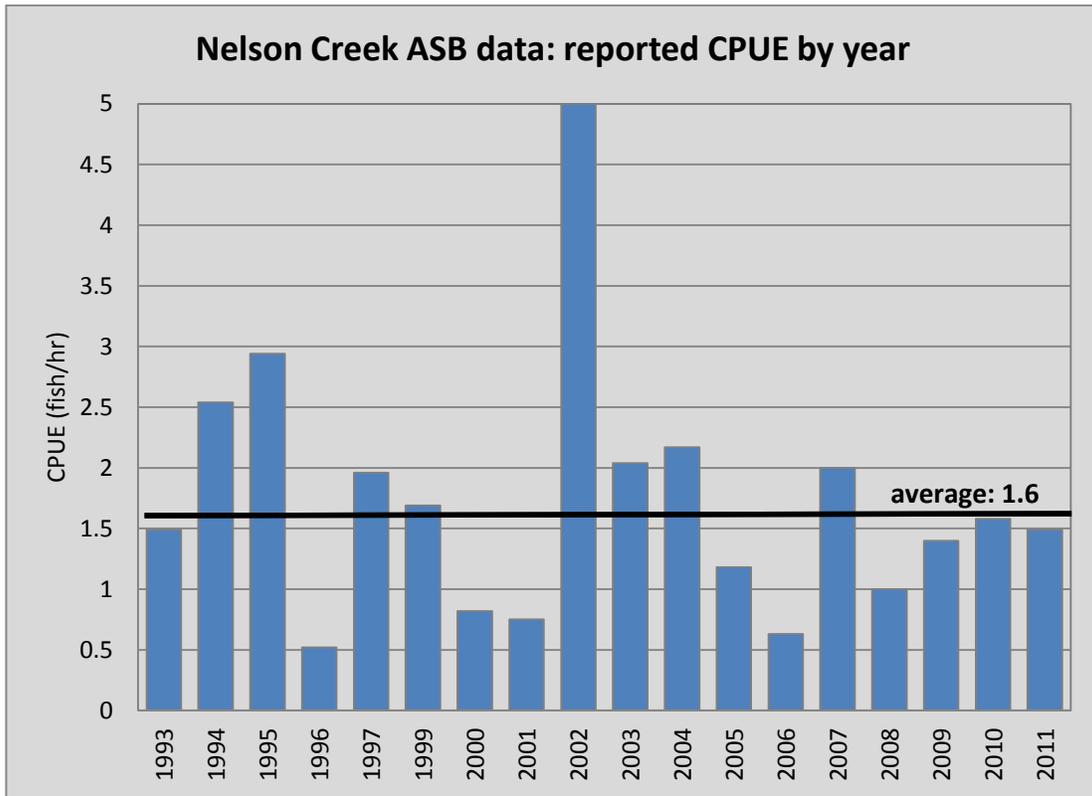


Figure 7. Graph of the Nelson Creek ASB coastal rainbow trout size class distribution by year from 1993-2011

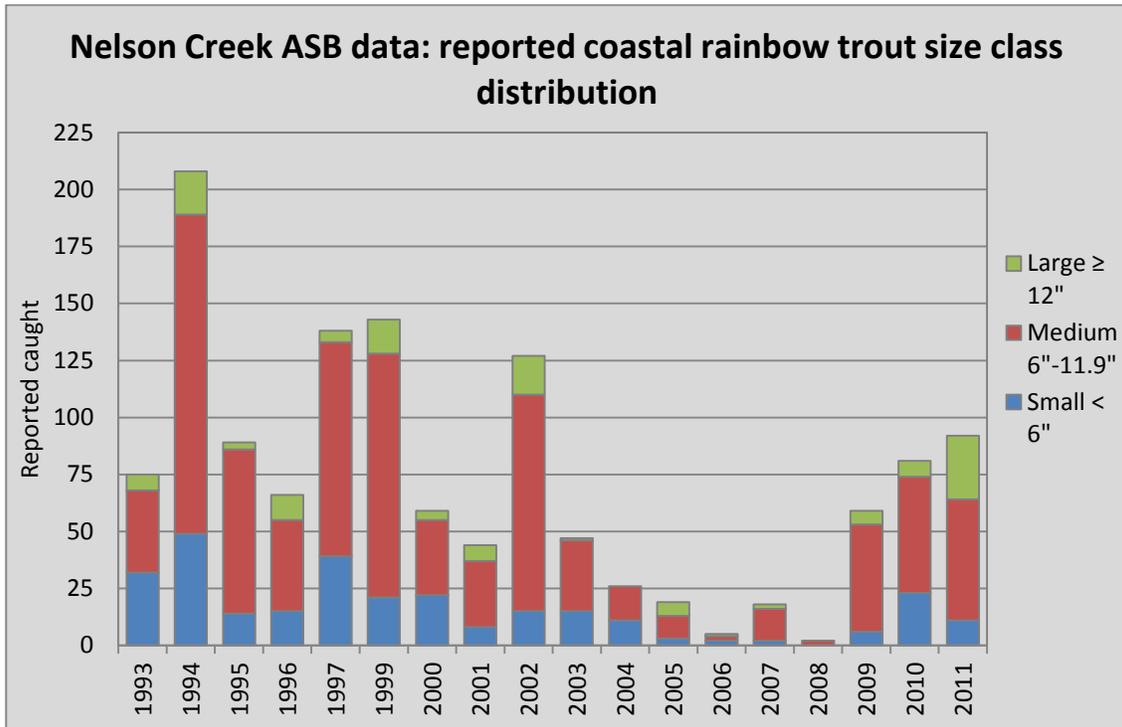


Figure 8. Graph of Nelson Creek ASB brown trout size class distribution by year from 1999-2011

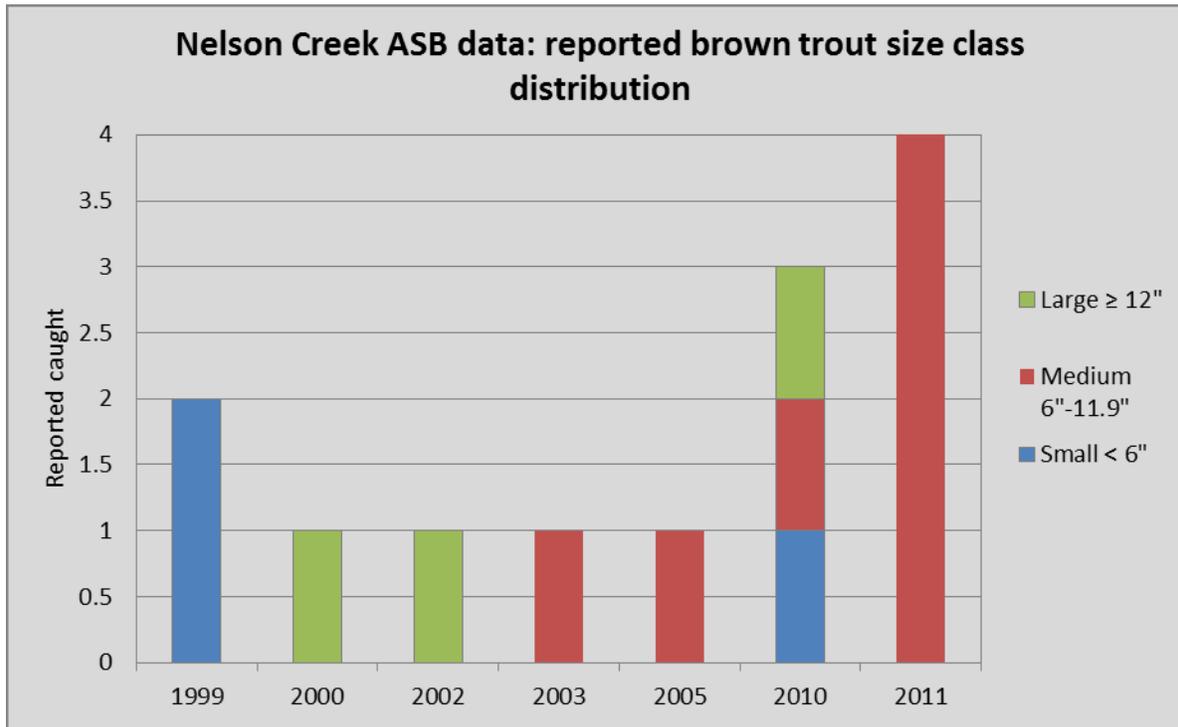


Figure 9. Graph of Nelson Creek ASB brook trout size class distribution by year from 1994-2011

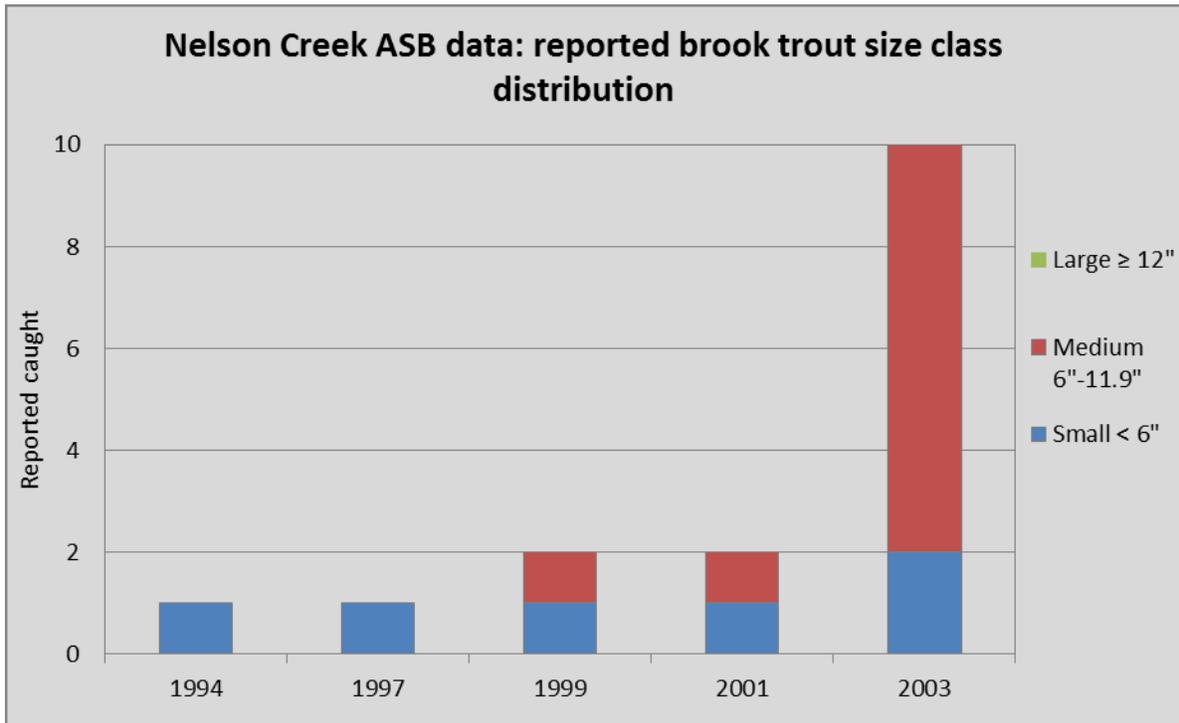


Figure 10. Graphs of Nelson Creek ASB angler satisfaction data with overall fishing experience by year from 1993-2002 and 2003-2011

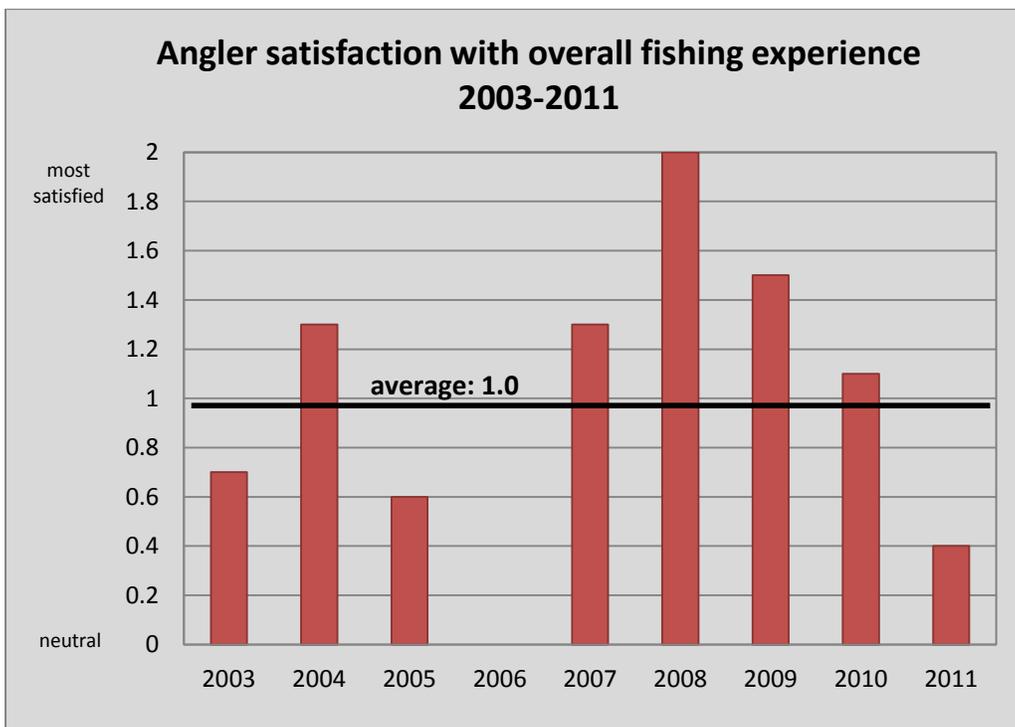


Figure 11. Graphs of Nelson Creek ASB angler satisfaction data with size of fish captured by year from 1993-2002 and 2003-2011

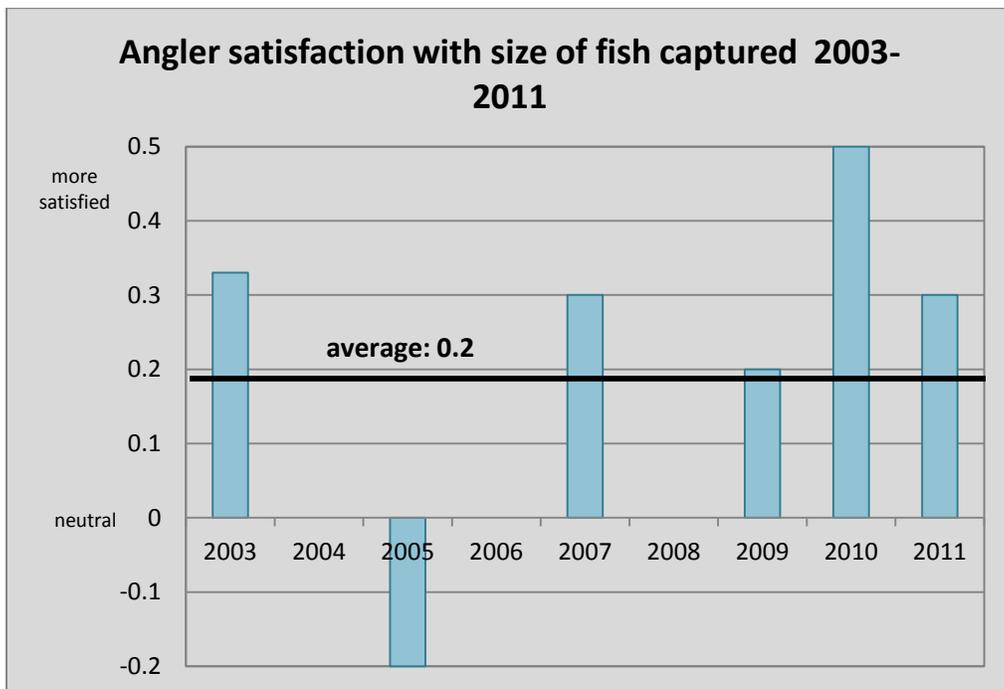
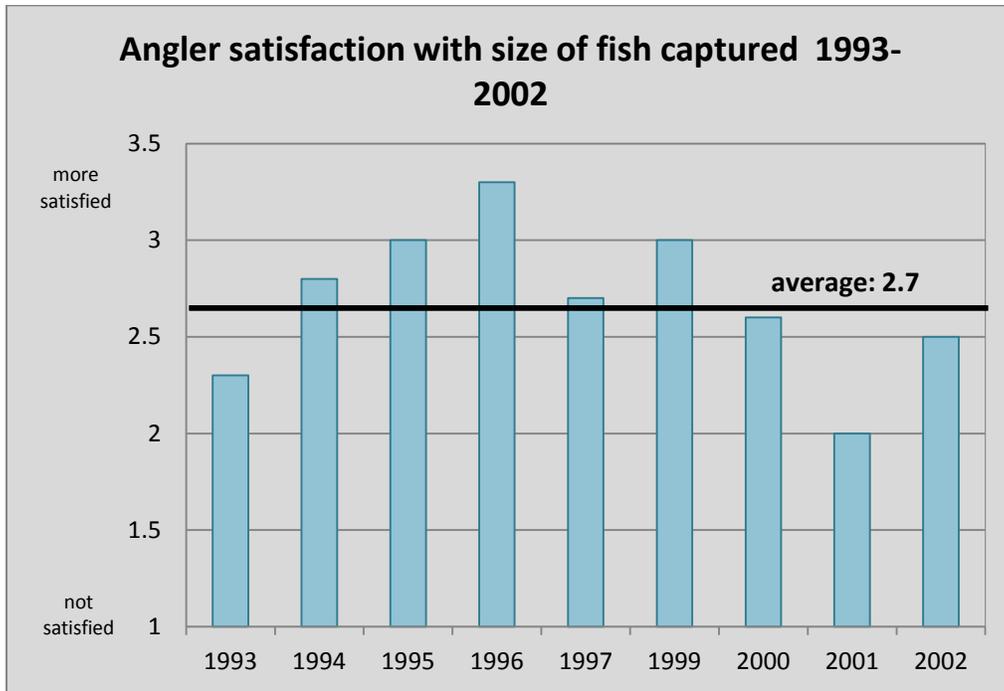


Figure 12. Graphs of Nelson Creek ASB angler satisfaction data with number of fish captured by year from 1993-2002 and 2003-2011

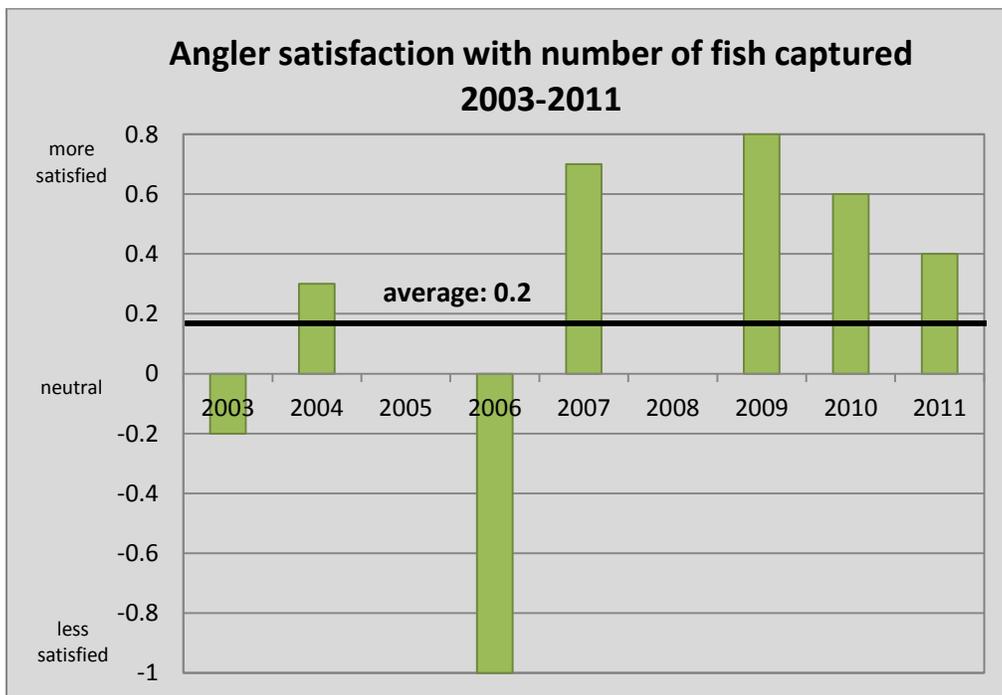
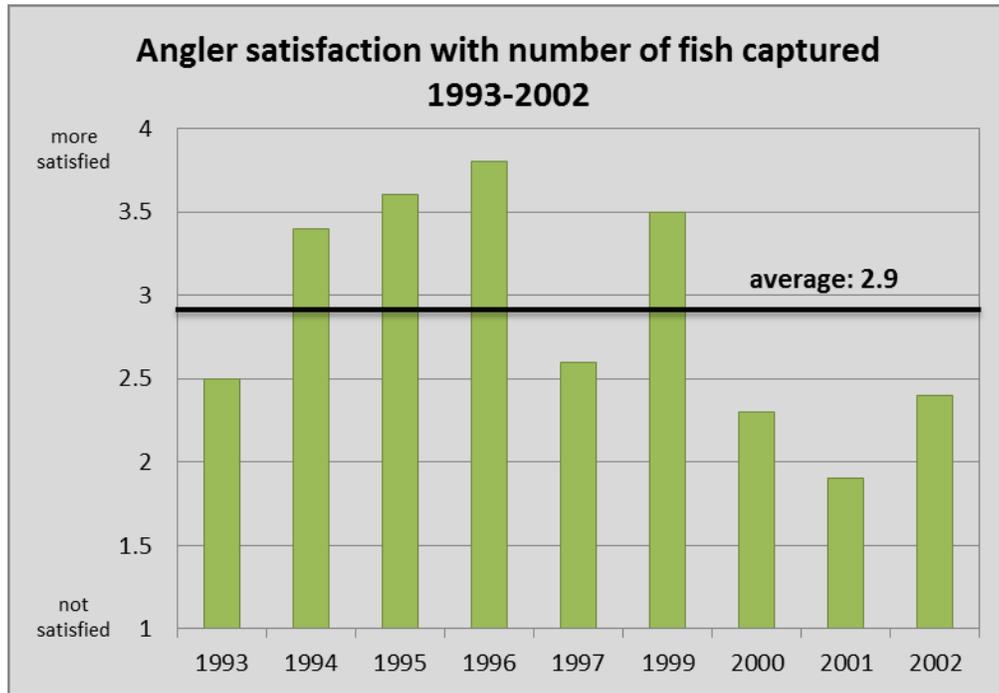


Figure 13. Graph of Nelson Creek coastal rainbow trout estimated density by year from 1988-2013 (long-term average in red)

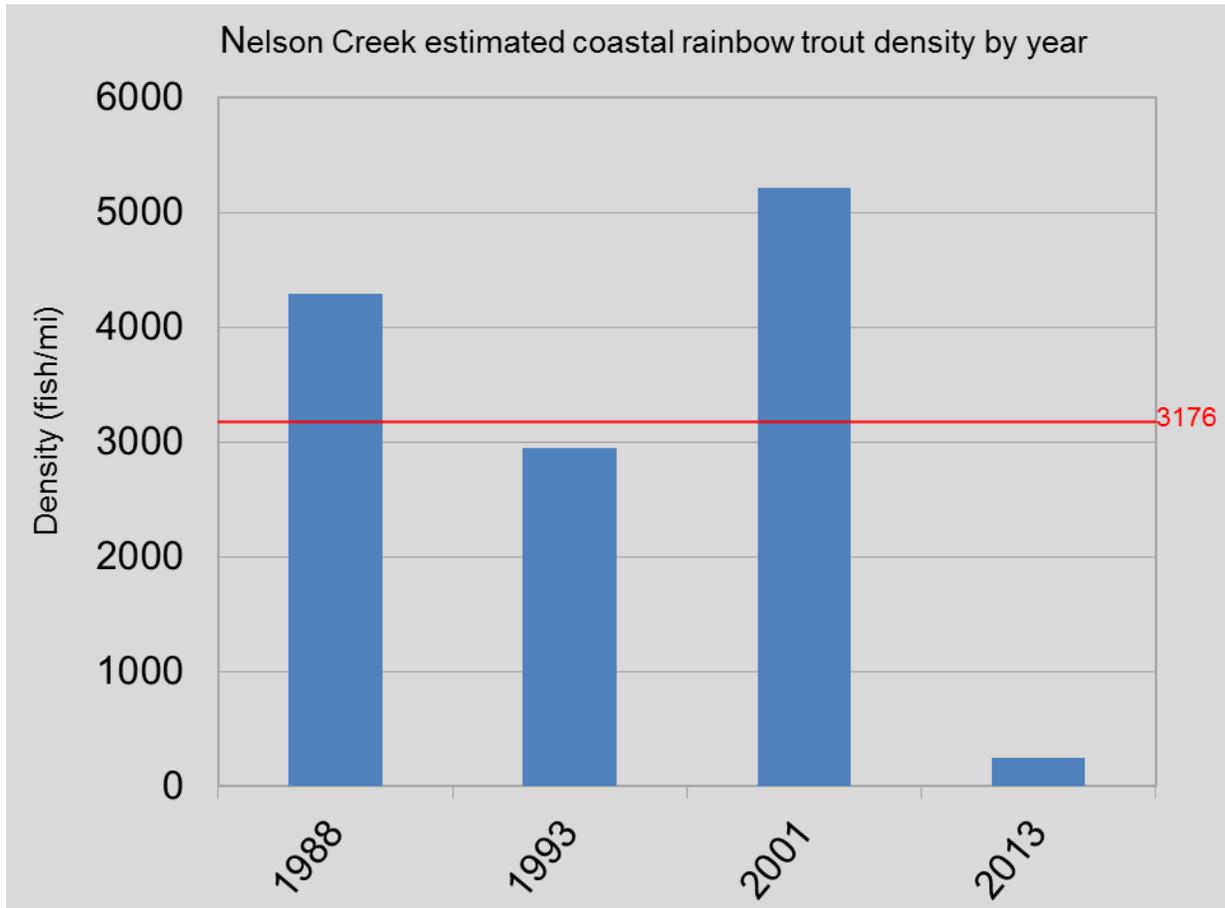


Figure 14. Graph of Nelson Creek 1993 to 2011 ASB data incorporating reported captured coastal rainbow trout size distribution into direct observation size classes

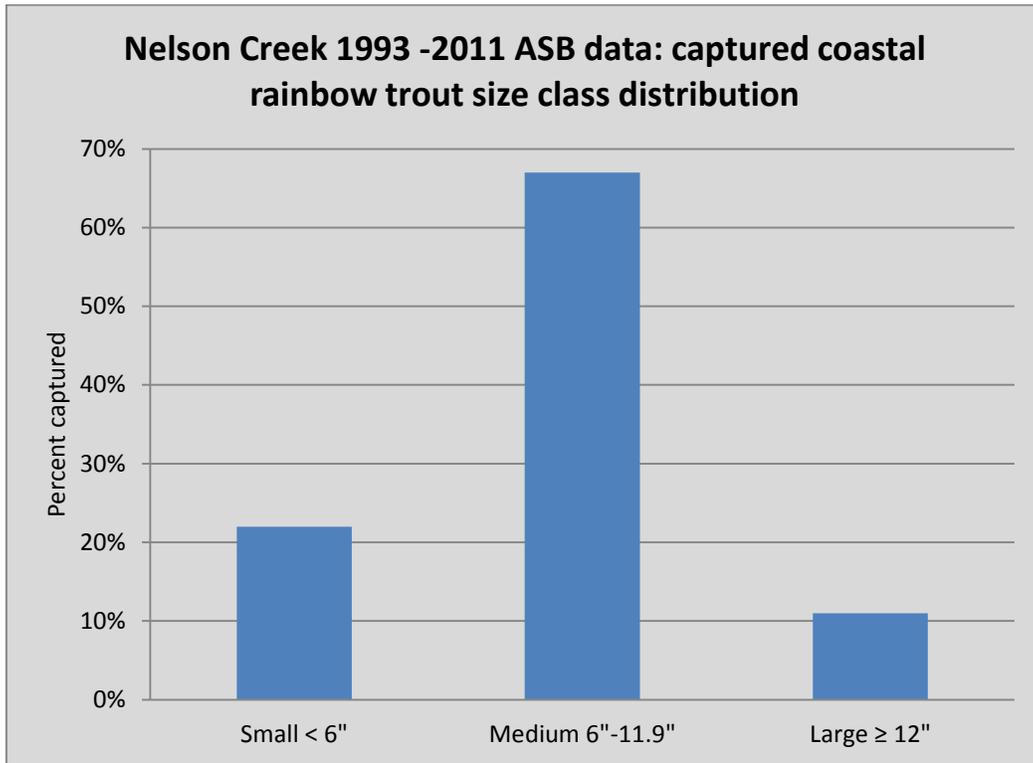


Figure 15. Photographs of evidence of mining from Sections 413 and 513



Figure 16. Photograph of 12 foot-waterfall and barrier to upstream fish migration on Nelson Creek in 2013



Table 1. Nelson Creek 2013 direct observation survey data

Section number	Section length (ft)	Habitat type	YOY	Number of coastal rainbow trout observed				Total	Estimated density (fish/mi)
				Small < 6"	Medium 6"-11.9"	Large 12"-17.9"	Extra-large ≥ 18"		
113	171.0	flatwater	0	0	0	2	0	2	62
213	166.4	riffle	3	16	2	1	0	22	698
313	181.7	flatwater	0	1	0	0	0	1	29
413	106.0	riffle	1	6	0	0	0	7	349
513	82.0	pool	0	1	0	0	0	1	64
613	127.0	flatwater	0	2	1	0	0	3	125
713	82.0	flatwater	8	2	0	0	0	10	644
813	66.8	pool	0	0	0	0	0	0	0

Table 2. Nelson Creek 2013 angling data: number of fish caught, total effort and CPUE

Angler	Date	Effort (hrs)	Number of rainbow trout captured				Total	CPUE (fish/hr)
			Small < 6"	Medium 6"-11.9"	Large 12"-17.9"	Extra-large ≥ 18"		
Anglin	10/2/2013	1.00	0	0	0	0	0	0.0
Choy	10/2/2013	1.00	0	0	1	0	1	1.0
<i>Average</i>								<i>0.5</i>

Table 3. Summary of Nelson Creek ASB data from 1993-2011

Year	Number of forms	Effort (hrs)	Total trout reported caught	Total brook trout reported caught	Total brown trout reported caught	Total coastal rainbow trout reported caught	CPUE (fish/hr)
1993	15	50.5	75	0	0	75	1.49
1994	29	82.25	209	1	0	208	2.54
1995	9	30.25	89	0	0	89	2.94
1996	8	34	66	0	0	66	0.52
1997	19	71	139	1	0	138	1.96
1998	0	0	0	0	0	0	0
1999	28	87	147	2	2	143	1.69
2000	21	73.5	60	0	1	59	0.82
2001	18	61.25	46	2	0	44	0.75
2002	40	23	115	0	1	114	5
2003	7	28.5	58	10	1	47	2.04
2004	3	12	26	0	0	26	2.17
2005	6	17	20	0	1	19	1.18
2006	2	8	5	0	0	5	0.63
2007	3	9	18	0	0	18	2
2008	1	2	2	0	0	2	1
2009	14	42	59	0	0	59	1.4
2010	15	53.25	84	0	3	81	1.58
2011	17	64.25	96	0	4	92	1.49

Table 4. Nelson Creek ASB data on reported gear type 1993-2011

Year	Bait	Bait and lure	Lure	Lure and fly	Fly	Unknown
1993	1.0%	0.0%	0.0%	0.0%	98.0%	1.0%
1994	28.0%	0.0%	52.0%	0.0%	14.0%	6.0%
1995	0.0%	0.0%	44.0%	0.0%	6.0%	50.0%
1996	0.0%	0.0%	37.0%	0.0%	13.0%	50.0%
1997	21.0%	0.0%	79.0%	0.0%	0.0%	0.0%
1998	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1999	14.0%	0.0%	79.0%	0.0%	0.0%	7.0%
2000	11.0%	0.0%	81.0%	0.0%	4.0%	4.0%
2001	11.0%	0.0%	56.0%	0.0%	11.0%	22.0%
2002	23.0%	0.0%	43.0%	0.0%	17.0%	17.0%
2003	0.0%	0.0%	17.0%	0.0%	83.0%	0.0%
2004	33.0%	0.0%	0.0%	0.0%	67.0%	0.0%
2005	16.5%	0.0%	16.5%	0.0%	67.0%	0.0%
2006	50.0%	0.0%	0.0%	0.0%	50.0%	0.0%
2007	33.0%	0.0%	67.0%	0.0%	0.0%	0.0%
2008	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%
2009	29.0%	7.0%	14.0%	0.0%	50.0%	0.0%
2010	7.0%	0.0%	13.0%	7.0%	73.0%	0.0%
2011	6.0%	0.0%	12.0%	0.0%	82.0%	0.0%

Table 5. Summary of Nelson Creek ASB angler satisfaction data 1993-2011

Year	Number of forms	Angler satisfaction with overall fishing experience	Angler satisfaction with size of fish captured	Angler satisfaction with number of fish captured
1993	15	3.1	2.3	2.5
1994	29	4.1	2.8	3.4
1995	9	3.4	3	3.6
1996	8	3.8	3.3	3.8
1997	19	3.4	2.7	2.6
1998	0	0	0	0
1999	28	3.7	3	3.5
2000	21	3.2	2.6	2.3
2001	18	2.2	2	1.9
2002	40	3.1	2.5	2.4
<i>Average</i>		<i>3.0</i>	<i>2.4</i>	<i>2.6</i>
2003	7	0.7	0.33	-0.2
2004	3	1.3	0	0.3
2005	6	0.6	-0.2	0
2006	2	0	0	-1
2007	3	1.3	0.3	0.7
2008	1	2	0	0
2009	14	1.5	0.2	0.8
2010	15	1.1	0.5	0.6
2011	17	0.4	0.3	0.4
<i>Average</i>		<i>1.0</i>	<i>0.2</i>	<i>0.2</i>

Table 6. Nelson Creek multiple-pass electrofish data 1988-2001

Year	Section	Section length (ft)	Species	Total number caught	Estimated population	Estimated density (fish/mi)	Capture probability	Confidence range (+/-)	95% Confidence interval
1988	3	325	coastal rainbow trout	246	264	4289	59%	14	250-278
1993	3	270	coastal rainbow trout	147	151	2953	69%	6	145-157
2001	3	270	coastal rainbow trout	141	168	3285	45%	24	144-192
	5	331	coastal rainbow trout	363	448	7146	42%	47	495-401
			brown trout	8	13	207	26%	29	-16-42