SNORKEL SURVEY REPORT FOR NORTH FORK MATILIJA 2015

Report Prepared by Marisa Morse

INTRODUCTION

A single pass snorkel survey was conducted in North Fork Matilija Creek of the Ventura Basin by the California Department of Fish and Wildlife (CDFW) with assistance from Pacific States Marine Fisheries Commission (PSMFC). Approximately 0.7 miles were snorkeled and 4.58 miles total were surveyed over a series of 5 days between July 28 and August 13, 2015. The survey began at the confluence of Matilija Creek and Upper North Fork and ended in the Los Padres National Forest at a total barrier to steelhead migration in the form of a sizeable cement road crossing. The purpose of this study was to estimate abundance and distribution of the *Oncorhynchus mykiss* population in North Fork Matilija Creek of the Ventura River system.

Oncorhynchus mykiss is a salmonid species native to California in watersheds draining to the Pacific coast. They display several complex life history strategies distinguished by behavioral and physiological differences to maximize available habitat. Resident rainbow trout remain in fresh water for their entire life, while anadromous steelhead trout hatch in fresh water, migrate to the ocean as smolts to mature, and return to freshwater streams to spawn. Anadromous individuals face added risks including ocean related mortality and potential migration barriers limiting access to spawning habitat, but gain the opportunity to to grow rapidly and wait for ideal conditions before returning to the watershed. *O. mykiss* species survival relies on utilizing all habitats of a river system and can therefore serve as an indicator of southern California watershed health (NFMS 2012).

Southern California steelhead trout were listed as an endangered species under the Federal Endangered Species Act in 1997. This included all naturally spawned anadromous *O. mykiss* residing in freshwater below and above total impassible barriers from Santa Maria River to Tijuana River (NMFS 2012). The National Marine Fisheries Services (NMFS) created the Southern California Steelhead Recovery Plan in 2012 to set standards for recovery efforts and ultimately delist southern California steelhead. Objectives of the recovery plan included protecting existing habitat, maintaining current population distribution, increasing steelhead abundance, and conserving genetic diversity for each of the Biogeographic Population Groups in the Southern California Region. Each Biogeographic Population Group (BPG) was characterized by its own set of ecological and physical characteristics that created different natural selection regimes for steelhead populations residing within them. A single BPG can incorporate multiple watersheds and multiple steelhead populations, thus core populations in all BPGs must be viable before the entire population can be delisted (NMFS 2012).

WATERSHED OVERVIEW

The North Fork of the Matilija Creek is 4.58 miles long and located in the Monte Arido Highlands Biogeographical Population Group. It serves as a major tributary of the Ventura River and outlets into the Pacific Ocean. The entire Ventura Basin, including North Fork Matilija, is classified as a high priority watershed for steelhead trout recovery by the Southern California Steelhead Recovery Plan (NMFS

2012). Therefore, it is important to document *O. mykiss* abundance and distribution in North Fork Matilija to help structure management decisions and support recovery. The factors most threatening to *O. mykiss* populations in North Fork Matilija are wildfires, roads, and mining and quarrying (NMFS 2012).

METHODS

Field Methods

A study was conducted in North Fork Matilija Creek in the Ventura watershed using a protocol adapted from protocols designed by the American Fisheries Society in the Salmonid Field Protocol Handbook (O'Neil 2007) and the US Department of Agriculture in the Underwater Methods for Study of Salmonids in the Intermountain West (Thurow 1994). Approximately 4.58 miles were surveyed over a series of 5 days, beginning on July 28 and concluding on August 13, 2015. The survey began at the confluence of North Fork Matilija and Matilija Creek and ended at a total barrier to anadromy. The cement crossing in the Los Padres National Forest Wheeler Gorge Campground was assessed as a total barrier by DFG, Ecotrust, Entrix in January 2013.

Teams of up to four people, with at least one snorkeler and one data recorder, moved upstream to complete a single pass snorkel survey. A habitat unit was selected if it maintained an average depth greater than 0.7 feet. m

Data recorders carried a GPS, camera, thermometers, and stadia rod in order to document information on location, temperature, and pool size indexes. Snorkelers were outfitted with gear critical for effective fish surveying such as a full neoprene wetsuit, mask, snorkel, and dive light. Divers entered the water with controlled movements in order to reduce the disturbance to fish and fine sediment. While in the water, the diver's responsibility was to count and sort *O. mykiss* into 2" size classes (eg. 0-1.99", 2-3.99", 4-5.99", etc.) for each snorkeled unit. Observations regarding other fish (Arroyo Chub (*Gila orcutti)* and Coastal Threespine Stickleback (*Gasterosteus aculeatus aculeatus*)), amphibian, or reptile species were also recorded. The diver determined shelter value on a scale of 1 to 3, with 1 indicating inability to survey pool due to turbidity and 3 meaning ideal visibility. In addition, shelter value was estimated on a scale of 0 to 3 based on in-stream shelter complexity. 0 specified no shelter and 3 was the most complex habitat following the Flosi et al. 2010 guidelines (Table 1).

Value	Instream Shelter Complexity Value Examples
0	• No Shelter
1	• One to five boulders • Bare undercut bank or bedrock ledge • Single piece of large wood (>12" diameter and 6' long) defined as Large woody debris (LWD)

2	• One or two pieces of LWD associated with any amount of small wood (<12" diameter) defined as small woody debris (SWD) • Six or more boulders per 50 feet • stable undercut bank with root mass, and less than 12" undercut • A single root wad lacking complexity • Branches in or near the water • Limited submersed vegetative fish cover • Bubble curtain
3	Combinations of (must have at least two cover types): • LWD/boulders/root wads • Three or more pieces of LWD combined with SWD • Three or more boulders combined with LWD/SWD • Bubble curtain combined with LWD or boulders • Stable undercut bank with greater than 12" undercut, associated with root mass or LWD • Extensive submersed vegetative fish cover

Table 1. Shelter value based on habitat complexity (Flosi et al. 2010)

Data Analysis

North Fork Matilija Creek trout densities for 2014 and 2015 were calculated based on three different parameters: total units, length, and surface area. *O. mykiss* density per foot of length was calculated by dividing total observed trout abundance by the total length surveyed (ft). By dividing total *O. mykiss* count by the total number of units snorkeled, average *O. mykiss* observed per unit was estimated. In addition, trout density per square foot of surface area was enumerated by dividing the total *O. mykiss* abundance by the sum of each unit's surface areas.

Size class distribution was estimated as total *O. mykiss* occurrence within each size class for years 2014 and 2015.

All habitat units of the snorkel survey were separated based on shelter value to give a better understanding of fish distribution by habitat complexity. *O. mykiss* density was calculated by dividing trout abundance by the total surface area surveyed with the associated shelter value. The probability of *O. mykiss* occurrence within each shelter value was determined by dividing the number of units with observed *O. mykiss* by the frequency of units with the corresponding shelter value.

Methods to calculate *O. mykiss* density and shelter value measurements were duplicated for arroyo chub and three-spined stickleback populations in North Fork Matilija of 2015. Average fish per unit, length (ft), or surface area (sqft) was equivalent to the total number of fish divided by the associated parameter.

RESULTS

Year	2014	2015

***O. mykiss* Abundance**	75	84
Units Snorkeled Count	148	134
Total Length (ft) Snorkeled	4496	3925
***O. mykiss* Density per Unit**	5.07E-01	6.27E-01
***O. mykiss* Density per Length (ft)**	1.67E-02	2.14E-02
***O. mykiss* Density per Surface Area (sqft)**	1.30E-03	1.60E-03

Table 2. *O. mykiss* density based on total units, length snorkeled, and total surface area for 2014 and 2015

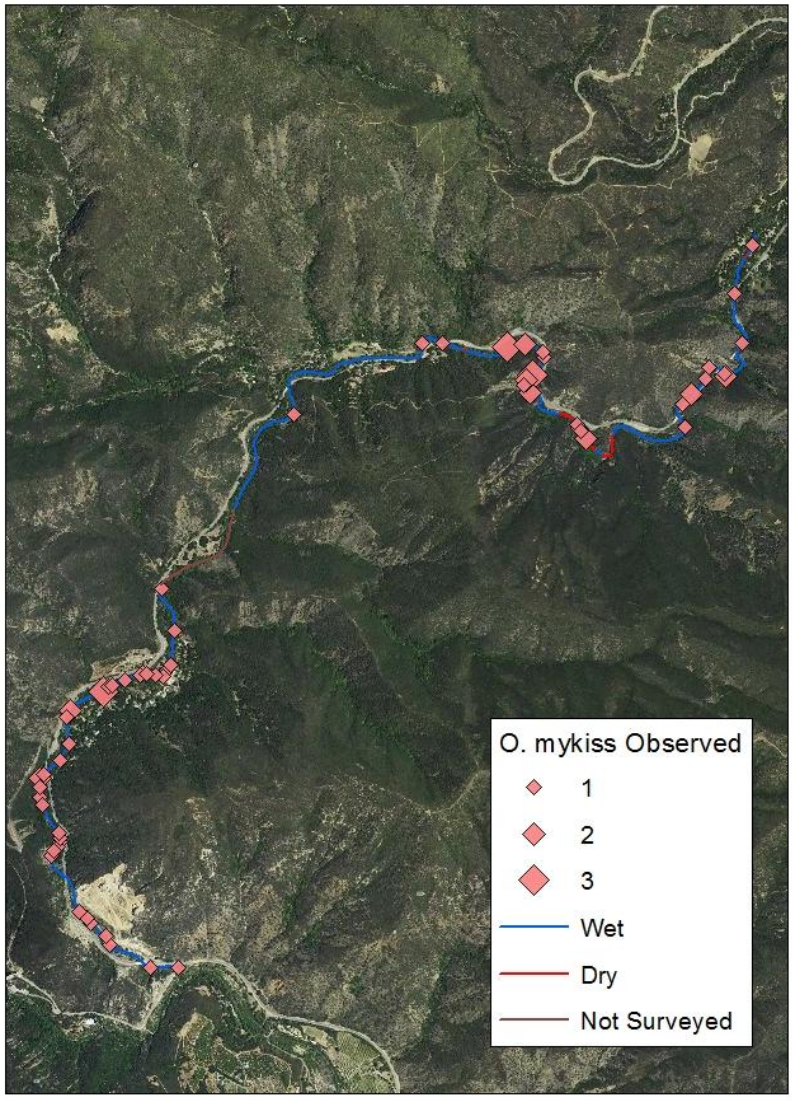

Figure 1. Observed O. mykiss distribution along North Fork Matilija in 2015. Portions were not surveyed (brown) due to ungranted access on private property.

Observed *O. mykiss* Size Class Distribution						
Year	**0-1.99**	**2-3.99**	**4-5.99**	**6-7.99**	**8-9.99**	**10-11.9**
2014	10	47	12	5	1	1
2015	1	43	24	12	2	2

Table 3. North Fork Matilija *O. mykiss* abundance observed within each size class for 2014 and 2015

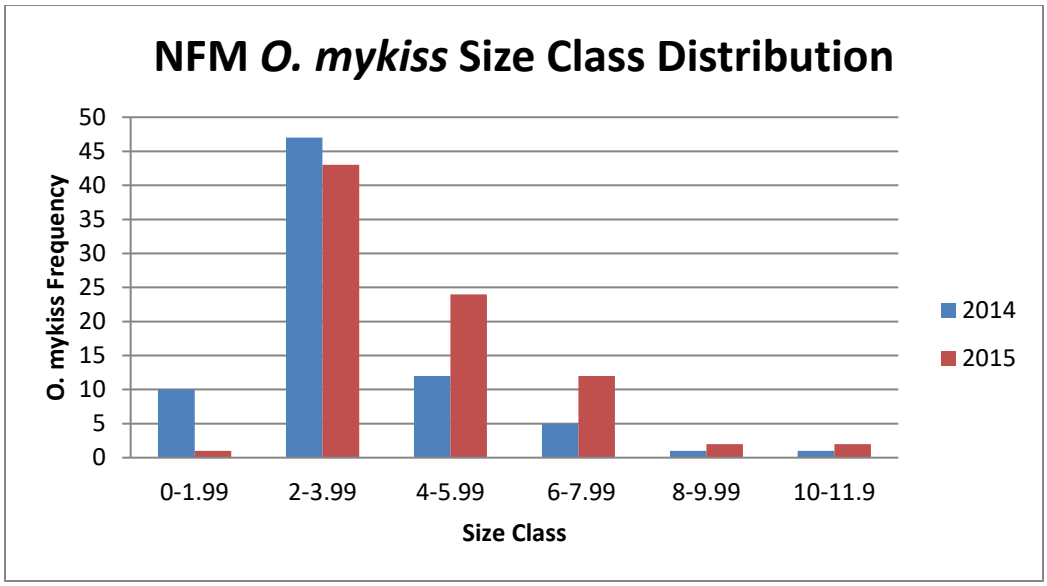

Figure 2. Observed *O. mykiss* abundance within each 2" size class for 2014 and 2015

Year	**2014**			**2015**		
Shelter Value	**1**	**2**	**3**	**1**	**2**	**3**
***O. mykiss* Abundance**	5	69	2	5	75	4
Total Surface Area (sqft)	3322	43018	418	4000	46085	2297
***O. mykiss* Density per Surface Area**	0.002	0.002	0.005	0.001	0.002	0.002
***O. mykiss* Presence Count**	3	34	1	5	44	4
Shelter Value Frequency	15	131	2	22	108	4
Ratio of Shelter Values with Presence	0.2	0.26	0.5	0.227	0.41	1

Table 4. *O. mykiss* abundance and presence by habitat complexity for 2014 and 2015

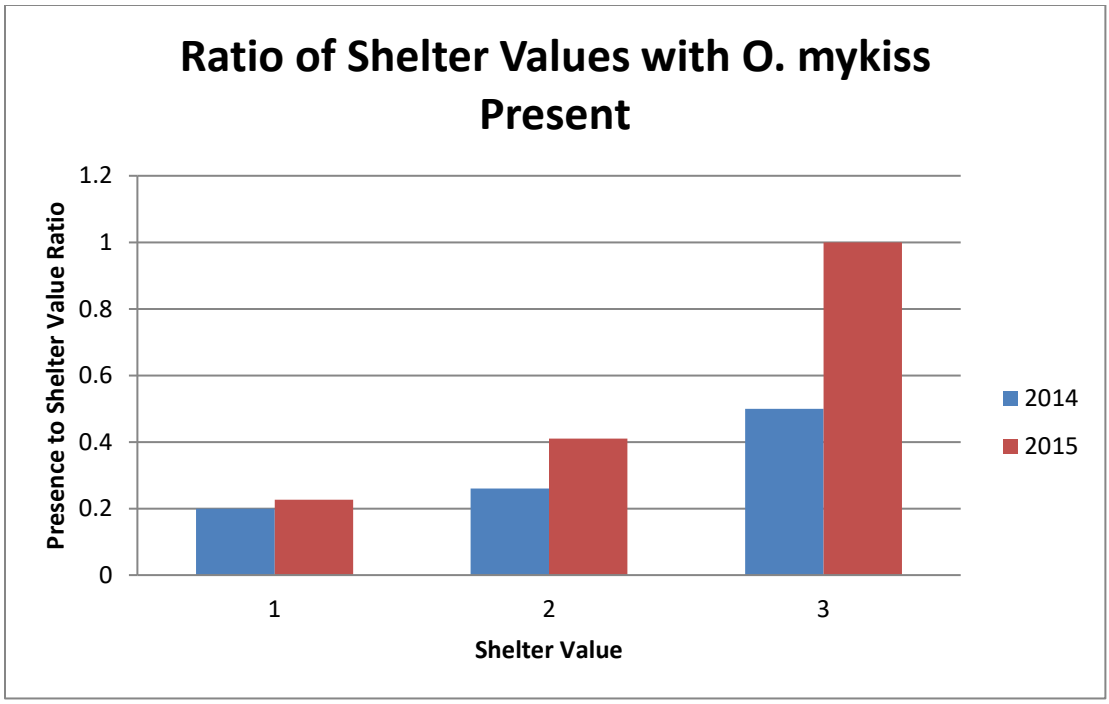

Figure 3. Ratio between *O. mykiss* presence and shelter value frequency for 2014 and 2015

	Arroyo Chub	Stickleback
Total Abundance	1951	1151
Fish Density per Unit	14.6	8.59
Fish Density per Length (ft)	0.497	0.293
Fish Density per Surface Area (sqft)	0.059	0.031

Table 5. Other species density based on unit count, length, and total surface area surveyed for 2015 in North Fork Matilija

Fish	**Arroyo Chub**			**Coastal Threespine Stickleback**		
Shelter Value	**1**	**2**	**3**	**1**	**2**	**3**
Abundance	98	1696	157	205	905	41
Total Surface Area	4000	46085	2297	4000	46085	2297
Fish Density per Surface Area	0.025	0.037	0.068	0.051	0.020	0.018
Fish Presence Count	10	76	4	18	90	3
Shelter Value Frequency	22	108	4	22	108	4
Ratio of Shelter Values with Presence	0.455	0.703	1.000	0.818	0.833	0.750

Table 6. Other species abundance and presence by habitat complexity for 2015 in North Fork Matilija

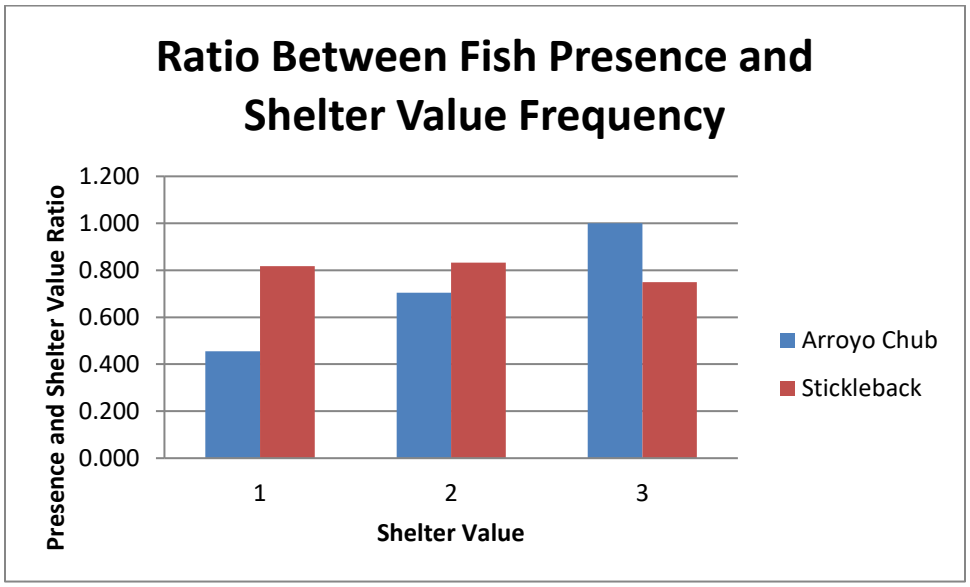

Figure 4. Ratio between other species presence and shelter value frequency for 2015

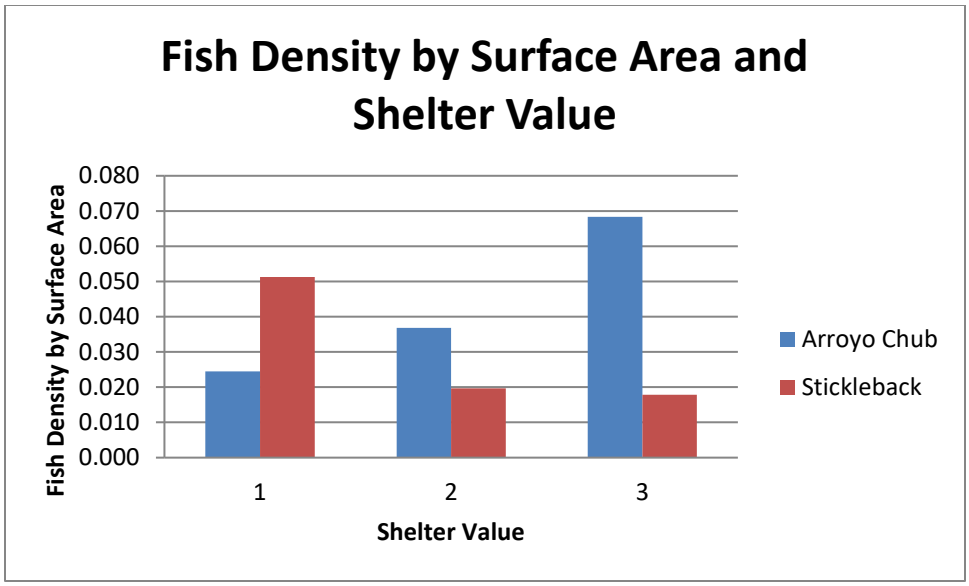

Figure 5. Other species density by fish abundance and total surface area within each shelter value

DISCUSSION

The goal of this report was to estimate population abundance and distribution of *Oncorhynchus mykiss* in North Fork Matilija of the Ventura Basin. Due to conflicts with private property access, a 0.3 mile section of the creek was unsurveyable. Snorkel survey data for years 2014 and 2015 were compared. 14 more units and 571 feet more of length were snorkeled in 2014 than 2015. For the length of North Fork Matilija that was surveyed, observed *O. mykiss* abundance was greater in 2015 than 2014. *O. mykiss* density based on either unit count, length (ft), or surface area (sqft) was also greater. Snorkelers observed *O. mykiss* presence in 38 of 148 (25.7%) habitat units in 2014 and 53 of 134 (39.6%) habitat units in 2015. Observed trout distribution demonstrated that *O. mykiss* were present along the entire surveyed area of North Fork Matilija. In addition,

Arroyo Chub and Stickleback populations were located throughout the snorkel survey.

The size class with the greatest *O. mykiss* frequency was 2-3.99” for both 2014 and 2015 data. Both years showed a decrease in trout frequency for each consecutive 2” size class until 10-11.99”.

Observed *O. mykiss* presence within shelter value bins (1, 2, and 3) increased from 2014 to 2015. In addition, for both years, fish presence to total habitat units increased with shelter value and habitat complexity. However, since both years yielded a low frequency of habitat value 3, these values should be considered with caution. In 2015, 100% of habitat units with a shelter value of 3 had fish presence; however a closer look revealed that shelter value of 3 was represented by only 4 units. The shelter value of 1 constitutes 7.4% of the total surface area surveyed for 2014 and 2015. 89.9% of the total surface area had a shelter value of 2 and 2.7% had a shelter value of 3. Recordings of habitat units with a shelter value of 1 or 3 were rare and could lead to a misrepresentation of how fish presence correlates to habitat complexity.

For 2015, Arroyo Chub presence and density increased as habitat became more complex. Observed Stickleback presence was not dependent on shelter value and habitat complexity. However, Coastal Threespine Stickleback density decreased with increasing habitat complexity. Although this data suggests certain trends, the unequal representation of shelter values with varying habitat complexity could be misleading during data analysis.

In conclusion, this data reveals little of the total abundance of *O.mykiss*, Arroyo Chub, and Coastal tickleback populations in North Fork Matilija. Fish distribution was more conclusive with all three species present throughout the reach, excluding unsurveyable sections. More research needs to be done to understand *O. mykiss* population density and abundance in the North Fork Matilija Creek.

LITERATURE CITED

Environmental Defense Center. Lawsuit filed against Ojai Rock Quarry to address chronic storm water pollution problems. Santa Barbara Channel Keeper. N.p., 04 Sept. 2013. Web. 03 Oct. 2015. <http://www.sbck.org/wp-content/uploads/2013/09/Quarry-lawsuit-press-release-9-3-131.pdf>.

Flosi, G. Downie S. 1998. California Salmonid Stream Habitat Restoration Manual. Third Edition. The Resources Agency, California Department of Fish and Wildlife, Inland Fisheries Division.

Johnson, D. H., B. M. Shrier, J. S. O'Neil, J. A. Knutzen, X. Augerot, T. A. O'Neil, and T. N. Pearsons. 2007. Salmonid field protocols handbook: techniques for assessing status and trends in salmon and trout populations. American Fisheries Society, Bethesda, Maryland.

National Marine Fisheries Service. 2011. Southern California Steelhead Recovery Plan. Southwest Region, Protected Resources Division, Long Beach, California.

Thurow, Russell F. 1994. Underwater methods for study of salmonids in the Intermountain West. Gen. Tech. Rep. INT-GTR-307. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station. 28 p.

APPENDIX

Habitat Unit	Mean Length	Mean Width	Mean Depth	Max Depth	O. mykiss Count	Size Class
A001	48	12.5	1.1	2.3	1	2 - 3.99
A002	16	8.5	0.7	1.5	0	
A003	12	18	0.8	1.8	0	
A004	14	17	0.9	1.8	0	
A005	46	25	5.5	6.8	0	
A006	10.5	11	0.7	1.1	0	
A007	14	7	1.2	1.4	1	2 - 3.99
A008	6.5	7	1.1	1.9	0	
A009	8	14	0.8	1.2	0	
A010	14	12	0.8	1.1	0	
A011	11	16	1.4	1.7	0	
A012	13	13	1.3	1.8	0	
A013	25	8	1.4	1.9	0	
A014	25	8	1.3	2.2	0	
A015	17	6	1	2.3	0	
A016	30	11	1.6	2.7	0	
A017	20	8	1	1.9	0	
A018	31	8	0.8	1.7	1	2 - 3.99
A019	12	6	1.1	2	0	
A020	17	10	1.6	2.9	1	6 - 7.99
A021	21	5	1.4	2.7	0	
A022	27	9	1.6	3.1	0	
A023	13	14	2	2.8	1	6 - 7.99
A024	25	33	2.9	4.9	1	4 - 5.99
A025	10	16	0.8	1.3	0	
A026	22	10	1.4	3	1	4 - 5.99
A027	38	20	1.2	2.7	0	
A028	21	13	1	1.8	0	
A029	30	15	1	2.8	0	
A030	20	13	1.1	2	0	
A031	11	7	0.7	1.3	0	
A032	52	12	1	2.2	1	6 - 7.99
A033	13	8	0.8	1.1	0	
A034	8	8	0.9	1.6	1	4 - 5.99
A035	9	22	1	1.5	1	4 - 5.99
A036	17	8	1.3	2.2	1	4 - 5.99
A037	15	18	2.1	2.7	1	4 - 5.99
A037	15	18	2.1	2.7	1	6 - 7.99
A038	15	17	1.2	2.5	0	
A039	12	7	0.9	1.5	0	
A040	22	9	1.2	2.2	0	
A041	47	15.5	0.8	2.3	0	
A042	12	3.8	0.7	1.15	1	2 - 3.99
A043	50	10.2	9	1.6	0	
A044	16	10.3	1	2.2	0	
A045	56	13	1.2	2.3	1	2 - 3.99
A045	56	13	1.2	2.3	1	4 - 5.99
A046	51	17	0.8	1.7	1	4 - 5.99
A046	51	17	0.8	1.7	1	10 - 11.99
A047	67	10.5	0.8	1.7	1	2 - 3.99
A047	67	10.5	0.8	1.7	2	4 - 5.99
A048	8	11	0.8	1.2	0	
A049	23	13	0.8	1.2	1	4 - 5.99
A050	102	13	1.6	3.2	0	
A051	89	24	2.6	4.7	1	4 - 5.99
A051	89	24	2.6	4.7	1	10 - 11.99
A052	11	9	0.9	1.1	0	
A053	22	11	1.1	1.7	1	2 - 3.99
A054	37	12.6	1	1.45	2	2 - 3.99
A055	16	10	1.1	1.5	0	
A056	24	14	0.9	1.1	0	
A057	37	15	1.3	2.3	3	2 - 3.99

Habitat Unit	Mean Length	Mean Width	Mean Depth	Max Depth	O. mykiss Count	Size Class
A058	33	11	0.9	1.25	1	2 - 3.99
A059	49	16.7	1	1.55	1	4 - 5.99
A060	32	12	0.9	1.7	1	2 - 3.99
A060	32	12	0.9	1.7	1	6 - 7.99
A061	20	11	0.9	1.2	0	
A062	16.5	10.5	1	1.2	0	
A063	13	10	1.2	2	1	2 - 3.99
A064	15	13	1.2	1.7	1	4 - 5.99
A065	25	7	1	1.5	0	
A066	20	9	0.8	1.2	1	2 - 3.99
A067	56	18	1.7	2.4	1	2 - 3.99
A068	34	17	2	5.6	1	2 - 3.99
A068	34	17	2	5.6	1	6 - 7.99
A068	34	17	2	5.6	1	8 - 9.99
A069	31.2	13	1.2	2.5	0	
A070	14	8	0.8	1.3	1	4 - 5.99
A071	18	13	1.3	2	0	
A072	11	6	0.8	2.1	0	
A073	14	11	0.9	2.1	1	2 - 3.99
A074	32	11	1	1.8	0	
A075	48	13	1.8	3.1	0	
A076	19	7	1.6	3.1	0	
A077	29	10	0.9	1.6	0	
A078	96	16	2.5	4.5	1	2 - 3.99
A078	96	16	2.5	4.5	1	4 - 5.99
A079	50	11	1.7	3.3	0	
A080	10	14	1.4	2.1	0	
A081	15	8	2.2	4	0	
A082	15	10	1.6	3	0	
A083	15	8	1	1.9	0	
A084	27	14	1.2	2.2	0	
A085	13	8	1	1.9	0	
A086	13	8	1.3	1.9	0	
A087	14	7	1.2	2.3	1	2 - 3.99
A088	28	11	1.4	3	0	
A089	31	14	1.4	2.9	0	
A090	12	10	2.5	5.5	0	
A091	14	10	1.5	2.3	0	
A092	11	16	1.3	1.9	0	
A093	7	8	0.9	1.3	0	
A094	63	14	1.3	1.8	0	
A095	17	9	0.9	1.5	0	
A096	49	8	1.5	2.2	0	
A097	13	6	1.1	1.4	0	
A098	28	8	1.1	2	0	
A099	9	7	1.3	2	0	
A100	22	9	1	1.6	1	2 - 3.99
A101	18	13	0.8	1.8	0	
A102	13	10	1	1.3	1	2 - 3.99
A103	18	6.5	0.8	1.4	0	
A104	24	10.5	0.8	1.3	0	
A105	12	9	1	2.1	0	
A106	38	9	1.8	2.5	3	2 - 3.99
A107	12	11	1.4	2	2	4 - 5.99
A108	19	14	1.2	2.1	0	
A109	13	47	1.3	2	1	2 - 3.99
A109	13	47	1.3	2	1	6 - 7.99
A110	9	55	1.3	2.6	0	
A111	16	9	1.4	2.3	1	2 - 3.99
A111	16	9	1.4	2.3	3	4 - 5.99
A112	28	15	1.3	1.8	2	2 - 3.99
A113	40	15	2.8	4.5	0	
A114	33	14	1.3	2.1	2	2 - 3.99
A116	24	17	1.1	1.6	0	

Habitat Unit	Mean Length	Mean Width	Mean Depth	Max Depth	O. mykiss Count	Size Class
A117	13	9	1	1.8	0	
A117	13	9	1	1.8	1	2 - 3.99
A117	13	9	1	1.8	1	4 - 5.99
A117	13	9	1	1.8	1	6 - 7.99
A118	30.5	13	1.7	3.1	2	6 - 7.99
A119	18	8	1.4	2.1	0	
A120	15	11	1.5	2	0	
A121	16	7	1.5	2.4	1	6 - 7.99
A122	19	6.5	1.3	2.3	0	
A123	23	12	2.3	3.6	1	2 - 3.99
A124	23	12	2.3	3.6	2	2 - 3.99
A125	18	13	0.8	1.2	0	
A126	27	14	1	1.6	1	0 - 1.99
A126	27	14	1	1.6	1	2 - 3.99
A126	27	14	1	1.6	1	4 - 5.99
A127	14	9	0.9	1.8	1	4 - 5.99
A128	24	12	1	2.3	1	6 - 7.99
A128	24	12	1	2.3	2	2 - 3.99
A129	25	12	0.9	2.8	2	2 - 3.99
A130	34	8	1	2.7	0	
A131	20	10	1.2	1.8	1	2 - 3.99
A132	31	15	0.8	2	0	
A133	18	16	0.7	1.3	1	2 - 3.99
A134	30	19	1	2	0	
A135	29	8	0.8	1.7	1	8 - 9.99