Snorkel Survey Report for North Fork Matilija Creek 2014

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Introduction

A double pass snorkel survey was conducted on North Fork Matilija Creek by Pacific States Marine Fisheries Commission (PSMFC). The survey was conducted between July 8, 2014 and July 28, 2014. The objective of this snorkel survey was to gather information about the abundance and distribution of *Oncorhynchus mykiss* (*O. mykiss*) currently residing in North Fork Matilija Creek.

O. 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 *O. mykiss*, more commonly known as 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 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).

Since 1997, the Southern California Steelhead Distinct Population Segment (DPS) has been classified as an endangered species under the Federal Endangered Species Act. In 2012, the National Marine Fisheries Service (NMFS) released the Southern California Steelhead recovery plan. The recovery plan outlined different recovery strategies for each of the Biogeographic Population Groups (BPG) in the Southern California region. A BPG is defined as a unique combination of physical and ecological characteristics that present differing natural selective regimes for steelhead populations utilizing the individual watersheds (NMFS 2012). Thus each BPG will be comprised of multiple watershed and multiple *O. mykiss* populations. The plan prioritizes each watershed as Core 1, 2, or 3 based on the creek's intrinsic potential to support viable steelhead populations. North Fork Matilija Creek is Core 1 population partly due to its historic significance as a steelhead spawning stream.

Watershed Overview

North Fork Matilija Creek is located north of the town of Ojai within the Ventura River watershed in Ventura County, California. It resides in the Monte Arido BPG and flows from the headwaters in the Topatopa Mountains, located in the Transverse Range, to the confluence with the Ventura River. North Fork Matilija Creek is a primary tributary to the Ventura River and resides on both public and United States Forest Service Land in the Los Padres National Forest. The North Fork Matilija Creek watershed drains approximately 10,297 acres out of a total of 144,967 acres for the entire Ventura River watershed. The survey reach began at the confluence of North Fork Matilija Creek and Ventura River (34.45819, -119.30055) and extended 4.35 miles (22,979 ft.) upstream ending at the limit of anadromy defined by the total barrier at the Wheeler Gorge Campground (34.27382, -119.51300). 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. Figure 1 shows surveyed section of North Fork Matilija Creek with respect to the Ventura River confluence.

Figure 1: Surveyed section of North Fork Matilija Creek

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). The objective of this snorkel survey was to measure an index of abundance and observe distribution of *O. mykiss* in this anadromous section of North Fork Matilija Creek.

This double pass snorkel survey was comprised of two teams, each consisting of at least one diver and one data recorder. The first team selected, marked, and then dove every other habitat unit with at least an average depth of 0.7 foot. Of these habitat units, the snorkel teams skipped pools unfit for snorkeling due to conditions unsuitable for a diver (e.g., oil slick, dead animal) or unsuitable for data collection (e.g., large woody debris, poor visibility).The second team would then snorkel that unit again within several days.

Divers were equipped with neoprene wet suits, vests, gloves, masks, snorkels and dive lights while data recorders carried GPS, camera, thermometers, and stadia rod. Dive teams observed known protocols (Thurow 1994 and O'Neal 2007) which state that for units with a channel width of less than 15', where a diver can see bank to bank, a single diver is needed to survey the entire length of the unit, moving in an upstream direction. Where channels are wider than 15' or a complex habitat makes it difficult for a single diver to observe fish from bank to bank, protocol necessitates two divers simultaneously diving the unit, moving upstream in tandem and making counts within their respective dive lanes to ensure all fish are accounted for. The North Fork Matilija Creek had 8 pools whose widths necessitated multiple divers.

Once in the water, divers enumerated *O. mykiss* and sorted into 2-inch size classes (i.e., 0-1.99 in, 2-3.99 in, 4-5.99 in) and reported any observations of note (e.g., fish exhibiting signs of black spot disease) to the bankside data recorder. Counts were also be made for special status species of amphibians and reptiles including Southern Western Pond Turtle (*Actinemys pallida)*, Two-striped Gartersnakes (*Thamnophis hammondii)*, California Red-legged Frog (*Rana draytonii)*, and California Newt, (*Taricha torosa)*; however this is not a focus of the overall study and these counts are not always recorded. Additionally presence and visual estimates of other fish species were recorded including Arroyo Chub (*Gila orcutti*) and Threespine Stickleback (*Gasterosteus aculeatus).*

Upon finishing a unit, the diver would also report shelter and visibility values to the data recorder. Visibility is recorded on a scale of zero to three. A value of zero indicates the diver is unable to perform the survey due to visibility, one is poor, two is average, and three is clear/excellent visibility. Shelter values are estimated on a scale of zero to three based on Flosi et al. (2010) as shown in Table 1**.**

Table 1 – Shelter value Ratings

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

In addition to fish counts, habitat measurements were also taken during the first or second snorkel pass. Protocol states that habitat measurements can be taken on either snorkel pass as long as it is coordinated among the crew members ahead of time. Habitat unit length, mean width, mean depth, and maximum depth were measured with a stadia rod. For each survey day, weather conditions were noted. Every tenth unit surveyed, water and air temperatures were recorded using a thermometer, starting with the first unit. GPS points were recorded at the beginning of the day and after every tenth snorkeled unit as well.

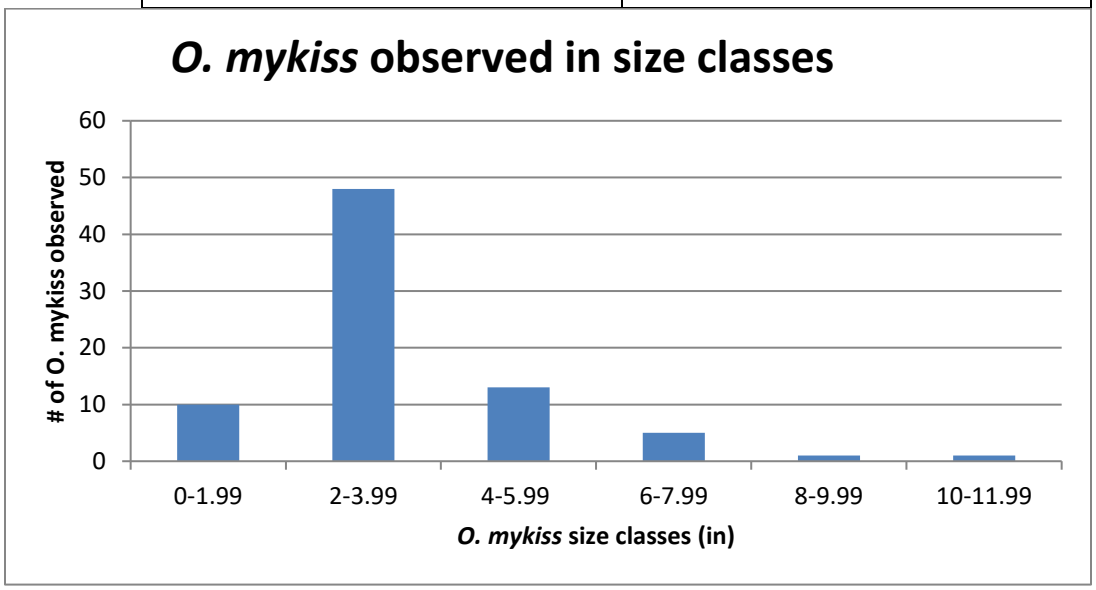
Results:

For the first pass, 78 individual *O. mykiss* were observed in 39 of the 148 pools snorkeled. For the second pass, 105 individual *O. mykiss* were observed in 43 of the 148 pools snorkeled. Due to unequal observation probability in the two passes (Dana McCanne, California Department of Fish and Wildlife, personal communication) our results will only reflect the observations of the first pass.

In the 4.35 mile surveyed stretch, a total of 78 *O. mykiss* were observed in varying size classes indicated in Table 2 below.

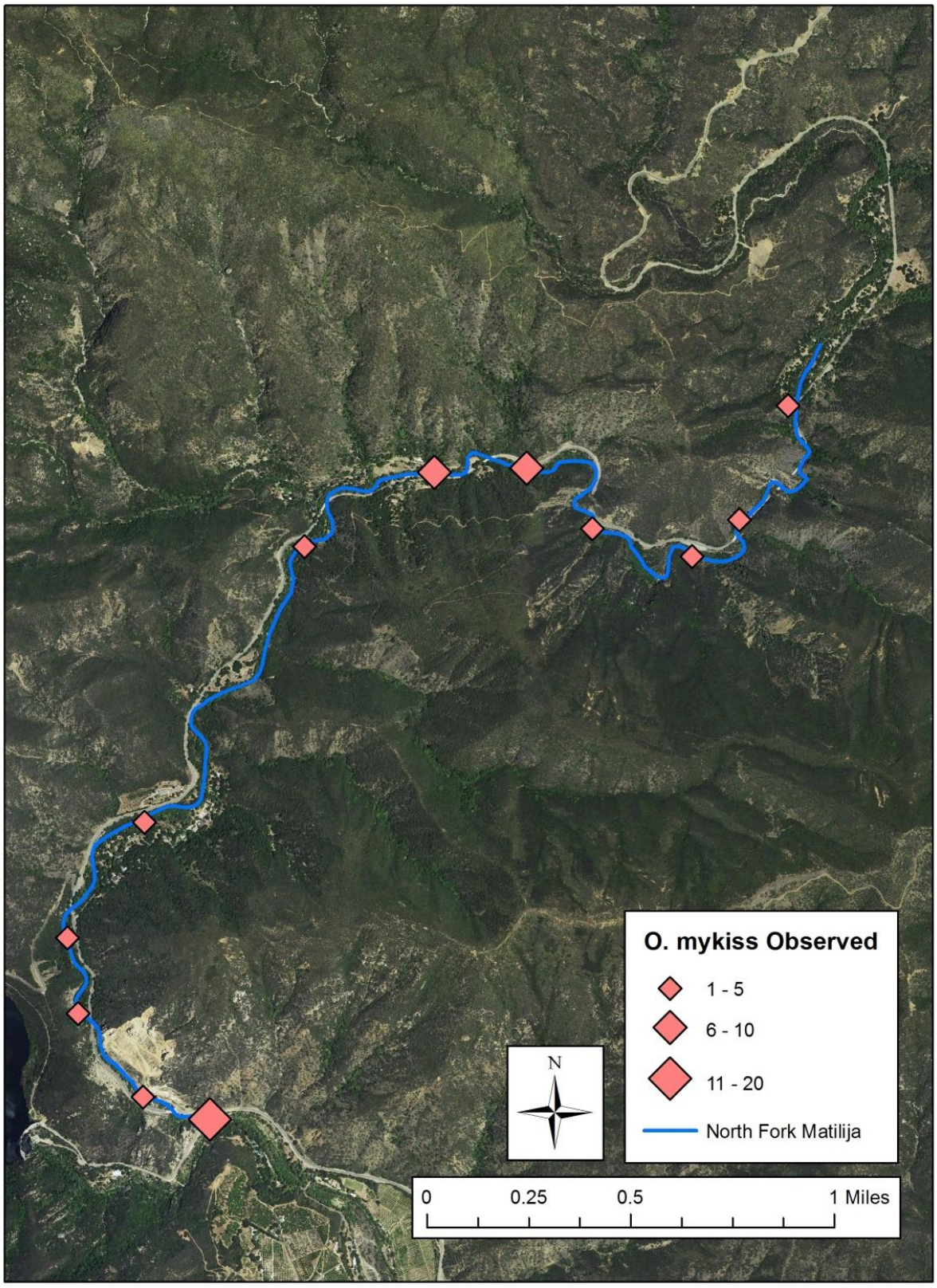
Table 2: Table of the first pass *O. mykiss* size class

***O. mykiss* Size Class (in)**	**Number O. mykiss Observed**
0-1.99	10
2-3.99	48
4-5.99	13
6-7.99	5
8-9.99	1
10-11.99	1



The total length of all snorkeled units was 4,494 feet within the 4.35 mile (22968 ft.) reach. 48 *O. mykiss* were observed in individual habitat units within the surveyed stretch of North Fork Matilija. **Figure 3** shows the distribution of *O. mykiss* over the surveyed reach.

Figure 3: Distribution map of *O. mykiss* on surveyed section of North Fork Matilija Creek



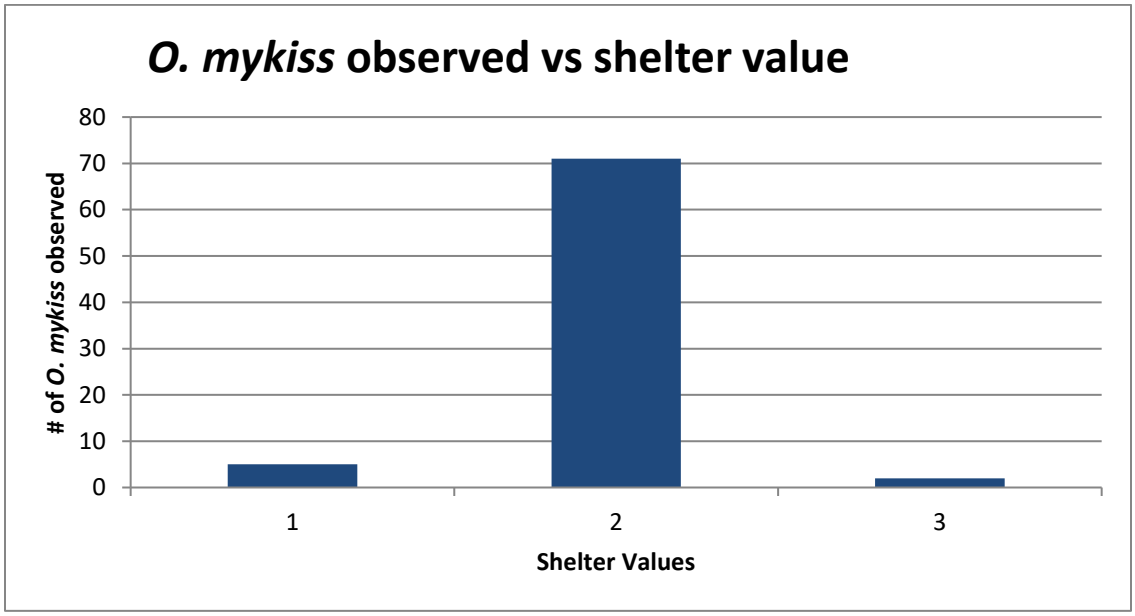
The average number of *O. mykiss* per unit length calculates to be 1.736 x 10^{-2} fish/ft. This was calculated by taking total of observed fish and dividing by the sum of all the lengths of snorkeled units. The average

number of *O. mykiss* per unit area calculates to be 1.299 x 10^{-2} fish/ft^2. This was calculated by taking the total number of fish observations and dividing by sum of all the individual surface areas for each snorkeled unit. We have also summarized *O. mykiss* counts for shelter values below.

Table 3: *O. Mykiss* counts and number of habitat units with respect to shelter values

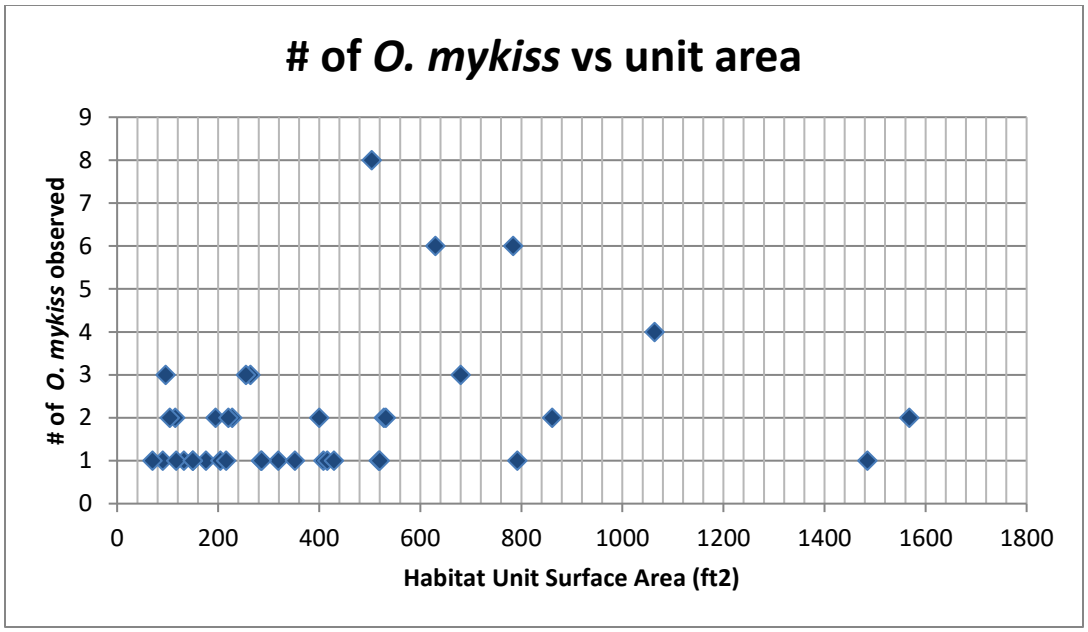
Habitat Unit Shelter Values	*O. Mykiss* Observed per Shelter Value	# of Habitat Units with Shelter Value
0	0	0
1	5	15
2	71	131
3	2	2

Figure 4: *O. mykiss* size class observations plotted against shelter values



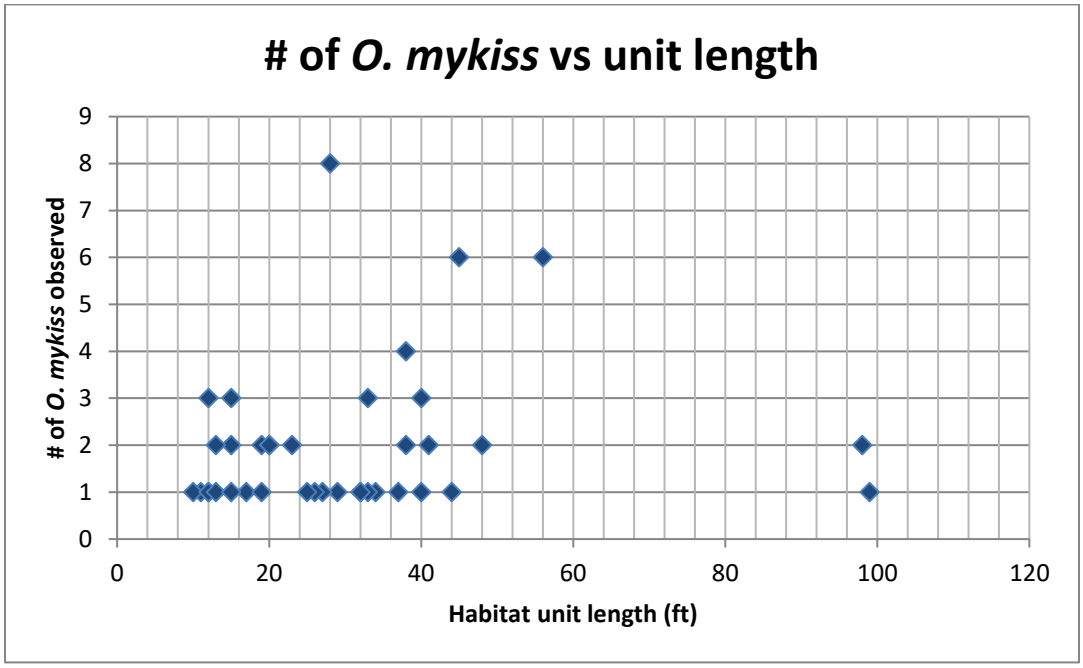
We also plotted *O. mykiss* observations with respect to total surface area of each habitat unit and this is shown in **Figure 5** below.

Figure 5: *O. Mykiss* observations plotted over habitat unit surface area



Additionally we plotted the number of *O. mykiss* observations with respect to the length of each habitat unit and this is shown below in **Figure 6.**

Figure 6: *O. mykiss* observations plotted over habitat unit length



Discussion:

Between July 8, 2014 and July 28, 2014, a double pass snorkel survey was conducted on a 4.35 mile stretch of North Fork Matilija Creek from the confluence of the Ventura River to the total barrier at Wheeler Campground in Ojai, California (Calfish 2015). The purpose of this double pass snorkel survey was to gain an understanding of the abundance and distribution of southern California steelhead (*O. mykiss*) in North Fork Matilija Creek, located in the Monte Arido BPG, in Ventura County. Due to conflicts with private property access, a 0.3 mile section of the creek was not surveyed.

The table in the following appendix summarizes the *O. mykiss* observations from both the first and second snorkel passes. When there is low observation probability (due to high shelter values and/or low visibility), we would expect to have significant differences in fish observations between pass 1 and pass 2. Since this was not the case, this could be an indication that snorkelers are missing a substantial portion of fish during their survey. For the purpose of this report, the graphs and calculations in the rest of the results were based solely off of the first snorkel pass.

Size class distributions of *O. mykiss* observed show the majority of observed fish were within the 2-3.99" size class while overall distributions ranged from 0-1.99 in to 10-11.99 in. We suspect that since this spawning season had concluded by our July snorkel surveys, that the 2014 year's recruitment class was particular poor as only 10 fish of the 0-1.99in size class were observed. This could be due to cumulative years of drought effects as shrinking habitat could lead to increased predation and decreased food sources.

The map of the surveyed section of North Fork Matilija Creek indicates the distribution of the observed *O. mykiss*. The larger circles indicate a greater number of fish observations within 10 surveyed units. We do not have individual observations on the map as GPS locations were only recorded on the first unit out of ten on a data sheet. The smaller circles indicate a lesser number of fish observations in a single unit. There are no clear differences seen between different sections of the creek. The only observation that can be made is that distribution is throughout the entire reach and not confined to any particular areas.

Figure 5 and **Figure 6** show the number of *O. mykiss* observed versus the surface area and length of the pools they were found in. There was no distinct correlation between *O. mykiss* observations and the surface area and length of the pools they were found in. *O. mykiss* density was then calculated in relation to the total length of the surveyed pools (4,436 feet) as well as the combined total surface area of the surveyed pools (60,034 square feet). Again this returned no obvious relationships most likely due to low fish counts. The average number of *O. mykiss* per unit length calculates to be 1.736×10^{-2} fish/ft while the average number of *O. mykiss* per unit area calculates to be 1.299×10^{-3} fish/ft^2. Again, these numbers are relatively insignificant due to the small sample size.

We also choose to look at shelter values which can range on a scale of 0 to 3. A shelter value of 0 means the surveyed unit has no components of shelter (e.g., no undercut, boulders, woody debris, etc.), whereas a value of 3 means the shelter in the surveyed unit has at least three shelter components including large woody debris (LWD). Large woody debris is uncommon in Southern California streams; therefore shelter values of 3 are not as common as shelter values of 2. In North Fork Matilija Creek, 88.5% of the surveyed units had a shelter value of 2, 10% of the surveyed units had a shelter value of 1, and only 1.5% of the pools had a shelter value of 3 (Figure 6). Figure 6 is a histogram showing the number of *O. mykiss* observed for each of the shelter values. It is not surprising that most of the fish observations were in pools with a shelter value of 2, since the majority of the surveyed pools had a shelter value of 2. This discrepancy in shelter value distribution may be explained by the importance of large woody debris and complex features in the shelter rating system. LWD is fairly uncommon in

Southern California streams. Below average rainfall and water levels may have reduced the availability of complex features.

There were slight deviations from our chosen protocol, as divers initially chose which units were considered snorkelable. Divers had to estimate if the average depth was sufficient prior to the taking of habitat measurement. As a result, a few habitat units were snorkeled that had a mean depth of less than 0.7 feet.

Some snorkelers also collected observation data on Arroyo Chub and Threespine Stickleback, but this was not the emphasis of this study. Due to large numbers of observations of these species and the inconsistencies in observations, this data was not included in this report.

As these surveys took place during ever increasing drought conditions, divers also collected data on potential relocation pools, counting the numbers of fish already present and habitat metrics. If divers encountered pools that were in danger of drying up, these were also snorkeled and flagged if eventual rescue might be needed. Both relocation and rescue data was recorded on the data sheets but was not included in any of the analysis.

Additionally, we continued our snorkel survey above the known limits of anadromy and collected habitat and fish observations above the Wheeler Campground. In the interests on continuity and our research efforts focusing on anadromous reaches within the Ventura Watershed, this data was not included in this report. It may however be summarized in a future report.

Overall, this snorkel summary report shows us a snapshot of what age classes were present and where these *O. mykiss* were distributed on North Fork Matilija Creek. We were able to calculate an index of fish densities but without additional survey seasons, no reliable inferences can be made. We can make no reliable estimates of population abundance since we did not conduct electrofished calibration of the snorkel counts. Additional survey seasons must be completed in order to make a comparison of our observations. Subsequent surveys should include electrofishing to we can make accurate population estimates as per Hankin & Reeves 1988.

Acknowledgements:

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Appendix: Habitat unit measurements and fish counts

Habitat #	Mean Length	Mean Width	Mean Depth	Max Depth	First Pass Fish Counts	Second Pass Fish Counts
1	48	11	1.5	2.7	2	0
2	38	28	5	7.7	4	1
3	15	8	1.3	2.5	0	1
4	12	7.5	1	2.2	1	0

5	12	11	1.1	1.9	0	0
6	11	16	0.8	1.9	1	0
7	41	21	2	4.3	2	2
8	19	12	2	2.8	2	0
9	21	19	2.5	3.3	0	0
10	31	15	2.5	3.1	0	0
11	18	7.5	0.7	2.6	0	0
12	19	10	2	3.3	0	0
13	16	11	1.6	2.6	1	1
14	16	7	1	2.1	0	0
15	30	12.5	0.9	2	0	0
16	15	13	2	4	2	3
17	18	9	2	3	0	0
18	10	7.5	0.9	1.2	0	0
19	60	15	1.8	4.1	0	1
20	34	95	1	2	0	0
21	42	18	2	2.6	0	0
22	53	13	1.5	2.3	0	0
23	70	14	1.5	1.8	0	0
24	23	5	1.7	2.3	2	2
25	8	10	1.3	1.9	0	0
26	14	16	2	2.8	0	0
27	20	20	1.9	2.9	2	0
28	48	14	1.2	2.4	0	0
29	16	17	0.6	1.3	0	0
30	35	15	1.9	2.6	0	0
31	32	13	1.1	1.5	0	0
32	25	18	1.5	2	0	0
33	43	13	1.1	1.5	0	0
34	16	9	0.7	1.2	0	0
35	33	15	1.1	1.6	0	0
36	34	12	9	1.7	1	0
37	99	15	2.2	3.4	1	0
38	89	22	2.5	5.2	0	0
Habitat #	**Mean Length**	**Mean Width**	**Mean Depth**	**Max Depth**	**First Pass Fish Counts**	**Second Pass Fish Counts**
39	24	15	1	1.6	0	0
40	44	18	1.4	2.9	1	0
41	38	14	1.2	2.1	2	2
42	12	6	1.1	1.7	0	0
43	32	13	1.4	2.5	1	1
44	92	14	1	1.7	0	0

45	39	11	2.8	4.4	0	1
46	21	13	1.2	1.8	0	0
47	41	13	1.2	1.9	0	0
48	50	12	1.2	2.2	0	0
49	29	10	1.1	1.7	0	0
50	46	9	1.4	2.5	0	0
51	18	10	1.7	2.9	0	0
52	25	10	1.1	2	0	0
53	101	18	2.7	5	0	0
54	31	12	1.6	2.4	0	0
55	22	17	1.1	1.7	0	0
56	10	11	0.9	1.6	0	0
57	30	11	1.2	2.1	0	0
58	14	12	1.5	2.5	0	0
59	38	17	1.8	2.5	0	0
60	51	14	1.7	2.8	0	0
61	12	14	1.6	2	0	0
62	22	9	2.5	3.9	0	0
63	21	13	1.7	2.4	0	0
64	37	14	1.4	2.4	1	0
65	16	16	1.2	2	0	0
66	13	10	1	1.5	0	0
67	11	9	1.2	1.9	0	0
68	17	12	1.5	2.7	1	0
69	20	15	1.6	2.7	0	0
70	15	9	1.1	2.4	0	0
71	27	10	1.4	2.7	0	0
72	26	16	0.9	1.6	0	0
73	26	12	1.1	1.8	0	1
74	64	11	1.4	2.5	0	0
75	21	10	1.1	2.2	0	0
76	18	18	1.2	2.1	0	0
77	35	16	1.8	2.2	0	0
78	21	7	0.8	1.3	0	0
Habitat #	**Mean Length**	**Mean Width**	**Mean Depth**	**Max Depth**	**First Pass Fish Counts**	**Second Pass Fish Counts**
79	9	8	0.7	1.2	0	0
80	28	10	1.1	1.6	0	1
81	11	8	0.8	1.2	0	0
82	68	15	1.2	1.7	0	0
83	9	10	1	1.7	0	0
84	59	11	1.5	1.8	0	0

85	14	11	0.7	1.3	0	0
86	21	17	1.2	1.7	0	0
87	59	15	1.4	2.3	0	0
88	32	9	0.9	1.4	0	0
89	48	12	1.2	1.8	0	0
90	10	4	0.5	0.8	0	0
91	28	12	1	1.8	1	0
92	27	10	0.6	1.7	0	0
93	21	5	0.5	1.3	0	1
94	59	11	1.4	3.1	0	0
95	29	11	1	2	1	1
96	21	7	0.5	1	0	0
97	20	11	1	1.8	2	2
98	17	5	0.6	1.3	0	0
99	33	8	0.8	1.5	3	1
100	10	5	0.5	0.8	0	0
101	13	8	0.6	0.8	2	2
102	9	8	0.5	1	0	1
103	19	8	1.2	1.9	0	0
104	15	8	1	1.6	0	1
105	56	14	1.3	2.4	6	9
106	39	14	0.8	1.8	0	2
107	11	12	1.1	1.9	0	1
108	10	7	0.7	1	1	0
109	15	17	1	2	3	3
110	68	14	1.6	3.1	0	0
111	13	20	0.7	1.5	0	1
112	40	17	1.1	2	3	3
113	17	11	1.4	2.3	0	2
114	33	13	1	1.8	1	9
115	45	14	3.2	4.9	6	14
116	28	18	2.5	3.2	8	5
117	63	9	1	2	0	2
118	12	11	1	2	1	1
Habitat #	**Mean Length**	**Mean Width**	**Mean Depth**	**Max Depth**	**First Pass Fish Counts**	**Second Pass Fish Counts**
119	54	12	0.8	1.6	0	0
120	40	13	3.6	5.4	1	2
121	13	9	0.8	1.5	1	0
122	12	8	1	1.9	3	2
123	33	11	2	3.2	0	1
124	11	8	1	1.9	0	0

125	14	5.5	0.7	1.2	0	0
126	22	5	0.6	1.1	0	0
127	22	8	1	2	0	0
128	25	9	0.8	1	0	0
129	40	11	0.9	1.6	0	0
130	17	11	0.6	1.2	0	0
131	15	10	0.6	1.6	1	1
132	21	4	0.8	1.3	0	0
133	27	8	1.8	2.4	1	1
134	24	5	1	1.7	0	1
135	63	14	1.7	3.4	0	0
136	31	12	1.5	2.7	0	0
137	98	16	3	5.2	2	1
138	32	11	1	2.2	1	1
139	35	13	1.8	2.6	0	0
140	66	10	2	2.9	0	1
141	67	9	1	1.1	0	3
142	34	10	1.4	2.6	0	3
143	18	7	1.5	2.3	0	2
144	24	12	0.7	1.2	0	0
145	19	15	1	1.4	1	0
146	26	11	1.4	2	1	0
147	13	8	1	1.7	0	0
148	25	6	0.6	1.2	1	0