Snorkel Report for Upper North Fork Matilija Creek 2014

Report Prepared by Leah Gonzales[1] and Tom van Meeuwen[2]

Watershed Stewards Program[1] ,Pacific States Marine Fisheries Commission[2]

Introduction

A double-pass snorkel survey was conducted on Upper North Fork Matilija Creek in the Ventura River Watershed by the California Department of Fish and Wildlife (CDFW) with assistance from the Pacific States Marine Fisheries Commission (PSMFC) and the Watershed Stewards Program (WSP). The survey was conducted between July 30thand August 15th, 2014. The objective of the snorkel survey was to determine an index of abundance and distribution of *Oncorhynchus mykiss* (*O. mykiss*) residing in Upper 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).

Largely due to extensive watershed development, southern California steelhead populations have dropped dramatically resulting in the species being listed under the Federal Endangered Species act in 1997. In 2012, the National Marine Fisheries Service (NMFS) released a recovery plan for southern California steelhead which provided a framework of recovery strategies for each of southern California's 5 Biogeographic Population Groups (BPGs). 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 further categorizes each watershed by priority core populations, Core 1, 2, or 3, based on the watershed's potential to support viable steelhead populations. Upper North Fork Matilija Creek resides in the Ventura River Watershed, which is listed as a Core 1 watershed, the highest priority listing. However, since Upper North Fork Matilija Creek is located above a total fish passage barrier, the Matilija Dam, NMFS does not have jurisdiction over this population. Although Upper North Fork Matilija Creek is located above anadromy, this *O. mykiss* population could be important in promoting the connectivity between *O. mykiss* populations and genetic diversity across the Southern California Steelhead Recovery planning area. Thus, this *O. mykiss* population is integral to the overall biological recovery strategy of southern California steelhead (Southern California Steelhead Recovery Plan, January 2012, NOAA).

Watershed Overview

Upper North Fork Matilija Creek is located in 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 Matilija Creek. Upper North Fork Matilija Creek is a secondary tributary to the Ventura River and resides on United States Forest Service Land in the Los Padres National Forest. The immediate area is not accessible by automobile and is predominately used as a recreational area for hikers and campers with designated campsites along the creek. The survey reach began at the confluence of Upper North Fork Matilija Creek and Matilija Creek (34.50902 ^{o}N, -119.38358 ^{o}W) and extended 1.12 miles (5,897ft) upstream to 34.51517 ^{o}N, -119.37468 ^{o}W.

Methods

A study was conducted in Upper North Fork Matilija Creek 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 Upper 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.

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.

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, 119 individual *O. mykiss* were observed in 35 of the 51 pools snorkeled. For the second pass, 123 individual *O. mykiss* were observed in 37 of the 51 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 1.12 mile surveyed stretch, a total of 119 *O. mykiss* were observed in varying size classes indicated in Table 2 below. The total length of all snorkeled units was 1,292.55 feet within the 1.12 mile (5,913 ft.) reach. 119 *O. mykiss* were observed in individual habitat units within the surveyed stretch of Upper North Fork Matilija Creek. Figure 3 shows the distribution of *O. mykiss* over the surveyed reach.

The average number of *O. mykiss* per unit length calculates to be 9.207×10^{-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 7.897×10^{-3} 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.

We also plotted *O. mykiss* observations with respect to total surface area of each habitat unit and this is shown in Figure 4. Additionally we plotted the number of *O. mykiss* observations with respect to the length of each habitat unit and this is shown in Figure 5.

Black Spot Disease was present within the survey reach, but was confined to a limited number of pools. Black Spot disease refers to the infestation of multiple genera of digenic trematodes on freshwater fish. Life cycles of trematodes are complex and can house a variety of hosts. The presence of Black Spot Disease was observed in seven discrete pools within the surveyed reach, shown in Figure 6. A total of 29 *O. mykiss* were observed with Black Spot Disease.

Discussion:

Between July 30, 2014 and August 15, 2014, a double pass snorkel survey was conducted on a stretch of Upper North Fork Matilija Creek. The survey reach began at the confluence of Upper North Fork Matilija Creek and Matilija Creek and extended 1.12 miles (5,897ft) upstream ending at a point where the creek dried. The purpose of this survey was to gain an understanding of the abundance and distribution of southern California steelhead (*O. mykiss*). Initially the snorkeling began in the upper section of the survey stretch, but after discussion it was decided to include the lower section starting at the confluence.

The table in the following appendix summarizes the *O. mykiss* observations from both the first and second snorkel passes. 119 *O. mykiss* were observed on pass 1 while 123 were observed on pass 2. We'd expect there to be significant difference between pass 1 and pass 2 when there's low observation probability. MacKenzie et. Al 2002 proposes a likelihood-based method for estimating occupancy rates when detection probability is less than one. We would expect the detection probability to be less than one because non- detection of *O. mykiss* does not imply that the species is absent from each pool snorkeled. With different snorkelers conducting each pass, there is the potential for error in counting fish or observing them. There were two teams that ended up surveying the same portions of the creek on different days. This additional time factor could account for the similar observed fish totals because the pool was not disturbed within a time period that would affect the visibility and inhibit the second snorkeler. 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 in size class(n=64) while overall distributions ranged from 0-1.99 in to 8-9.99 in. In prior steelhead population and habitat assessments (Allen, 2015), a 10 cm criteria was used to distinguish between 0+ and 1+ age classifications. Age 0+ represents fry, or young of the year, and age 1+ represents a juvenile fish in their second summer of life. The 10 cm criterion dictates that trout measuring less than 3.94 inches are considered to be fry or young of the year. Trout larger than 3.94 inches but less than 20 cm are considered juveniles. The *O. mykiss* observed within the surveyed reach represent both fry and juveniles by this criterion, with the majority of observed trout being fry or young of the year. The survey was conducted approximately 4 months after spawning season and thus we expect to see an abundance of young of the year trout. In subsequent years, including 2008, 2010, 2011, and 2012, fry were the dominant size class in Upper North Fork Matilija, (Allen 2015). We suspect that since this spawning season had concluded by our July snorkel surveys, that most of the observed fish were from that year's recruitment class.

The map of the surveyed section of Upper 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 4 and Figure 5 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 (1,292.5 feet) as well as the combined total surface area of the surveyed pools (15,068 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 9.207×10^{-2} fish/ft while the average number of *O. mykiss* per unit area calculates to be 7.897×10^{-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 Arroyo Hondo Creek, 94.1 % of the surveyed units had a shelter value of 2, 5.9% of the surveyed units had a shelter value of 1, 0 % had a shelter value of 0 or 3 (Table 3). 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.

In addition to noting the numbers of *O. mykiss* and other species of special concern, the snorkelers noted any presence of Black Spot Disease. Figure 6 illustrates the distribution of Black Spot Disease within the surveyed reach and Photo 1 is an example of a trout with the disease. The presence of Black Spot Disease was noted in 7 discrete pools within the survey reach. The reach was wetted throughout enabling fish to migrate between connecting pools, although the presence of black spot was isolated. Black Spot is present in other tributaries within the same watershed and distributed more evenly throughout those reaches. The effect of Black Spot Disease on trout is not known to be fatal. The trematodes live within the water column and select a host, meaning that not all trout within one habitat unit will show signs of the disease and the distribution of the disease can be widespread or localized in any given reach.

Overall, this snorkel summary report shows us a snapshot of what age classes were present and where these *O. mykiss* were distributed on Upper 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.

Tables and Figures:

Figure 1. Map of the surveyed stretch of Upper North Fork Matilija Creek 2014.

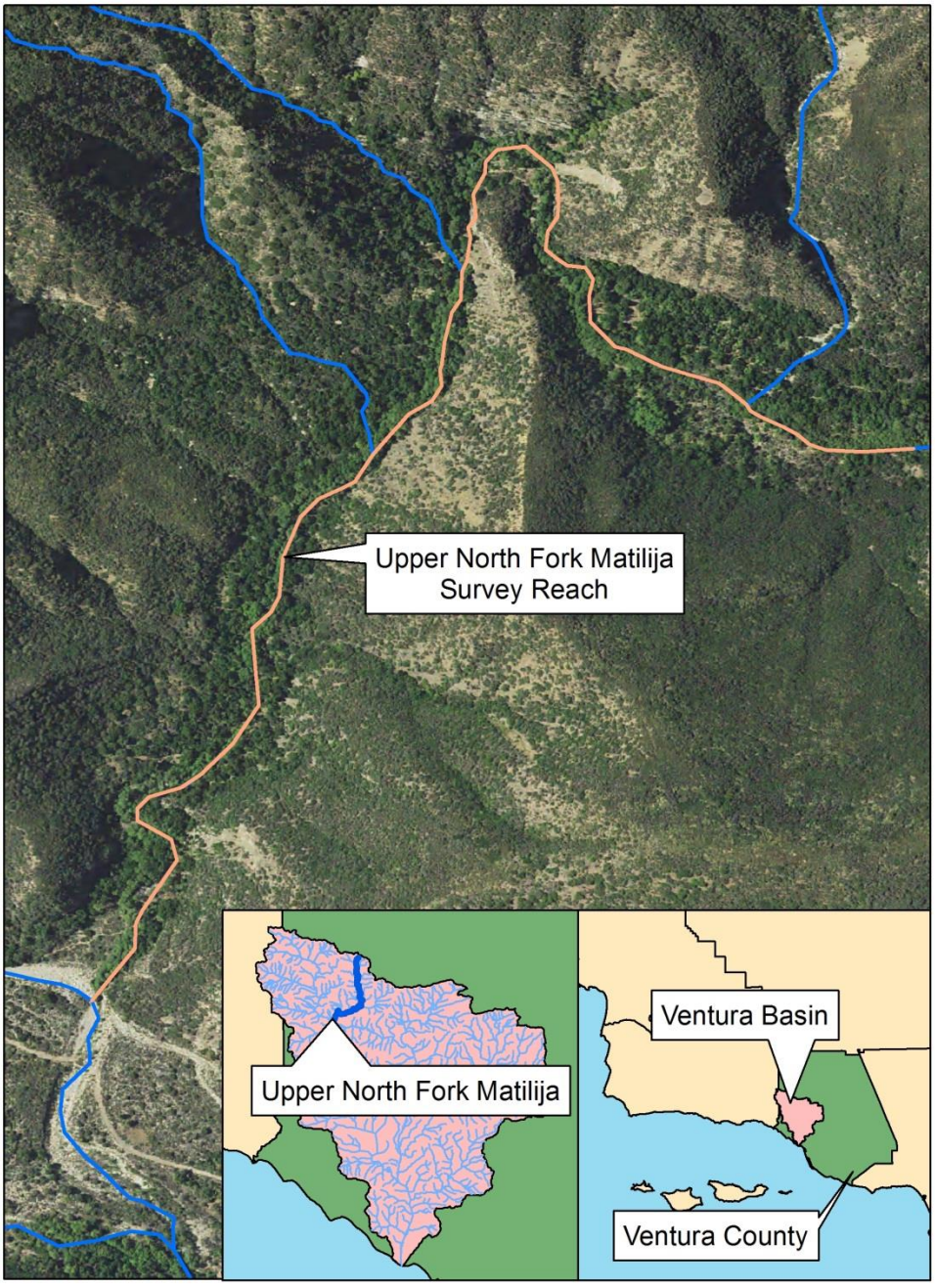


Table 1. Shelter value Ratings

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

Table 2. First pass *O. mykiss* size class for Upper North Fork Matilija Creek, 2014.

***O. mykiss* Size Class (in)**	**Number O. mykiss Observed**
0-1.99	16
2-3.99	64
4-5.99	28
6-7.99	8
8-9.99	3

10-11.99	0

Figure 2. Size class distribution for Upper North Fork Matilija Creek, 2014.

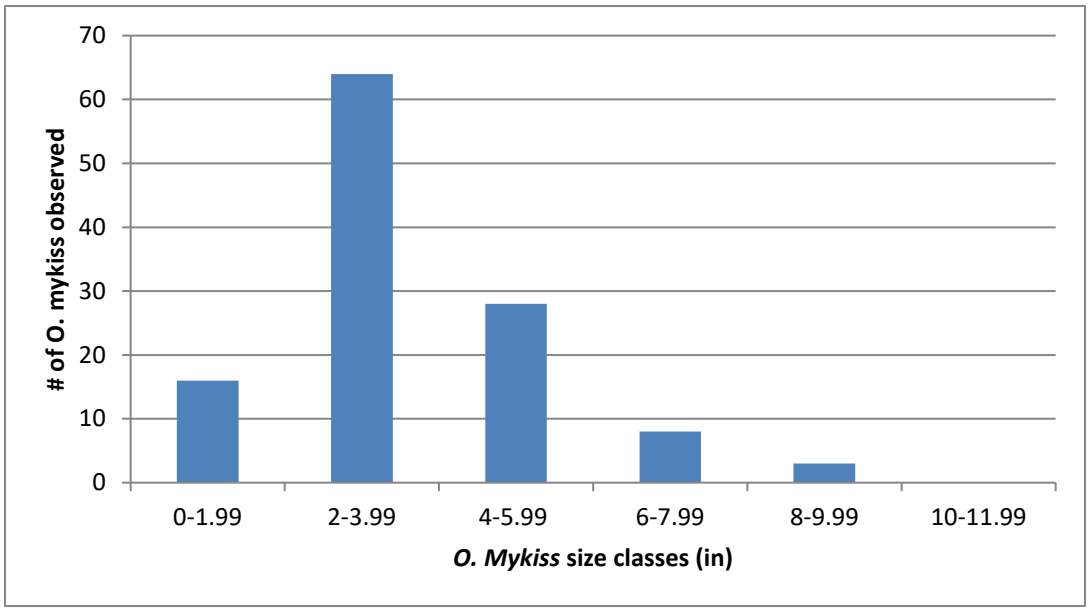


Figure 3. Distribution map of *O. mykiss* on surveyed section of Upper North Fork Matilija Creek, 2014.

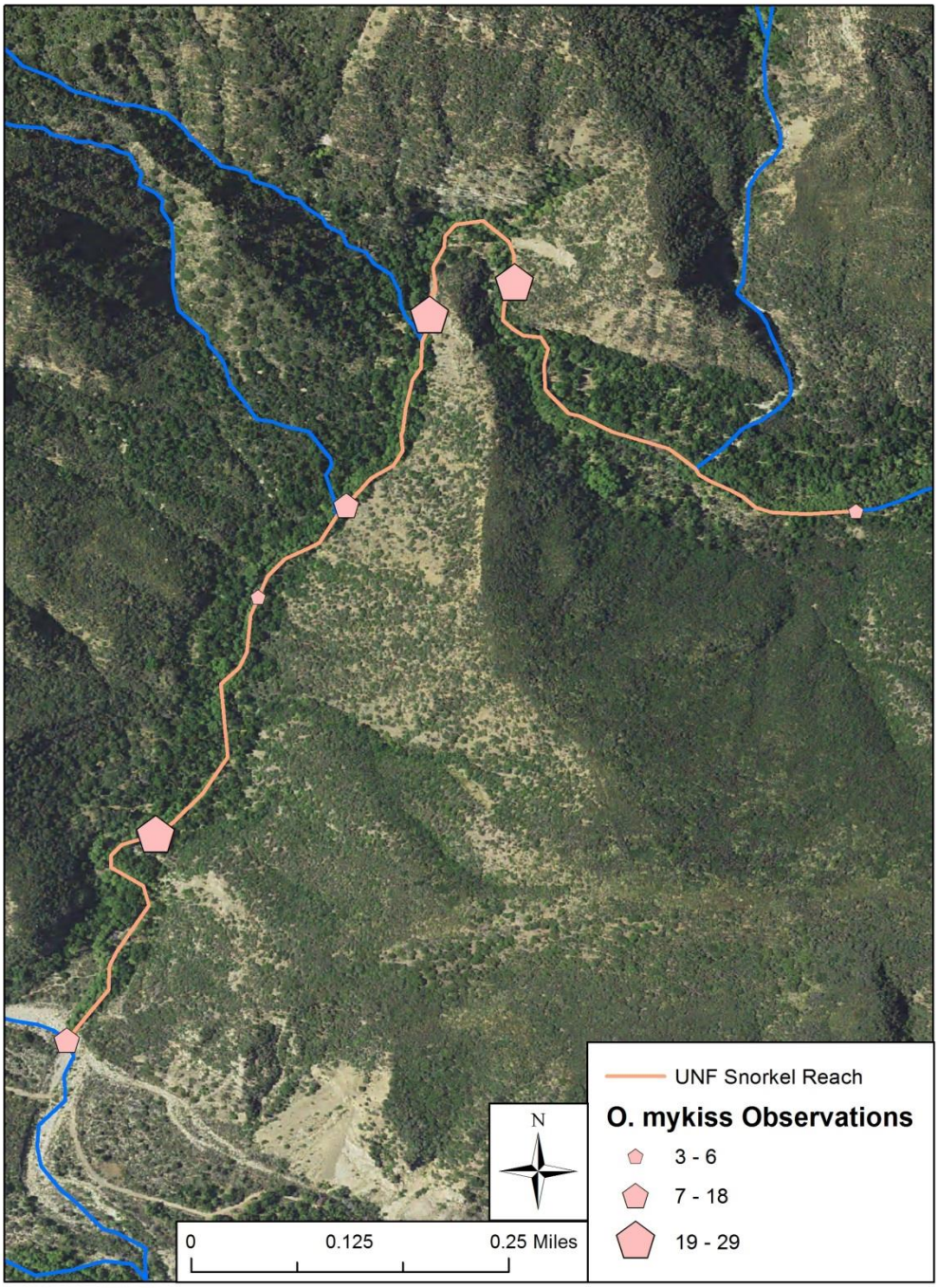


Table 3. *O. Mykiss* counts and number of habitat units with respect to shelter values for Upper North Fork Matilija Creek, 2014.

Habitat Unit Shelter Values	*O. Mykiss* Observed per Shelter Value	# of Habitat Units with Shelter Value
0	0	0
1	0	3
2	119	48
3	0	0

Figure 4. *O. Mykiss* observations plotted over habitat unit surface area for Upper North Fork Matilija Creek, 2014.

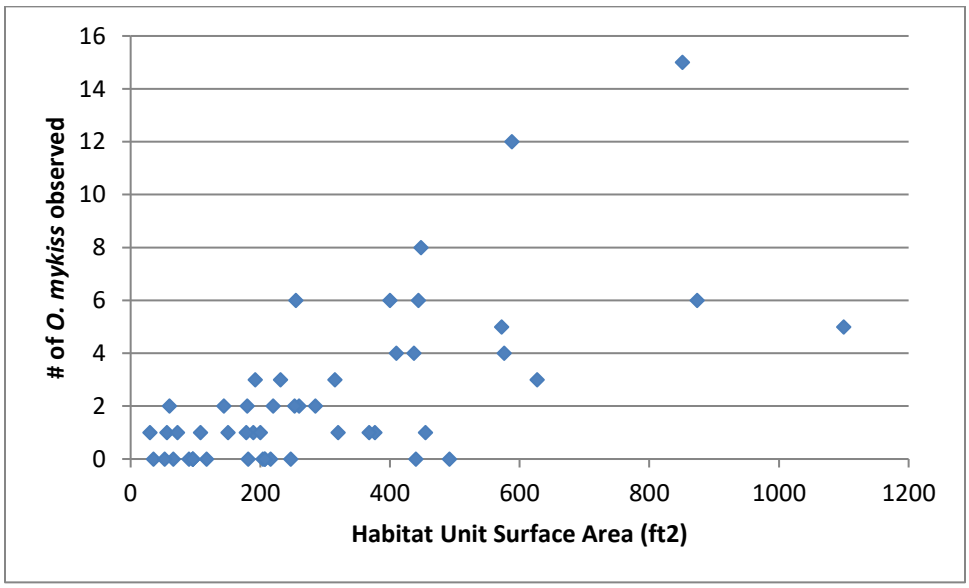


Figure 5. *O. mykiss* observations plotted over habitat unit length for Upper North Fork Matilija Creek, 2014.

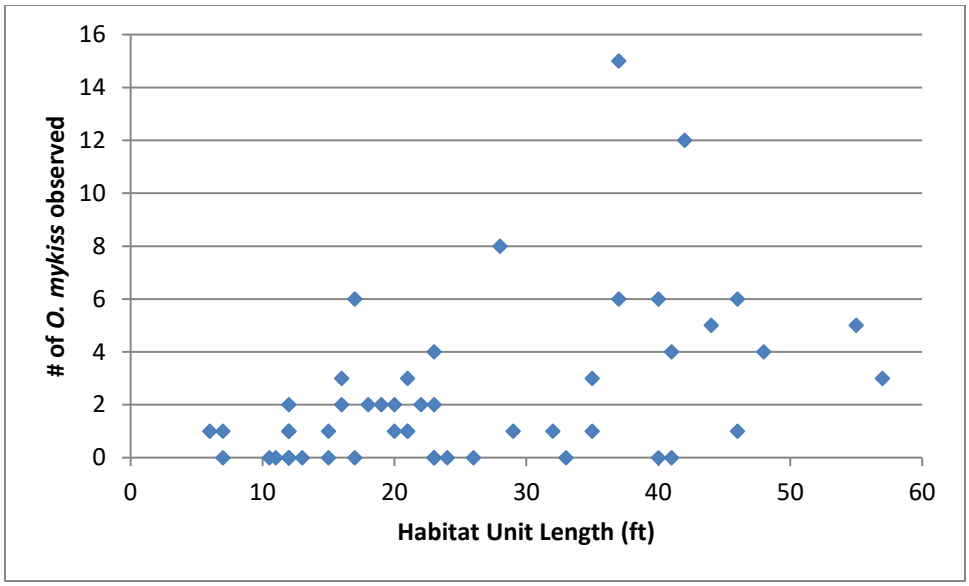


Figure 6. Distribution of Black Spot Disease amongst *O. mykiss* in Upper North Fork Matilija Creek.

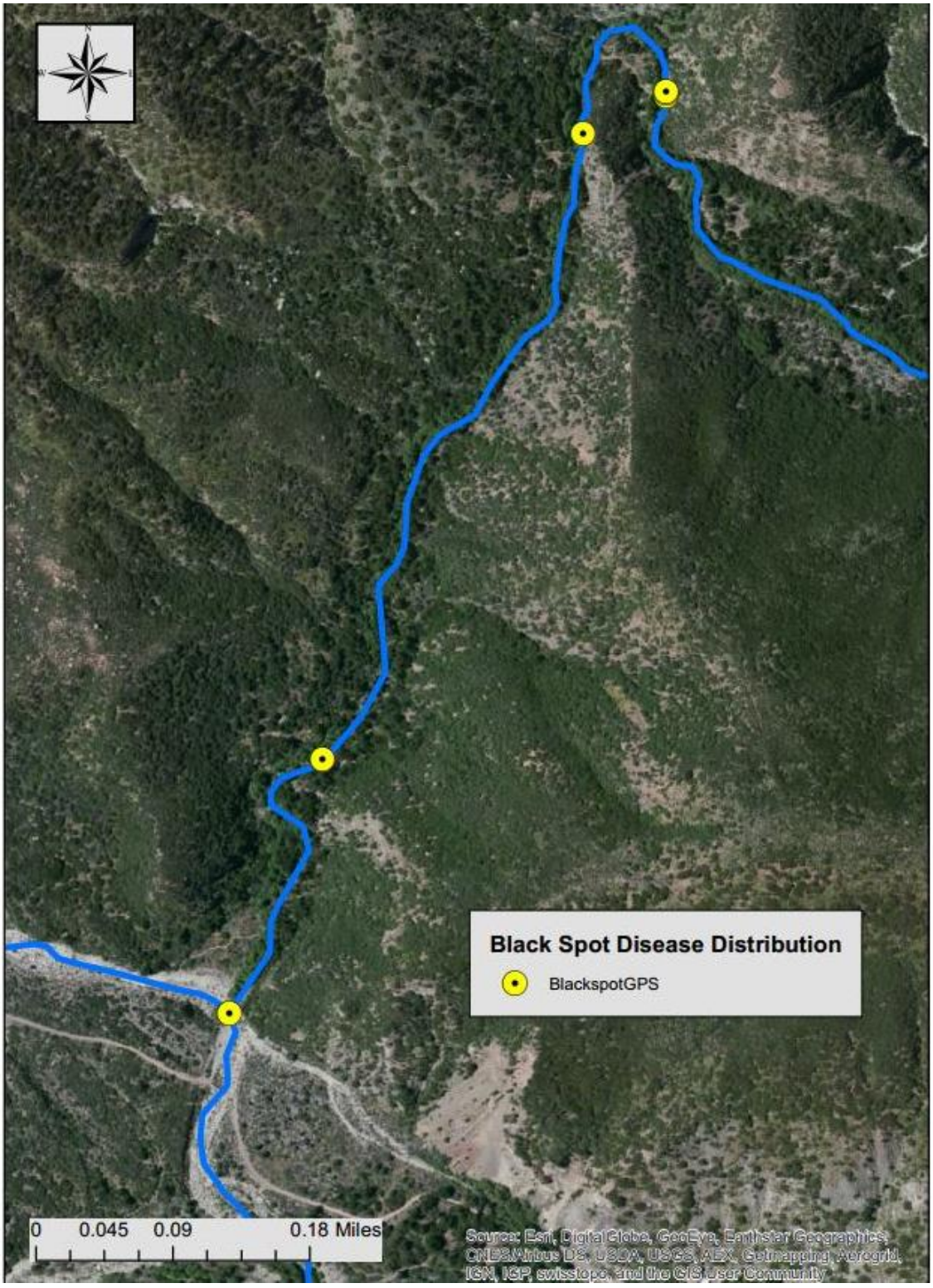
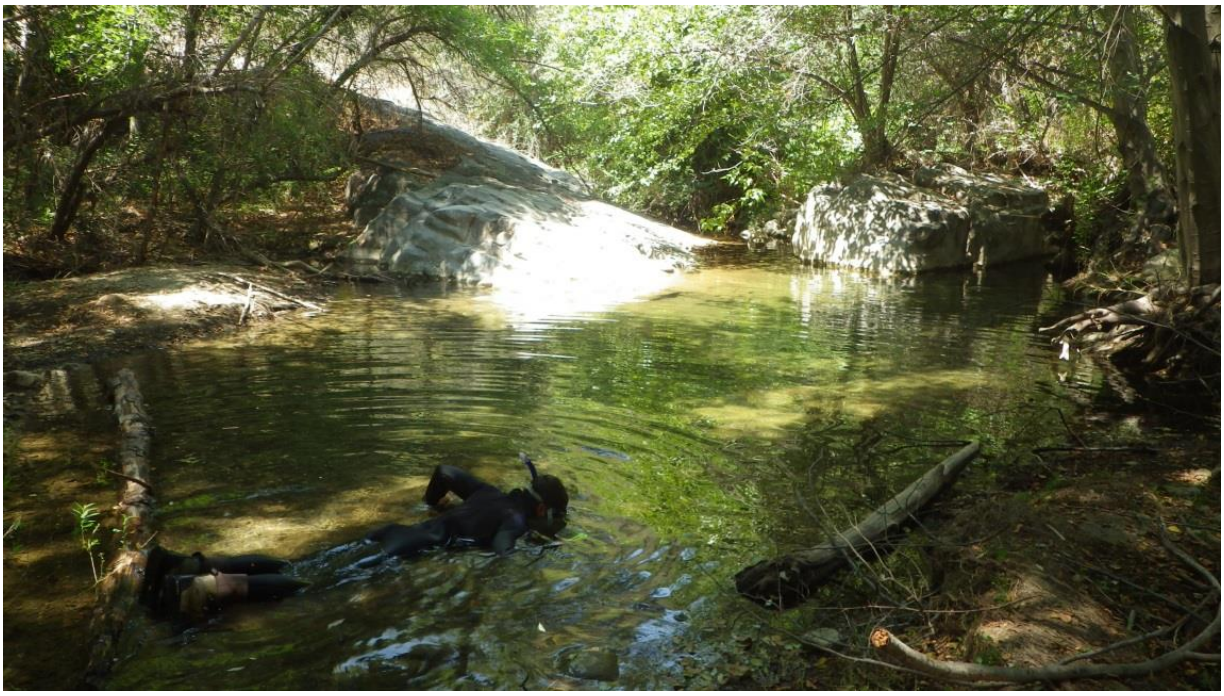


Figure 7. Black spot disease on *O. mykiss* in Upper North Fork Matilija, 2014.

Figure 8. Snorkel survey on Upper North Fork Matilija Creek on 08/06/2014



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Appendix: Habitat unit measurements and fish counts

Habitat Unit #	Mean Length	Mean Width	Mean Depth	Max Depth	First Pass Counts	Second Pass Counts
1	33	5.5	0.4	0.9	0	0
2	12	5	1	1.5	2	1
3	41	12	0.6	1.1	0	0
4	24	9	0.9	1.4	0	0
5	7	5	0.6	1.1	0	1
6	11	6	0.6	0.8	0	0
7	29	13	1.5	2.5	1	1
8	55	20	2.1	3.7	5	8
9	46	19	1.8	3.3	6	7
10	23	19	1.7	4	4	5
11	19	15	0.9	1.5	2	5
12	44	13	1.3	2.5	5	6
13	26	9.5	0.7	1.1	0	2
14	32	10	0.8	1.5	1	3
15	12	8	0.8	1.1	0	1
16	37	12	1.2	2	6	3
17	21	9	1.1	1.8	1	9
18	15	10	1.1	1.4	1	2
19	17	15	1.6	2.5	6	5
20	40	11	1.4	1.8	0	2
21	35	13	1.4	2.5	1	3
22	17	12	1	2.1	0	1
23	12	9	1.8	3.2	1	2
24	21	8.5	1.1	1.7	1	1
25	57	11	0.7	1.6	3	3
26	41	10	0.8	1.3	4	2
27	12	8	0.5	0.8	0	0
28	23	9	0.7	1.2	0	0
29	20	13	1.6	2.5	2	3
30	35	9	0.8	1.4	3	0
31	15	6	0.9	1.5	0	0
32	20	10	1.7	2.2	1	1
33	21	11	1.1	1.8	3	2
34	22	10	1.3	1.9	2	1
35	13	9	1.7	2.3	0	0
36	37	23	2	3.4	15	17
37	28	16	1.8	3.2	8	5
Habitat Unit #	Mean Length	Mean Width	Mean Depth	Max Depth	First Pass Counts	Second Pass

						Counts
38	7	8	0.6	1	1	0
39	23	11	1	2	2	2
40	23	9	0.9	1.2	0	2
41	42	14	1.8	3.6	12	9
42	16	12	0.7	1.3	3	2
43	48	12	0.7	1.5	4	1
44	40	10	0.7	1.5	6	1
45	10.5	5	0.5	1.1	0	0
46	16	9	0.9	1.4	2	0
47	12	8	0.6	1.2	0	1
48	6	5	0.9	1.5	1	2
49	12	6	0.8	1.2	1	0
50	46	8	0.6	1.6	1	1
51	18	10	0.7	1.3	2	0