

## Ventura River Watershed Redd Surveys 2014

Prepared by:

Patrick Saldaña<sup>1</sup>, Sam Bankston<sup>1</sup>, and Kate McLaughlin<sup>2</sup>

<sup>1</sup>Pacific States Marine Fisheries Commission, 1933 Cliff Drive, Suite 9 Santa Barbara, CA 93109

<sup>2</sup>California Department of Fish and Wildlife, 1933 Cliff Drive, Suite 9 Santa Barbara, CA 93109

### Introduction

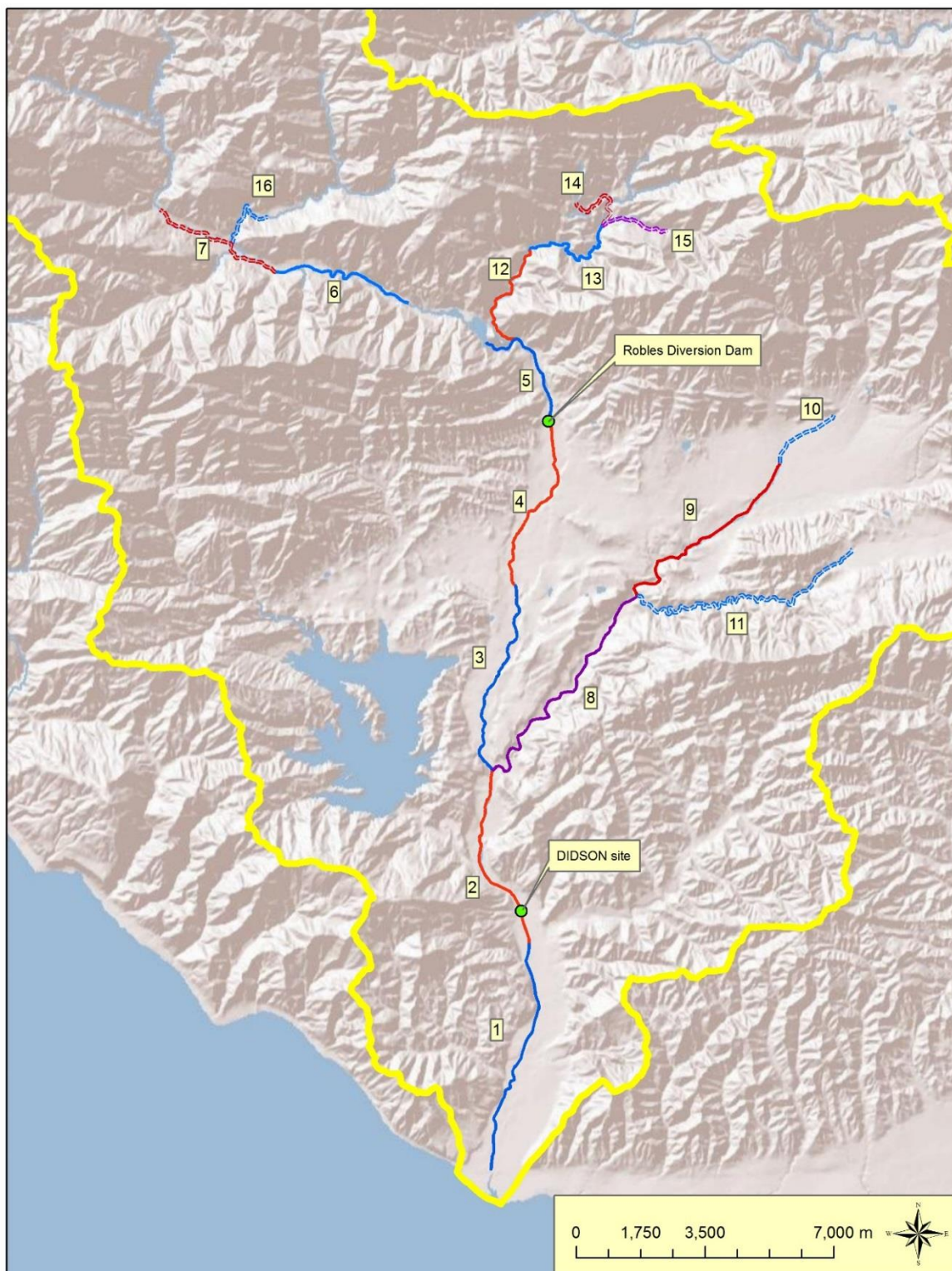
In 1997, southern California steelhead (*Oncorhynchus mykiss*) were listed as endangered under the Federal Endangered Species Act. The National Marine Fisheries Service (NMFS) has created a recovery plan that outlines necessary objectives for facilitating the species' recovery before delisting can occur. This plan outlines five biogeographic population groups (BPGs) throughout southern steelheads' range that will require a minimum number of viable populations within each group before the species can be delisted (NMFS, 2011). Watersheds are classified throughout each BPG in relation to their priority for recovery as Core 1, 2 and 3 populations; with Core 1 populations being the highest priority for recovery (NMFS, 2011).

The California Department of Fish and Wildlife (CDFW) has focused research efforts on the Ventura River watershed in recent years as part of the California Coastal Salmonid Monitoring Program (CMP). Because of the few steelhead inhabiting a broad range in the southern California area, CDFW has developed fixed station monitoring techniques to assess steelhead abundance, but those counts cannot be used to infer estimations of non-sampled streams (Adams et al., 2011). Because of the need to sample at unchanging sites as opposed to rotating sites, and the Ventura River's classification as a Core 1 population, CDFW has performed a variety of surveys throughout this watershed for monitoring purposes. Staff and field crew members have conducted habitat surveys, presence/absence surveys of *O. mykiss* using snorkel techniques, fixed-station migrant counts using dual-frequency identification sonar (DIDSON), and redd surveys. Redd surveys are a relatively cost effective method for monitoring the trends in the number of female steelheads in an area. Information on redd size can assist in determining whether the redd was created by anadromous steelhead or resident rainbow trout since steelhead tend to create bigger redds that contain larger substrate (Zimmerman & Reeves, 2000). Redd surveys also contribute information on the spatial distribution of both anadromous and resident *O. mykiss*.

The goal of these surveys in the Ventura Basin is to obtain data on population trends over time - data that is crucial for the species' recovery. Combined with counts of migrants through DIDSON and distribution data from snorkel surveys, redd surveys can assist management in understanding the status of steelhead populations. As we continue to conduct these surveys in the Ventura River basin, we will develop a dataset that will eventually allow us to detect trends in steelhead populations.

CDFW began completing regular spawning surveys during the winter spawning season of 2013 and continued these surveys starting in January of 2014. Prior to these years, NMFS had completed redd surveys through the Ventura basin from 2010 through 2012. Survey protocols and reach designations were developed by NMFS (Bush, 2012) and adopted by CDFW in 2013. These surveys include counts and measurements of redds, counts of live *O. mykiss* and counts of other species of special concern.

This report includes the results from the second CDFW season of redd surveys conducted from January 2014 through May 2014 in the Ventura River watershed. Surveys were conducted in ten reaches with five on the Ventura River main stem (VR1-5), three in San Antonio Creek (SA1, 2 and 4) and two in North Fork Matilija Creek (NFM1-2); see Figure 1 and Table 1.



**Figure 1.** Ventura River watershed redd survey reaches and corresponding location codes.

**Table 1.** List of redd survey reaches with location codes and GPS points for the Ventura River basin. Reach abbreviations that are used throughout this report are noted here.

Description	Reach Abbreviation	Location Code	Latitude Downstream	Longitude Downstream	Latitude Upstream	Longitude Upstream	Distance (mi)
Ventura River Reach 1	VR1	1	34.28189	119.30885	34.33662	119.29708	4.04
Ventura River Reach 2	VR2	2	34.33662	119.29708	34.37942	119.30752	3.48
Ventura River Reach 3	VR3	3	34.37942	119.30752	34.42503	119.30159	3.48
Ventura River Reach 4	VR4	4	34.42503	119.30159	34.46509	119.28950	3.36
Ventura River Reach 5	VR5	5	34.46509	119.28950	34.48456	119.30843	1.68
Matilija Creek Reach Below Dam	VR5.1	5.1	34.48527	119.30004	34.48441	119.30853	0.65
Matilija Creek Reach 1	MAT1	6	34.49466	119.33091	34.50217	119.37057	2.80
Matilija Creek Reach 2	MAT2	7	34.50217	119.37057	34.51756	119.40476	2.49
San Antonio Creek Reach 1	SA1	8	34.37942	119.30752	34.42210	119.26424	4.66
San Antonio Creek Reach 2	SA2	9	34.42210	119.26424	34.45434	119.22169	3.85
San Antonio Creek Reach 3	SA3	10	34.45434	119.22169	34.46603	119.20564	1.43
San Antonio (Lion) Creek Reach 4	SA4	11	34.42210	119.26424	34.41936	119.24276	5.28
North Fork Matilija Creek Reach 1	NFM1	12	34.48530	119.29973	34.50691	119.29518	2.17
North Fork Matilija Creek Reach 2	NMF2	13	34.50691	119.29518	34.51290	119.27386	2.11
North Fork Matilija Creek Reach 3	NFM3	14	34.51290	119.27386	34.51854	119.28140	1.40
North Fork Matilija Creek (Bear) Reach 4	NFM4	15	34.51290	119.27386	34.51152	119.25447	1.24
Upper North Fork Matilija Creek Reach 3	UNF	16	34.50910	119.38362	34.51564	119.37294	1.24

## **Methods:**

Redd surveys were conducted from January 22, 2014 through May 28, 2014 in the Ventura River watershed using the NMFS 2012 Redd Survey Protocol. Reaches were surveyed every two weeks following their initial survey date as staffing levels and habitat conditions permitted. Surveys were temporarily put on hold from the end of February through mid-March due to staffing limitations related to DIDSON camera deployment following heavy rainfall.

During redd surveys, teams of two or more walked stream reaches looking for new and old redds, live *O. mykiss*, *O. mykiss* carcasses and other species of interest. Surveys were conducted using the CDFW Salmonid Spawning Survey Personal Digital Assistant Data Entry Protocol 2011-2012 (see Appendix 1; similar to Gallagher, 2005). Data was collected using paper data forms and Palm Personal Digital Assistants (PDAs) using a custom Pendragon forms database. The summaries of these protocols are presented below.

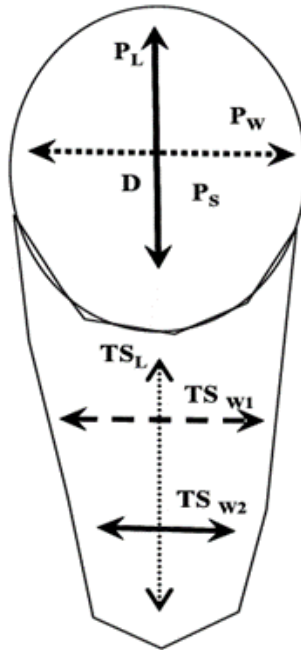
## ***Survey Header Data***

Date, watershed, stream name, reach, method (i.e., walking), weather (sunny, cloudy, etc.), air temperature, water temperature, water visibility, and surveyors' names were recorded prior to the beginning of any survey.

### Redd Counting Protocol

Because no other redd forming species exist in southern California, all observed redds can be assumed to be a product of *O. mykiss* (Adams et al. 2011). All newly observed redds were flagged and measured for pot length ( $P_L$ ), pot width ( $P_w$ ), pot depth ( $D$ ), pot substrate ( $P_s$ ), tail spill length ( $TS_L$ ), tail spill widths ( $TS_w$ ; taken from 1/3 and 2/3 the distance from the top of the tail spill) and tail spill substrate (Figure 2). GPS data was collected using a handheld Garmin 60CSx unit. Flagging tape indicating the date, redd record number, bearing and distance from the flag to the center of the redd, the total redd length (the combined pot and tail spill lengths of the redd), the redd age and the year was attached downstream of each newly detected redd. This flagging was used to avoid double counting redds and to track any change in the redds between subsequent surveys. Redd age was assigned according to the following rubric:

- 1=New since last survey
- 2=Previously identified and still measurable
- 3=No longer measurable but still visible
- 4=No redd apparent, only flag
- 5=Poor conditions, cannot see substrate



**Figure 2.** Redd measurement locations

## **Results:**

### ***Redd Survey Results***

A total of 13 redds were observed during the 2014 survey season in five reaches throughout the Ventura River watershed including the Ventura River reach 5 (VR5), San Antonio Creek reaches 1 and 2 (SA 1 and 2), and North Fork Matilija Creek reaches 1 and 2 (NFM 1 and 2). Table 2 indicates the number of redds observed by date. Though redds were recorded as early as February 13, 2014, these and any existing redds were destroyed by rains from a significant storm system that occurred from February 27 to March 2, 2014. During these four days the city of Ventura received 4.7 inches of rain (VCWPD, 2014). The majority of redds were observed after the storm between March 24 and April 14, 2014 with most occurring in North Fork Matilija reaches 1 and 2 (Table 2). The average total length (average pot length plus average tail spill length) for observed redds in the Ventura River watershed was 62.22 cm (24.5 in). Tables 3A and 3B outline the average measurements for redds in the surveyed reaches as well as the averages for the watershed as a whole.

It is important to note that 2011-2014 has been the second driest three year period in California since at least 1895 (Seager, et al. 2014). With extreme drought persisting in California, many crucial sections of creeks became dry. Some redds, including the one pictured in Figure 3, were in sections that dewatered. The number of redds detected and the measurements recorded were potentially affected by sections of creek going dry.

**Table 2.** New redd observations by stream reach. Redd observations are listed for each survey date and stream reach. The number of redds seen on the survey is shown in red. When a survey was complete but no new redds were found a black 0 is used. Blank cells indicate days where no survey occurred on the reach in question.

Survey Date	Stream Reach									
	VR1	VR2	VR3	VR4	VR5	SA1	SA2	SA4	NFM1	NFM2
1/22/2014	0									
1/27/2014							0			
1/30/2014									0	0
2/6/2014		0	0	0						
2/13/2014									1	0
2/21/2014						0				
2/26/2014									0	3
3/12/2014	0									
3/14/2014		0								
3/17/2014						1	0			
3/20/2014			0							
3/24/2014									2	
3/26/2014	0									
3/27/2014		0								
3/28/2014										2
4/2/2014									1	0
4/3/2014						0	2			
4/4/2014					0					
4/9/2014	0	0								
4/10/2014								0		
4/11/2014									0	0
4/14/2014					1					
4/18/2014						0	0			
4/21/2014	0									
4/23/2014		0								
5/2/2014						0	0			
5/5/2014	0									
5/8/2014		0								
5/9/2014									0	0
5/12/2014					0					
5/16/2014						0				
5/19/2014	0									
5/21/2014									0	0
5/28/2014					0					

**Table 3A.** Average redd measurements for each surveyed reach and averages for all the surveyed reaches within the watershed (centimeters).

Reach	# of Redds	Average Pot Length (cm)	Average Pot Width (cm)	Average Pot Depth (cm)	Average Pot Substrate Size (cm)	Average Pot Area (cm)	Average Tail Spill Length (cm)	Average Tail Spill Width (cm)	Average Spill Substrate Size (cm)	Tail Spill Average Area (cm)	Average Total Length (cm)
VR1	0	-	-	-	-	-	-	-	-	-	-
VR2	0	-	-	-	-	-	-	-	-	-	-
VR3	0	-	-	-	-	-	-	-	-	-	-
VR4	0	-	-	-	-	-	-	-	-	-	-
VR5	1	17	16	6	1	213.63	34	15.5	0.5	527	51
SA1	1	30.5	27.4	3.05	3.05	656.69	33.5	32	1.2	1073.03	64
SA2	2	31	43	3.75	1.25	1041.44	54	38.25	0.75	2088.5	85
SA4	0	-	-	-	-	-	-	-	-	-	-
NFM1	4	25.8	21.6	2.6	1.38	472.18	35.8	19.5	0.51	751.5	61.6
NFM2	5	22	20	4.5	1.75	345.58	27.5	17.25	0.75	473.75	49.5
Watershed Total	13	25.26	25.60	3.98	1.69	545.90	36.96	24.50	0.74	982.76	62.22

**Table 3B.** Average redd measurements for each surveyed reach and averages for all the surveyed reaches within the watershed (inches).

Reach	# of Redds	Average Pot Length (in)	Average Pot Width (in)	Average Pot Depth (in)	Average Pot Substrate Size (in)	Average Pot Area (in)	Average Tail Spill Length (in)	Average Tail Spill Width (in)	Average Spill Substrate Size (in)	Tail Spill Average Area (in)	Average Total Length (in)
VR1	0	-	-	-	-	-	-	-	-	-	-
VR2	0	-	-	-	-	-	-	-	-	-	-
VR3	0	-	-	-	-	-	-	-	-	-	-
VR4	0	-	-	-	-	-	-	-	-	-	-
VR5	1	6.69	6.30	2.36	0.39	84.11	13.39	6.10	0.20	207.48	20.08
SA1	1	12.01	10.79	1.20	1.20	258.54	13.19	12.60	0.47	422.45	25.20
SA2	2	12.20	16.93	1.48	0.49	410.02	21.26	15.06	0.30	822.24	33.46
SA4	0	-	-	-	-	-	-	-	-	-	-
NFM1	4	10.16	8.50	1.02	0.54	185.90	14.09	7.68	0.20	295.87	24.25
NFM2	5	8.66	7.87	1.77	0.69	136.05	10.83	6.79	0.30	186.52	19.49
Watershed Total	13	9.94	10.08	1.57	0.66	214.92	14.55	9.65	0.29	386.91	24.50





**Figure 3.** Observed redd in San Antonio Creek March 17, 2014.

#### ***Oncorhynchus mykiss* Observation Results**

Bankside *O. mykiss* observations were recorded opportunistically during each redd survey. Individual fish were potentially recorded more than once with repeat surveys of the same reaches on different days. *O. mykiss* were observed in 6 of the 10 surveyed reaches: Ventura 1 and 5 (Table 4); San Antonio 1, 2, and 4 (Table 5) and North Fork Matilija 1 and 2 (Table 6). North Fork Matilija Creek had the most *O. mykiss* observations with 68 individuals recorded between the two reaches (Figure 4). Counts were low in San Antonio Creek (n=4) and in the Ventura River main stem (n=2), likely due in part to long dry stretches in those reaches. Only fish 10 cm or greater were recorded as *O. mykiss* due to difficulty in distinguishing smaller fish from other species found in these systems.

**Table 4.** *O. mykiss* observations in Ventura River mainstem reaches. The number of *O. mykiss* observed during each survey is indicated in red. A black zero signifies that a survey was carried out but no *O. mykiss* were observed. Blank cells indicate days where no survey occurred on the reach in question.

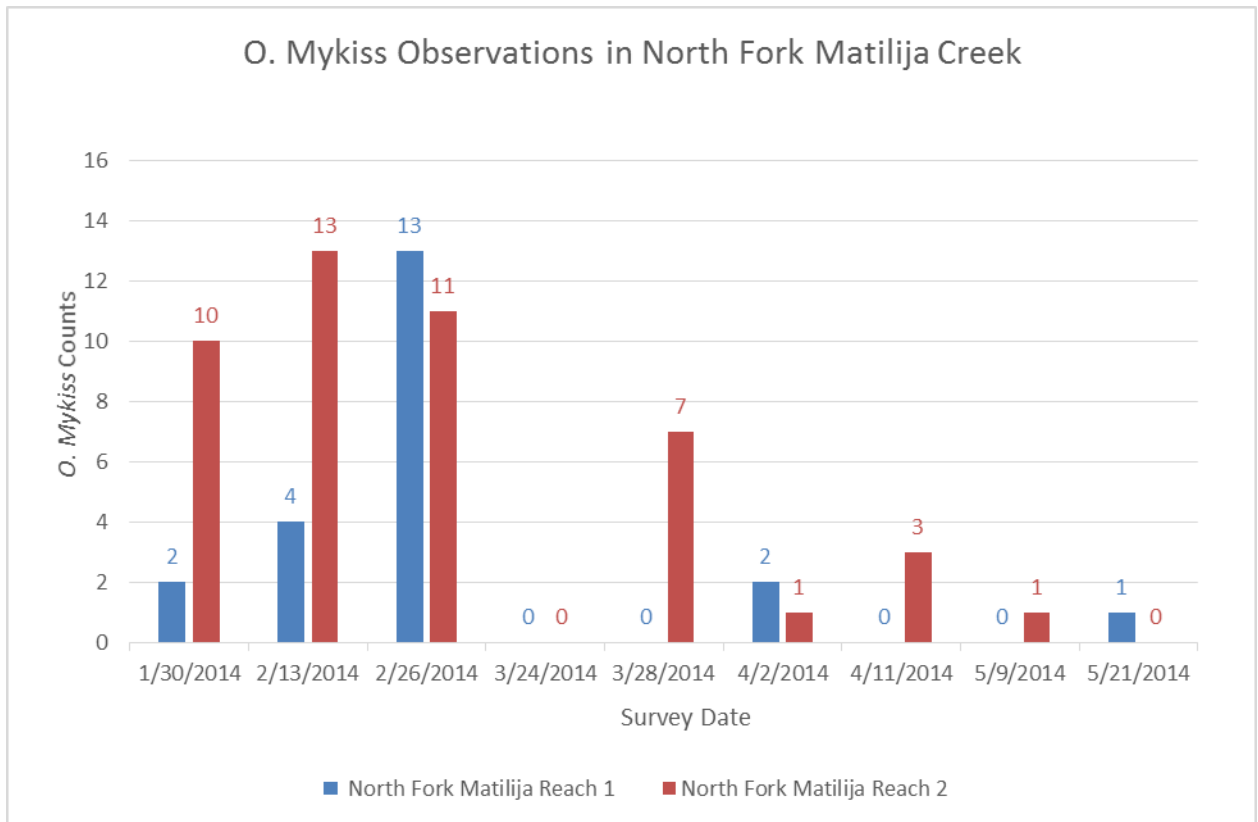
Survey Date	<i>O. Mykiss</i> Observations				
	VR1	VR2	VR3	VR4	VR5
1/22/2014	0				
2/6/2014		0	0	0	
3/12/2014	0				
3/14/2014		0			
3/20/2014			0		
3/26/2014	0				
3/27/2014		0			
4/4/2014					1
4/9/2014	0	0			
4/14/2014					0
4/21/2014	0				
4/23/2014		1			
5/5/2014	0				
5/8/2014		0			
5/12/2014					0
5/19/2014	0				
5/28/2014					0

**Table 5.** *O. mykiss* observations in San Antonio Creek by reach and survey date. The number of *O. mykiss* observed during each survey is indicated in red. A black zero signifies that a survey was carried out but no *O. mykiss* were observed. Blank cells indicate days where no survey occurred on the reach in question.

Survey Date	SA1	SA2	SA4
1/27/2014		2	
3/17/2014	2	0	
4/3/2014	0	0	
4/10/2014			0
4/18/2014	0	0	
5/2/2014	0	0	
5/16/2014	0		

**Table 6.** *O. mykiss* observations in North Fork Matilija Creek by reach and survey date. The number of *O. mykiss* observed during each survey is indicated in red. A black zero signifies that a survey was carried out but no *O. mykiss* were observed. Blank cells indicate days where no survey occurred on the reach in question.

Survey Date	NFM1	NFM2
1/30/2014	2	10
2/13/2014	4	13
2/26/2014	13	11
3/24/2014	0	0
3/28/2014	0	7
4/2/2014	2	1
4/11/2014	0	3
5/9/2014	0	1
5/21/2014	1	0



**Figure 4.** The number of bankside observations of *O. mykiss* in North Fork Matilija Creek. Blue columns represent counts of *O. mykiss* in North Fork Matilija Creek reach 1 and red columns indicate counts in North Fork Matilija Creek reach 2 by date. Zeros indicate that no *O. mykiss* were recorded on that survey.

### Other Species Observations Results

Observations of CDFW Species of Special Concern including the two-striped garter snake (*Thamnophis hammondi*), California red-legged frog (*Rana draytonii*), and southern western pond turtle (*Actinemys pallida*) were also recorded during redd surveys. Field crew members, differing in their ability to identify species, recorded these observations opportunistically while following normal redd survey protocols.

#### California Red-Legged Frogs

California red-legged frogs (CRLF) are a federally threatened species and opportunistic sightings of adult individuals (Figure 5), tadpoles and egg masses (Figure 6) were recorded during surveys. All CRLF observations were in San Antonio Creek with the majority in reach 1 (Table 7). Efforts were made to not double count egg masses by referencing GPS points of previous surveys.





**Figure 5.** California red-legged frog observed in San Antonio Creek March17, 2014.



**Figure 6.** California red-legged frog egg mass observed in San Antonio Creek March 17, 2014.

**Table 7.** CRLF observations in all surveyed reaches. Blue numbers represent CRLF egg masses while red numbers indicate the number of adult frogs. A black zero signifies that a survey was carried out but no CRLF were observed. Blank cells indicate days where no survey occurred on the reach in question. While CRLF tadpoles were observed during some surveys, they were not included in this table due to difficulty in accurately quantifying their numbers.

Survey Date	Red Legged Frog Counts (Blue represents egg mass, red represents frog)									
	VR1	VR2	VR3	VR4	VR5	SA1	SA2	SA4	NFM1	NFM2
1/22/2014	0									
1/27/2014							0			
1/30/2014									0	0
2/6/2014		0	0	0						
2/13/2014									0	0
2/21/2014						2				
2/26/2014									0	0
3/12/2014	0									
3/14/2014		0								
3/17/2014						12, 3	2			
3/20/2014			0							
3/24/2014									0	
3/26/2014	0									
3/27/2014		0								
3/28/2014										0
4/2/2014									0	0
4/3/2014						2	0			
4/4/2014					0					
4/9/2014	0	0								
4/10/2014								0		
4/11/2014									0	0
4/14/2014					0					
4/18/2014						0	0			
4/21/2014	0									
4/23/2014		0								
5/2/2014						0	0			
5/5/2014	0									
5/8/2014		0								
5/9/2014									0	0
5/12/2014					0					
5/16/2014						0				
5/19/2014	0									
5/21/2014									0	0
5/28/2014					0					

### Two-Striped Garter Snake

Observations of two-striped garter snakes (TSGS; Figure 7) were recorded when individuals could be positively identified. These snakes were seen from January through May, during the entirety of the spawning season, and were observed in most reaches in all systems (Table 8).

**Table 8.** Observations of two-striped garter snakes in surveyed reaches are indicated by red numbers. Black zeros indicate a completed survey with no TSGS observations. Blank cells indicate days when no survey was completed.

Survey Date	Stream Reach									
	VR1	VR2	VR3	VR4	VR5	SA1	SA2	SA4	NFM1	NFM2
1/22/2014	0									
1/27/2014							0			
1/30/2014									0	1
2/6/2014		0	0	0						
2/13/2014									0	0
2/21/2014										
2/26/2014									0	0
3/12/2014	0									
3/14/2014		0								
3/17/2014						0	0			
3/20/2014			0							
3/24/2014									0	
3/26/2014	0									
3/27/2014		0								
3/28/2014										0
4/2/2014									0	0
4/3/2014						0	0			
4/4/2014					0					
4/9/2014	1	1								
4/10/2014								2		
4/11/2014									0	1
4/14/2014					0					
4/18/2014						0	0			
4/21/2014	0									
4/23/2014		0								
5/2/2014						0	0			
5/5/2014	0									
5/8/2014		0								
5/9/2014									0	0
5/12/2014					0					
5/16/2014						2				
5/19/2014	0									
5/21/2014									2	0
5/28/2014					0					



**Figure 7.** Two-striped garter snake observed in North Fork Matilija Creek on April 11, 2014.

#### *Southern Western Pond Turtles*

Southern western pond turtles (WPTs; Figure 8) were observed in most surveyed reaches, with the largest concentration in San Antonio Creek during the entirety of the survey season from late January to late May (Table 9). It is likely that some double-counting occurred as individuals were never marked or tagged. When possible, lengths and sex were recorded on individuals.



**Table 9.** Observations of southern western pond turtles in surveyed reaches. Individual counts are indicated by red numbers. Black zeros indicate that no WPTs were observed during a completed survey. Blank cells represent days when no survey was completed.

Survey Date	Stream Reach									
	VR1	VR2	VR3	VR4	VR5	SA1	SA2	SA4	NFM1	NFM2
1/22/2014	1									
1/27/2014							0			
1/30/2014									0	0
2/6/2014		0	0	0						
2/13/2014									0	0
2/21/2014						1				
2/26/2014									1	1
3/12/2014	4									
3/14/2014		0								
3/17/2014						6	4			
3/20/2014			0							
3/24/2014									2	
3/26/2014	7									
3/27/2014		4								
3/28/2014										0
4/2/2014									0	1
4/3/2014						3	0			
4/4/2014					2					
4/9/2014	6	4								
4/10/2014								19		
4/11/2014									1	0
4/14/2014					1					
4/18/2014						6	11			
4/21/2014	2									
4/23/2014		1								
5/2/2014						0	1			
5/5/2014	0									
5/8/2014		1								
5/9/2014									0	0
5/12/2014					0					
5/16/2014						3				
5/19/2014	1									
5/21/2014									4	0
5/28/2014					0					

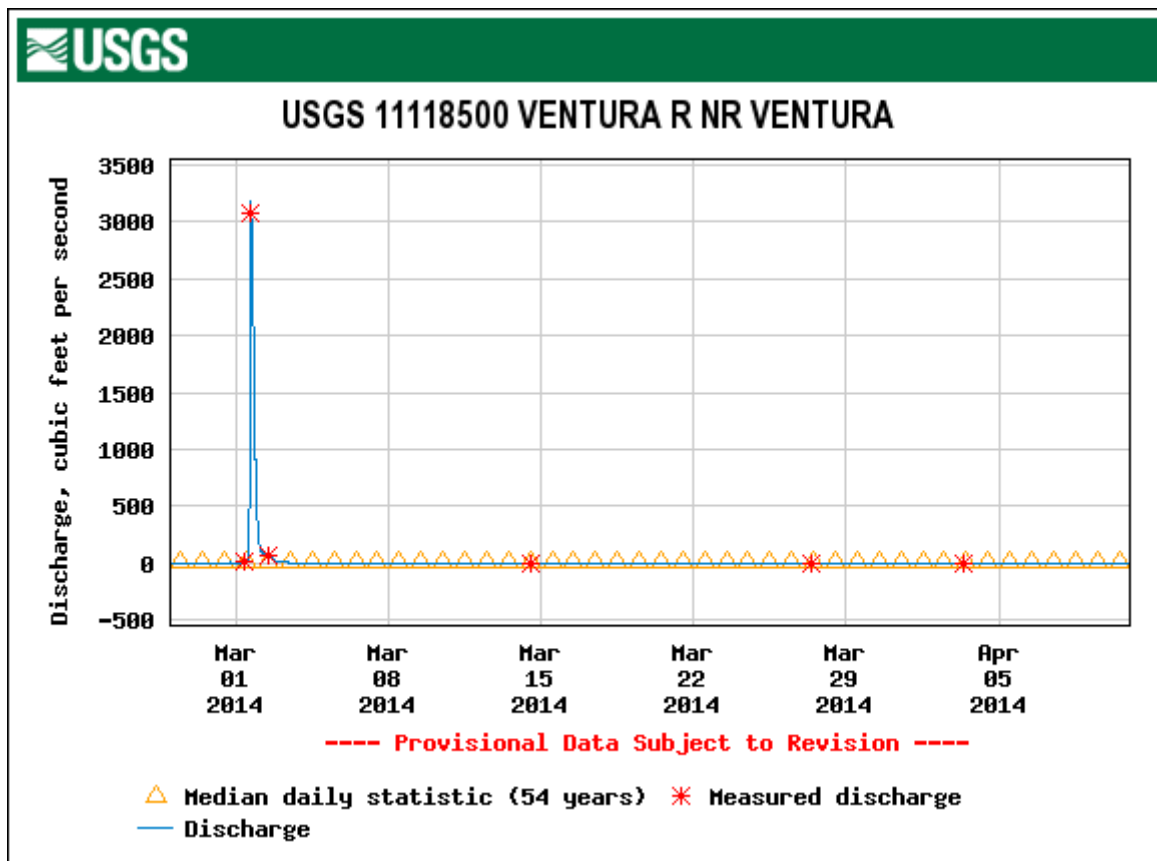


**Figure 8.** Southern western pond turtle observed in San Antonio Creek on March 17, 2014.

#### **Discussion:**

Since 2010, California has experienced extremely dry years causing a severe drought throughout most of the state. On January 17, 2014 Governor Jerry Brown declared a “Drought State of Emergency” for this unprecedented period of low rainfall (California Drought, 2014). Such conditions have dramatically affected the Ventura River watershed by reducing flows and water levels and creating intermittency in streams. With rainfall totals throughout the state reaching record lows for the 2013-2014 water year, opportunity for steelhead migration has been limited. During this water year, downtown Ventura only received 6.14 inches of rain which amounts to about 42 % of average annual rainfall totals (VCWPD, 2014). In 2013, the city only received 44 % of average annual rainfall. In 2014, the first significant rainfall occurred on February 27, 2014 from a strong storm system that caused periods of heavy rainfall through March 02, 2014. This system caused a short lived high flow event causing flows in the Ventura River main stem to break the sand berm where the river meets the ocean and briefly allow for fish passage into the estuary. Peak flow was measured at 3,180 cubic feet per second (cfs) with the USGS gauge

height at 12.86 feet on March 1, 2014 (USGS, 2014). However, this measurement is not indicative of average flow for this system. Figure 10 shows how quickly flow dissipated after the storm passed, with flow returning to virtually zero after a few days and remaining at that level for the rest of the year.



**Figure 9.** USGS graph indicating peak flow in the Ventura River main stem for the 2013 water year (USGS, 2014).

As the city of Ventura received 77% of its rainfall from this single rain event (VCWPD, 2014), the migration window for steelhead to move up through the watershed from the ocean was extremely limited. Our results suggest a very low likelihood of any migrating steelhead in the Ventura watershed. In addition to there being a very small window for any *O. mykiss* to move into the river during the few days that the berm was open and allowed passage, the redds that we observed averaged 62.22 cm in length. Zimmerman and Reeves (2000) indicated that steelhead redds are substantially larger than resident rainbow trout redds with average lengths approximately 28% larger in anadromous individuals. The largest redd measured had a total length of 88 cm, still far smaller than a steelhead redd would likely be. Gallagher (2003) studied the size differences in coho salmon and steelhead redds throughout Mendocino County in California and found the average steelhead redd length to be 224 cm. We would expect any steelhead redds to far exceed the redd sizes we observed. In addition, CDFW staff and PSMFC

field crew members monitored the Ventura River main stem with DIDSON sonar cameras from February 27, 2014 to March 27, 2014. There were no *O. mykiss* identified through this monitoring effort with the camera recording imagery 24 hours a day, seven days a week.

Based on the data from our redd surveys, limited connectivity of the Ventura River to the ocean and our DIDSON survey results, no anadromous *O. mykiss* are presumed to have spawned in the Ventura River watershed during the 2013-2014 water year.

In the Ventura River watershed for the 2013-2014 water year, 13 resident *O. mykiss* redds were detected. While this number can be used to track relative abundance of spawning female resident *O. mykiss* over time, we are unable to infer from this value the number of non-spawning resident females or the number of males without further study.

One potential source of error in our redd counts was that surveys were not always done biweekly due to necessary staff placement in other monitoring efforts. DIDSON monitoring of the Ventura River main stem especially took a substantial amount of time and personnel resources. Due to these staffing limitations, it is possible that redds deteriorated and were no longer visible by the time crews returned to a reach, thereby influencing our redd counts. Regularity of redd surveys will be taken into consideration in future redd surveys, as funding, staffing levels and workloads allow.

With the continued drought persisting in California, the lack of suitable habitat will likely contribute to a decline in steelhead spawners until rainfall increases. During this spawning season, a large amount of steelhead habitat went dry. The largest recorded redd (Figure 9) was observed on April 3, 2014 in San Antonio Creek with a total length of 88 cm. This redd dried up along with its respected section of creek by May 16, 2014.





**Figure 10.** Observed redd in San Antonio Creek Reach 1, March 17, 2014, that later became dry.

In 2013, 23 redds were recorded in this watershed. During the 2014 water year, only 13 redds were observed. These low numbers suggest that both resident and anadromous *O. mykiss* populations may not adequately be able to reproduce until drought conditions subside and rainfall increases. Further research on the effects of drought conditions on *O. mykiss* in southern California may prove especially useful in determining the role of climate change on partial migration strategies within the species' population groups. While we can infer that no southern steelhead migrated up the Ventura River this year, we must also consider the possibility that steelhead in the ocean that originated from the Ventura River could have migrated and spawned elsewhere. The ongoing drought in California is making it increasingly difficult for fish to access their natal spawning grounds and so it is highly possible that Ventura River fish are attempting to migrate into other streams exhibiting connectivity with the ocean. The data from this survey and from the DIDSON upstream migrant survey gives us no information on the number of steelhead currently in the ocean. Until rainfall increases and access between the river and ocean improves significantly, this number will remain difficult to estimate. At this point, we must consider that any Ventura born steelhead could potentially have spawned elsewhere throughout the southern California region.

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## Appendix 1

Version Date:24-OCT-11

### Salmonid Spawning Survey Personal Digital Assistant Data Entry Protocol 2011-2012

California Department of Fish and Game  
Anadromous Fisheries Research and Monitoring Program  
50 Ericson Court  
Arcata, CA 95521

#### Introduction

Coho (*Oncorhynchus kisutch*), Chinook (*O. tshawytscha*) and steelhead (*O. mykiss*) are listed as threatened under the Endangered Species Act in coastal Northern California (Federal Register 1997, 1999, 2000). The breeding population size is important for assessing population status (McElhany et al. 2000). The National Marine Fisheries Service focuses on the number of adults escaping to spawn in order to evaluate the natural viability of salmon populations for recovery planning (Busby et al. 1996). There is a need for a reliable technique for long term monitoring of adult Chinook, coho and steelhead populations in coastal Northern California.

Spawning surveys include; redd counts, live fish observations, and carcass mark-recapture surveys that are commonly used to assess salmonid population abundance (Maahs 1997, Rieman and Myers 1997, Susac and Jacobs 1999, Jacobs et al 2001, Gallagher 2002, 2003, Gallagher and Gallagher 2005, Hannon and Healey 2002). The California State Department of Fish and Game's Steelhead Research and Monitoring Program has been testing, modifying and evaluating various approaches for estimating salmonid populations in coastal Northern California since its inception in 1999. Spawning surveys, which include redd measurement, redd counts, live fish counts, and carcass marking, in a stratified index sampling scheme (Irvine et al 1992) have been shown to produce reasonable population estimates with reduced field effort (Gallagher 2003, Gallagher and Gallagher 2005). The purpose of the 2008-09 spawning surveys is to continue to evaluate this technique at the independent population scale.

Each reach will be surveyed multiple times beginning in late-November (or as soon as fish enter the stream) continuing until late-April (or when new redds and fish are no longer observed). Some reaches may be temporally surveyed a maximum of two weeks apart and stream flows and/or weather conditions will likely have some effect on the temporal intensity of surveys. All redds will be identified to species when possible, measured and geo-referenced. All live and dead fish will be identified to species, measured and marked (carcasses only). The condition of redds measured during previous surveys will be recorded during subsequent surveys to assess the duration of redd observability.

#### Field Methods

Each reach should be surveyed every one to two weeks. All redds will be marked in the field with flagging to avoid double counting and determine the duration of redd longevity, measured, and geo-referenced with either meter markers (Freshwater) or GPS (Extensive Surveys). Teams of two will walk stream reaches every week. On each survey teams will look for new and old redds and examine all flagging from the season. Redd and fish data forms are filled out each survey even if nothing is observed. **It is the teams**

**responsibility to go through the equipment checklist before leaving the office**, make sure that you have all the necessary equipment, maps, GPS, first aid kit etc. Each crew must **sign out** at the office before leaving to the reach you are surveying and **sign back in** at the end of the day; if you are the last crew to return, or will not be heading back to the office, you must call an appointed person after completing your reach.

### **Data Capture**

All spawner survey data will be collected on Palm PDA's using a custom Pendragon® forms database. In the event where PDA's cannot be used or are lost, paper datasheets will be carried at all times to record survey data.

## **Survey Information (Survey Header)**

Prior to starting a survey reach, the survey header must be filled out. To start a new survey form, turn on the PDA:

Select: **Forms 5.0**.

Select: **Header** then press: **New**.

**Date:** select **Today**, unless different.

**Watershed:** (Lookup) This is at the regional scale.

**Stream:** (Lookup) Select stream at the basin scale.

**Reach** (Lookup) Select the actual reach you are surveying.

Select: **Next**

**Method:** (Lookup) Floating is a boat only survey. Walking is a walk only survey.

**Weather:** (Lookup) Pick the appropriate weather description.

**Air Temp:** Air Temperature

**Air Temp Type:** (Lookup), select Fahrenheit or centigrade.

**Water Temp:** Stream Water Temperature 0.5 Meters from edge- Use number keypad.

Select: **Next**

**Water Temp Type:** (Lookup), select Fahrenheit or centigrade.

**Water Visibility (cm):** The distance a surveyor can see into the water in centimeters. Value obtained by placing your stadia rod vertically into an undisturbed water column to a depth where the bottom of the rod begins to disappear from sight. If 100% visibility in the reach enter: **999**.

**Surveyors:** Select: **Click Here to Add Names**, and then Select: **Contributor Lookup**: now select the first contributor's name and select then **Next**. To add the second contributors name Select: **Add** and then **Lookup** again and select the second surveyor's name. If a name is not in the lookup list Select: **Anonymous** and add this contributors name to the header notes section. Once all contributors have been added, Select: **Done**.

Select: **Next**

At this point you are at the **Observations page**. If you want to enter any comments into the **Survey Comments** section Select: **Next**. Add any survey comments such as: did not survey entire reach: end GPS position 15837E, 234567N, or: No temperature data recorded, lost thermometer, or: water visibility has gotten much worse midway etc. You can add additional comments to this field throughout the survey by always selecting: **Next** at the **Observations page**. To exit the comments field, and return to the **observations page** Select: **Previous**

## **Survey Methodology**

Each reach will be surveyed with two observers walking or boating the stream together at the same time. A primary observer will identify redds independently prior to the second observer. The second observer will only identify redds which the primary observer overlooked. Approximately mid-reach (mid redd distribution), the primary and secondary observers' roles will switch. At this point a new header will be initiated, which will identify the new primary observer automatically with a time stamp in the **Observed By:** (Lookup Table). Fish observations are not independent and will be a team effort.



## Observation Information

During the survey there are three observations you can make: (1) redds, (2) individual fish (live or dead) and (3) batch counts of live fish. The observations page is where you will record this information.

**Redds:** Individual redd features identified or revisited from previous surveys.

**Individual Fish:** Observations of individual live fish or carcasses (new or recaptured).

**Batch Counts:** One-to-many fish observations (example: a group of six adult coho observed holding in a pool).

When an observation has been made, select one of the three buttons to record information on the observation. After entering all the information for an observation, the PDA will return to the observations page.

### **Redds**

All redds will be marked using flagging. If you observe a new redd on a survey on January 15, 2011 you will record the date followed by redd record number (0115001) and hang a flag (see flagging below). If you observe a redd flag from a previous survey (flag e.g. Record 1227003), redd record # indicated on the flag.

**Flagging a newly observed redd:** Record the date, Record Number, bearing and distance from the flag to the center of redd, the Total Redd Length (TL), the combined pot and tail spill lengths on completed redds, the Redd Age, and the year (EX: 1212001 30° 1.5m TL 2.3, RA=1, 2011). Write the redd record # on the tag end for bear insurance. Tie the flagging securely to the closest **solid living object** to the pot of the redd. If it's a redd under construction with a fish on the redd, DO NOT DISTURB the fish to obtain redd measurements, estimate measurements, but do write TL \_\_ and leave blank as a cue to be measured at a later date. If a GPS reading can't be obtained due to time constraints, satellite positions or a live fish on the redd write GPS on flag. Examine all flags during each survey (See Redd Age and Previously Measured, below). If the redd was identified as under construction OR could not be measured redd during previous survey(s) or it has changed (i.e. increased size), record the Redd Record Number from the flagging on the data form and measure the redd. Leave the Record Number unchanged. Record all appropriate data and fill out the TL \_\_ on the flagging if no fish is present. Cross out need GPS if you are able to obtain a reading. If a previously measured redd has changed size and is superimposed, write down old record number with a 4 redd age with a new record number cross referenced new redd record number in the notes column with SU (superimposed). Record the new Redd Record Number, measure the new redd and write the old redd record number in the notes column with SU (superimposed). Tie a knot in old redd flags when age 4 "redd no longer visible" is observed, or when old redd is covered by a new superimposed redd. Clues for identifying superimposed redds are redd TL length has increased drastically and/or the previous pot location is no longer visible or in a different location than on the flag. Redd architecture including pot and tail shapes and size may also help in determination of superimposed redds. Superimposition usually happens when a female is no longer present to guard her redd after two to three weeks' time. Superimposition is more likely to occur in reaches with limited spawning gravel and in high abundance years.

**Redd Record #:** Insert the redd record number you recorded or observed on the flag here.

**Observed By:** (Lookup Table) For **Extensive** survey Select: **1** for first observer or **2** for redds missed by primary observer and observed by the second observer.

### **Redd Location**

**Meter Marker:** (Freshwater only) See *generating locations* sidebar

**UTME:** (Extensive survey only) UTM Easting Coordinates obtained from a GPS waypoint (use number keypad) See *generating locations* sidebar

Select: **Next**

**UTMN:** (Extensive survey only) UTM Northing Coordinates obtained from a GPS waypoint (use number keypad) See *generating locations* sidebar

**GPS Error:** The estimated error (to the nearest meter) recorded during GPS point averaging. **Bearing:** The compass bearing (**using magnetic north**) in degrees from a flag to the center of a redd pot while standing directly under the flag.

**Distance:** The distance (in meters) a flag is away from the center of a redd pot.

Select: **Next**

### Generating Locations for Fish or Redds

We will use GPS points for identifying all newly observed redds, live fish and carcasses. We will use specific GPS units (Garmin 60csx) for all surveys. To obtain a reliable position using GPS, point averaging at feature locations is required. A minimum of 200 points per redd location is needed to obtain acceptable accuracy. If in dense canopy, or reads have a high error, more than 200 points are desired if time allows. We will be using *UTM NAD 83 zone 10 conus* datum for all waypoints. If you cannot obtain enough satellites to receive a waypoint with the GPS alone, insert the antenna and mount it to your stadia rod. Now extend the stadia rod into the air above you and try to record a position again. If you do not have a GPS, or you cannot get sufficient satellite coverage during a survey or a live fish is on the redd write need GPS on flag. Once you get a redd location during a subsequent survey, cross off GPS on flag. If you do get a waypoint for a fish or carcass, make sure you have the fish identified to species. Fish locations are not as critical as redd locations (do not flag fish locations with orange flagging if you do not have a GPS or cannot get satellites). If a fish is on a redd, you do not need to collect a fish waypoint because it's linked to all the redd data. Record the coordinates of a waypoint and error into the PDA. Then label the waypoint in the GPS as described below:

#### ***Redd Waypoints:***

Waypoint coordinates recorded with the GPS need to be renamed so they describe the specific redd you are mapping. If you do not rename a waypoint it will use a default number and will be useless. Labels are as follows:

Redd waypoint label structure: **ReachID.DateReddID**

Example: The third new redd found on December 22nd in Godwood Creek (Reach 111) would receive a waypoint label: **111.1222003** (*be sure to enter a period after the reach id*).

**\* If getting a redd location on a subsequent survey, use the redd id from the flag and cross out "gps" on flag.**

#### ***Fish/Carcass Waypoints:***

Live fish and carcass positions will be "on the fly" without point averaging or saving the waypoint on the GPS unit (positions will be entered into the palm). Location of the fish observation will be the current running position on the GPS. **If a carcass or fish is found past known distribution then use point averaging.**

Do not flag any fish positions when you cannot receive a waypoint, only record a fish waypoint if you can during the survey the fish was observed (do flag for a future GPS position if you have found a tagged fish or carcass when you cannot receive a waypoint). Batch counts fish waypoints can be recorded in the batch counts notes field as example UTME:0405655, UTMN:4512447.

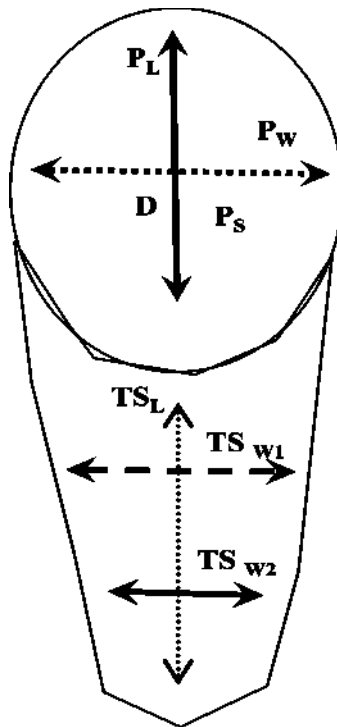
### *Redd Species*

**Species:** (Lookup) If a female Salmonid is on the redd or constructing the redd, and you can determine the species; select the correct species from the list. If no fish is on the redd, use your best judgment to assign a species. If you cannot determine the species, select unknown.

### *Redd Dimensions*

**Do not measure redd if fish are observed constructing a redd or spawning.** Estimate measurements and write estimated in notes. Physical measurements can be obtained on subsequent survey. See “individual fish” section to record fish on redds.

**Measurement Unit:** Centimeters (CM) will be used for all redd measurements.

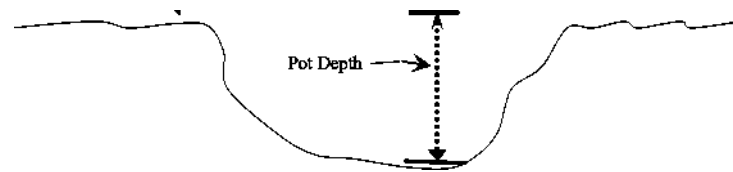


**Pot Length:** (PL) is the total length of the pot parallel to the stream flow from the top to bottom edge. When the pot is irregularly shaped, do your best to estimate the total length. Record this information on the data form.

**Pot Width:** (PW) The maximum width of the pot perpendicular to the stream flow or pot length. Measure in cm from one edge to the other. When the pot is irregularly shaped, do your best to estimate the maximum width.

Stream Bed

Water Surface



**Pot Depth:** The maximum depth of the excavation relative to the undisturbed stream bed (not relative to the water surface). Use the staff to

measure the depth from the substrate adjacent to the pot to the water surface, then measure the depth from the pot to the water surface. Subtract the outside measurement from the depth inside the pot to the water surface to get a pot depth. Example: Stream depth outside pot = 20 cm, stream depth inside pot = 34 cm,  $34 - 20 = 14$  cm pot depth.

Select: **Next**

**Pot Substrate:** is the size of the dominant substrate in the pot. Select a stone in the pot that represents the dominant substrate and measure its width across the shortest axis.

**Tail Spill Length:** ( $TS_L$ ) is the total length of the tail spill parallel to the stream flow. Measure it from the top edge of the middle of the pot to bottom edge of the tail spill. When the tail spill is irregularly shaped, do your best to estimate the total length.

**Tail Spill Width 1:** ( $TS_{W1}$ ) is the maximum width of the tail spill perpendicular to the stream flow or pot length. Measure it from one edge to the other 1/3 of the distance down from the top of the tail spill. When the tail spill is irregularly shaped, do your best to estimate the maximum width.

**Tail Spill Width 2:** ( $TS_{W2}$ ) is the maximum width of the tail spill perpendicular to the stream flow or pot length. Measure it from one edge to the other 2/3 of the distance down from the top of the tail spill. When the tail spill is irregularly shaped, do your best to estimate the maximum width.

**Tail Spill Substrate:** is the size of the dominant substrate in the tail spill. Select a stone in the pot that represents the dominant substrate and measure its width across the shortest axis.

Select: **Next**

**Redd Age:** (Lookup Table) To determine how long we are able to observe redds we are going to estimate the redd age and record if and when it was previously measured.

**1=New since last survey:** All new redds observed and flagged for the first time.

**2=Previously identified and still measurable:** A redd flagged from a previous survey. If tail spill has changed, remeasure the entire redd. If redd was previously *Under Construction* or not measured, take all measurements.

**3=No longer measurable but still visible:** Previously identified redd still visible but has become less discernable.

**4=No redd apparent only flag:** Previously identified redd which is no longer visible. If you cannot see the redd then tie a loose **knot** in the redds flag. Redds with knotted flags will no longer be assessed in future surveys. If a new redd is seen under a knotted flag, then record it as a new redd and write

**Superimposed** on knotted flags redd ID in the new redds comment field **5=Poor conditions cannot see substrate:** When you identify where a previously flagged (unknotted) redd is, but cannot see the substrate to confirm if a redd is visible or not.

**Individual Redd Notes:** Record if the redd is irregularly shaped (not a circle, ellipsis, oval, square, or rhomboid). What shape is it? Redd under Construction (UC), redd under log. Information that won't help our understanding, such as two salamanders in hole, is not needed.

Select: **Next** or **End** to complete the Redd entry

### **Individual Fish**

All live fish observed during the survey will be identified to species and sex, and fork length (CM) estimated (when possible). All carcasses will be measured, sexed, and tagged with uniquely numbered hog ring tags. All carcasses found in Freshwater, Ryan, and Prairie creek basins need to be scanned for PIT tags. Recaptured carcasses tag numbers will be recorded. If the carcass is fresh (eyes still there and clear) take scales. Record an on the fly GPS position for individual fish records.

Select: **Individual Fish**

**UTME:** enter UTM Easting Coordinates obtained from a GPS waypoint. See *generating locations* sidebar. If the fish is on a redd, use the redd coordinates, furthermore, if the redd is old and coordinates were obtained during a previous survey omit collecting a GPS position. Carcass recaptures always get new location information (carcasses may move during flow events).

**UTMN:** enter UTM Northing Coordinates obtained from a GPS waypoint. See *generating locations* sidebar.

**Condition:** (Lookup) The condition of the fish.

*Live Fish Conditions*

**L1=Live Fresh not yet spawned**

**L2=Live Spent spawned out Dead**

*Fish Conditions*

**1=Carcass fresh clear eye(s)**

**2=Carcass cloudy eye(s) low fungus 3=Carcass cloudy eye(s) or no eyes heavy fungus 4=Carcass skin and bones with head 5=Carcass skin and bones no head 6=Loose tag no fish**

**Species:** (Lookup)

**Length:** the fork length of an intact carcass or estimated length of a live fish.

**Length Unit:** (Lookup) Select measuring units (CM)

**Length Measurement Type:** (Lookup Table) Select type (TL: total length, FL: fork length). Select: **Next**

**Sex:** (Lookup) Choose **M** or **F**, if unknown select **U**. Select: **Next**

**Tag Type:** (Lookup) select tag type.

**Tag Number:** Enter tag Number if applicable using keypad.

**Tag Color:** (Lookup) Select tag color if applicable.

**Tag position:** (Lookup) Select tag position if applicable (Left or right side of fish). Select: **Next**.

**Clip/ Mark Type:** (Lookup) select the tag/ mark type.

**Clip/ Mark position:** (Lookup) select the tag/ mark position (Left or right side of fish).

Select: **Next**

**Notes:** record any specific notes or tag types not found in lookup tables here.

**Fish on Redd?:** (Click button for yes) If a fish is seen on a redd then the fish needs to be linked to the redd id it is found on.

**Redd Record #:** If there is a fish on a redd, the redd record number will be obtained from the redd flag. For example: If a fish is on a redd that was flagged on a previous survey, the date on the flag will be recorded in this column.

**Notes:** Record other pertinent information, information that won't help our understanding, such as two logs over the stream or nice fish, is not needed. Pre Spawn Mortality PSM. Carcass missing tail length was estimated.

Select: **Next to complete Individual fish**

### **\*Carcasses in Freshwater Creek and Ryan Creek**

Freshwater Creek carcasses are used in a Peterson Mark-Recapture study to generate run size estimates. In order for a carcass to be used in this estimate it must have a complete left operculum intact. If operculum is present it will be noted in the individual record under: Was fish already clipped or marked? (Yes) and in the

Clip/Mark type as left operculum. If left operculum is missing it will be noted in the individual record under: Was fish already clipped or marked? (No) and in the Clip/Mark type as unknown. All new entries of carcasses from Freshwater Creek should contain a note in the clip/mark notes (left operculum present or left operculum missing).

**Batch Counts:** (Lookup) Batch counts allow for a surveyor to enter one to many fish observations. For example if six coho were seen in a pool then you can enter them as a group.

**Species:** (Lookup) Select the species identified **Count:** The number of individuals observed.

**Notes:** Any applicable notes (EX: holding pool, below barrier etc.) as well as UTM's.

Select: **Next to complete Batch Counts**

### Extra Stuff

*PIT tag scanners need to be carried on all Freshwater Creek, and Ryan Creek surveys. These basins have PIT tagged adult salmonids.*

### Species Identification

**Chinook salmon (CH)** have a black mouth with black gums, 13-19 anal fin rays, a narrow caudal peduncle, the caudal fin rays are smooth, they have large black spots on the back and both lobes of the caudal fin, and a generally thick body. Males generally have a pronounced kype and females don't. Ripe females are generally rotund.

**Coho salmon (CO)** have a black mouth and white gums, 13-19 anal fin rays, a wide caudal peduncle, small black spots on the upper back and upper lobe of the caudal fin only, striated caudal fin rays (like the edge of a coin) and a generally thick body. Males generally have a pronounced kype and females don't. Ripe females are generally rotund.

**Steelhead (SH)** have a white mouth and white gums, 8-12 anal fin rays, a wide caudal peduncle, the caudal fin rays are smooth, small black spots on the back, uniform rows of black spots along the caudal fin, and a generally slender body. Males generally have pronounced to somewhat pronounced kype, very pink operculum, and a pink stripe along the lateral line. Ripe females are generally rotund, no kype, and a pink stripe along the lateral line.

The above identifications mainly rely on relative differences so that you may need to have two species in hand to tell them apart (i.e. wide versus narrow caudal peduncle). As with any key, you should use combinations of the above characteristics to identify fish. As a general rule, if you see the mouth, and can tell the color of mouth and gums this is most desirable. Don't rely on things not in a taxonomic key, such as the size of the eye or color of the adipose fin, to determine species. If you can't tell, it's unknown.

### Salmonid Associated Species

We are interested in other species that are associated with salmonids, most notably those species which rely on salmonids as prey. We have chosen 5 focal species, based on their potential dependence on fish populations, and ease of identification. As with all fish and redd data, these five focal species must be recorded if observed during a survey. If these species are not recorded when seen, we cannot analyze these data with any certainty. These species include: river otter, common merganser, American dipper, kingfisher, and black bear. All that is required is a raw count of each species within the reach per survey.

Be sure not to **double count** species. Notice the direction you have spooked them because you may be herding them until they go around you. For example American dippers will stay ahead of you until they reach the end of their territory and then they will abruptly turn around and fly by you. Use the provided separate paper datasheet to record these species.

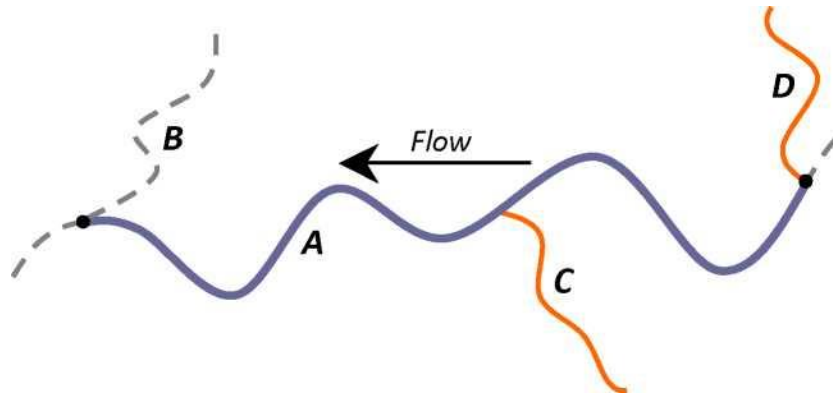
## Sub-reaches

A Sub-reach is any tributary stream to a selected reach that has been determined by GIS modeling to have insufficient spawning habitat to warrant a single reach survey yet may contain some spawning salmonids. These Sub-reaches are all less than one KM in length and should be surveyed by implication if it flows into a randomly selected survey reach (> 1 km) at a position above the selected reaches bottom. This survey criterion allows short reaches to be included in the sample frame in a random fashion by adding them to already selected survey reaches.

Sub-reaches, similarly to reaches, have been identified as part of the sampling universe and have a unique reach ID number. As one surveys along the select reach and comes to the mouth of the subreach, the sub-reach should be surveyed at this time and not after the main reach is finished. A new HEADER in the PDA needs to be created to capture the data for this reach. To create a new header, select END from the Redds-Fish-Counts screen in the main reach header entry screen. If you are at the Header select review screen select Done. From the Pendragon Forms start screen select Header and then click the new button. Fill out the header form and proceed as described for the main reach using the ID for the sub-reach found on the reach map. Once a sub-reach is completed, select END from the Redds-Fish-Counts screen in the reach header entry screen.

To resume surveying the main reach, select Header from the Pendragon Forms start screen then click the review button. Click on the main reach row. Make sure the correct reach number is indicated at the bottom of the first header screen. Repeatedly select the next button until you reach the Redds-Fish-Counts selection screen (three button clicks).

Note: if a stream is not indicated as a reach or a sub-reach on your map, and fish or redds are found in it; do not record the observation in the PDA. Record the information on paper data sheets, being sure to record the GPS coordinates for the stream mouth on the sheet. Bring this to the attention of the PDA/database administrator so an appropriate reach ID can be assigned and made available in the PDA.



**Drawing indicates sub-reach selection when connected to a selected GRTS sample reach. Stream section A: GRTS selected sample reach. Stream section B: Short reach (< 1KM) at bottom of selected reach A- not surveyed. Stream sections C and D: Short streams within, and at the top of section A, surveyed by implication. Note: if section A is the lowest potential reach in the stream, then section B would be surveyed as well.**

On Palm OS devices, tap in the blank column heading of the 2nd column position.

Select a second field to view.

The image shows three sequential screenshots of a Palm OS application window titled "Customer Order".

- First Screenshot:** The window has a single column with a header "Customer Name". Below it is a list of customers: Grover's Ice Cream, Marina's, Zebra Mix, Alpha Garden, and Ocean Fresh. At the bottom are buttons for "Sort...", "All Fields", "Done", and a magnifying glass icon.
- Second Screenshot:** A second column has been added. A selection menu is open over the blank header of the second column, showing options: "Fax Number", "Billing Address Line 1", "Billing Address Line 2", "Billing City", "Billing State", and "Billing Zip Code".
- Third Screenshot:** The selection menu is closed. The second column header is "Billing Address Line". The data is now displayed in two columns: Customer Name and Billing Address Line. The data rows are: Grover's Ice Cream (542 Sunshine Blv), Marina's (24 Sweet Avenue), Zebra Mix (500 Zoo Parkwa), Alpha Garden (2 Alpha Base), and Ocean Fresh (67 Pier 5).

### Search Tip For Record Editing

When reviewing any form in the PDA, you have some control on what fields from the forms are displayed making it easier edit or delete the correct record. The first displayed field is fixed and cannot be changed from the PDA. Two other fields, however, can be viewed by tapping the column heading position on the top row of the form record display and tapping the desired field. The columns are indicated by very small tic marks on the line below the e form name. Any field in the second or third column can be changed by tapping on the header field name to be changed and selecting a new field. Also, column widths can be changed by putting the stylus on the line between field names in the header and dragging the line to achieve the desired width.

### **Back at the Office.**

#### **Downloading PDAs**

After returning from the field, each PDA needs to be downloaded to backup the data and clear the PDA for the next survey day. Place the PDA in the hot sync cradle and press the **hot sync** button. You will hear a beep when it starts the data offloading and another beep when it has completed the offloading. Make sure your survey records are visible on the pen dragon forms manager. After downloading is complete, plug the unit into a charging cord so the unit is ready to use the following day.

#### **Downloading GPS units**

All GPS units need to have waypoints downloaded a few times per week to avoid filling the storage memory. Use downloading instructions posted near downloading station in the Sci aid office. All waypoints need to be deleted from the units after downloading to clear up memory for future surveys.

#### **Equipment Decontamination**

To reduce the spread of disease, pathogens and exotic organisms, all boots and waders need to be soaked in metaquat for 10 minutes then placed in large plastic bags and frozen in the designated chest freezer at the office for a minimum of six hours if you are moving between major watersheds.



## Notes on Field Safety

Always work in pairs. Bring extra food, water, and clothing. Plan your route and always look ahead while walking upstream. Bring a cell phone; a list of all office, home, cellular phone numbers of coworkers as well as all emergency contacts is available in all vehicles. Make sure you have signed in at the DFG office with the names of all survey crew, and reach each crew is on. **EVERYONE MUST SIGN BACK IN THAT THEY ARE OFF THE CREEK.** Know what segment you're doing each day and ETA for return to the office. Don't ride the quads (aka ATV's) if you've not had the proper training. Use extra caution when loading and unloading the quads. Park the truck so that the truck is level and the rear tires are up slope so that the tail gate is as close to the ground as possible and so that the ramp is more level than steep. **Wear the Helmet at all times.** While unloading put the ATV in 4 low, lean forward while going up and down the ramp. Don't sit. Pay attention to what you are doing. Don't speed and watch for other traffic. Be respectful of the locals and drive < 15 MPH on all roads. Drive slowly past all residences. Drive with the lights on. If you're not done with the survey and it's getting on towards 4 pm, stop the survey and return to office.

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#### Website Links:

Department of Fish and Game Fish Bulletin 180  
California Coastal Salmonid Population Monitoring: Strategy, Design, And Methods  
<http://nrm.dfg.ca.gov/documents/ContextDocs.aspx?cat=Fisheries>

#### Redd Counts

<http://www.stateofthesalmon.org/fieldprotocols/downloads/SFPH p7.pdf>

#### California Fish Passage Assessment Database

[http://imaps.dfg.ca.gov/viewers/viewer4.18/metadata.asp?appName=calfish&afName=calfish&axlFile=calfish.axl&metaStyle=dfg\\_imaps.xsl&activeLyrName=X&activeLyr=2-3](http://imaps.dfg.ca.gov/viewers/viewer4.18/metadata.asp?appName=calfish&afName=calfish&axlFile=calfish.axl&metaStyle=dfg_imaps.xsl&activeLyrName=X&activeLyr=2-3)

