

Tuolumne River *O. mykiss* Acoustic Tracking Study 2010 Technical Report



Submitted To:

Turlock Irrigation District
Modesto Irrigation District

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Introduction

Study area description

The Tuolumne River is the largest of three major tributaries (Tuolumne, Merced, and Stanislaus Rivers) to the San Joaquin River, originating in the central Sierra Nevada in Yosemite National Park and flowing west between the Merced River to the south and the Stanislaus River to the north (Figure 1). The San Joaquin River itself flows north and joins the Sacramento River in the Sacramento-San Joaquin Delta within California’s Central Valley. The Tuolumne River is dammed at several locations for generation of power, water supply, and flood control – the largest impoundment is Don Pedro Reservoir.

The lower Tuolumne River corridor extends from its confluence with the San Joaquin River to La Grange Dam at river mile (RM) 52.2. The La Grange Dam site has been the upstream limit for anadromous fish migration since at least 1871.

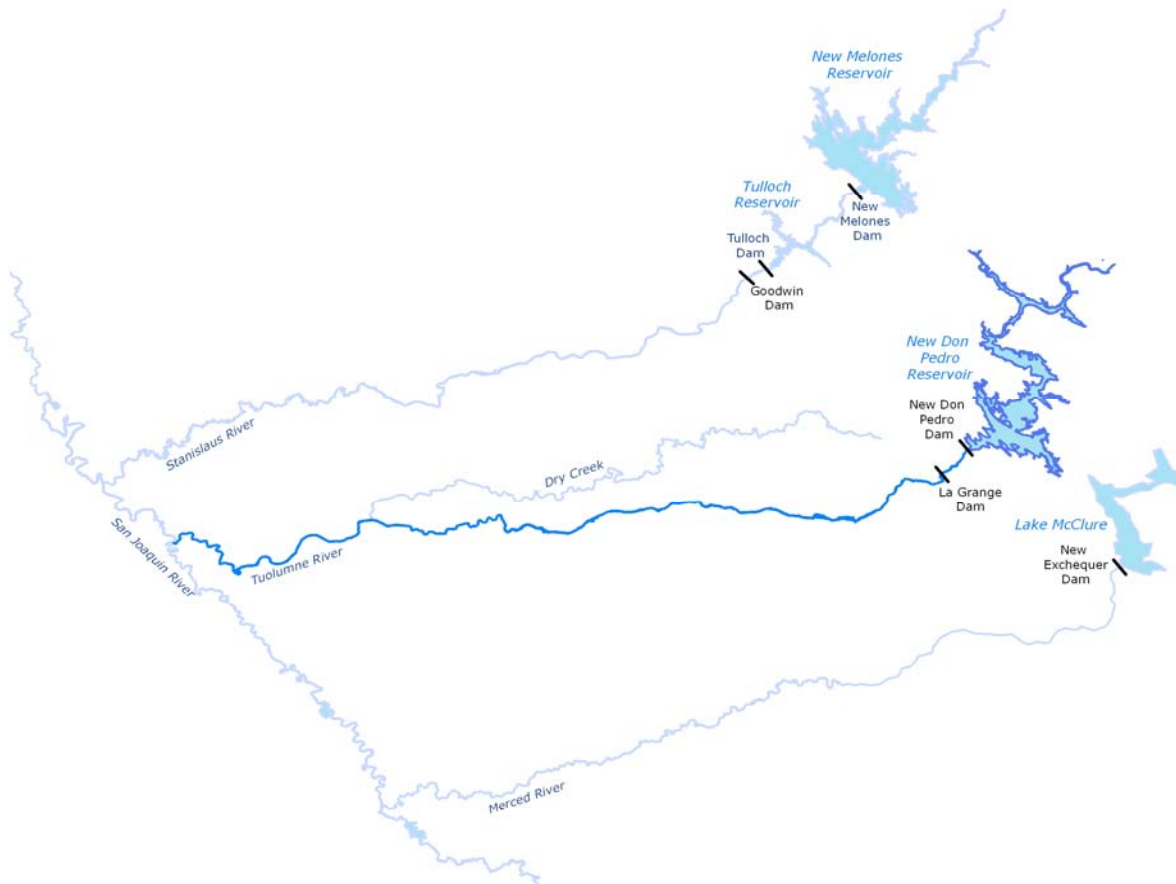


Figure 1. Location of the Tuolumne River within the San Joaquin River Basin.

Purpose and history of study

Turlock Irrigation District and Modesto Irrigation District (Districts) have been required to conduct fisheries studies and monitoring under the Don Pedro Project Federal Energy Regulatory Commission (FERC) license starting in 1971. A required “Ten Year Summary Report” (TID/MID 2005) presenting results of these efforts was filed by the Districts with FERC in March 2005. FERC solicited input on the

Report and held a public meeting during 2005-2006 which led to a December 20, 2006, request from FERC for a new Tuolumne River Fisheries Study Plan (Study Plan) to be prepared by the Districts and submitted by March 20, 2007. The Study Plan was intended to address information needs under Article 58 of the Project license that were identified during the review of the Report and in subsequent discussions. The primary goals of the Study Plan were to provide continued long-term trend monitoring and to undertake studies that clarify major factors that affect and potentially limit the Chinook salmon (*Oncorhynchus tshawytscha*) and *Oncorhynchus mykiss* (*O. mykiss*) populations in the Tuolumne River. The Study Plan was also expected to specifically include tasks on “Steelhead Presence/Protection.”

The Districts distributed a proposed Study Plan for review on February 2, 2007, and revised Study Plans that included a requested winter (January-March) adult *O. mykiss* tracking study were submitted by the Districts on March 20, 2007 and July 13, 2007. An Order issued by FERC on April 3, 2008, directed the Districts to conduct all of the *O. mykiss* studies identified in the Study Plan, including the adult tracking study beginning in January 2009. That task was intended to better determine habitat associations and potential spawning locations, including habitat use by *O. mykiss* adults in restored and nearby reference sites. While routine fisheries monitoring conducted by the Districts has long documented the presence of *O. mykiss* in the Lower Tuolumne River (TID/MID 2005), little is known about life history strategies of *O. mykiss* in the Tuolumne River (i.e.; habitat use, in-river migration patterns, and spawning location and timing).

Objectives of the adult *O. mykiss* acoustic tracking study include:

1. Determine spawning locations of tagged adult *O. mykiss*.
2. Document migration patterns of tagged adult *O. mykiss*.
3. Determine potential habitat use of restored river reaches and nearby reference sites by tagged adult *O. mykiss*.

This study was to begin in January 2009, and timely preparations were made by the Districts to implement the study on schedule including budgeting, contracting, equipment purchase, and requesting necessary permits and authorizations. However, necessary Endangered Species Act (ESA) take authorizations were not issued by the Agencies to permit moving forward with the study in 2009, and the study was delayed until March 2010.

Methods

Capturing study fish

Adult *O. mykiss* were targeted by hook and line sampling conducted between La Grange Dam (RM 52.2) and Turlock Lake State Recreation Area (TLSRA) (RM 42.6) during March, April, and October 2010 (Figure 2). Artificial, barbless lures or flies were used to minimize potential injury or mortality. All fish captured were placed in 38-53 L perforated containers in the river while equipment was prepared to collect biological data and for tagging if the fish was of suitable size. Prior to collection of biological data, all fish were anesthetized in a separate 53 L container using a solution of 80-90 mg/L triclanemethanesulfonate in water buffered with an equal concentration of sodium bicarbonate.

Once anesthetized, fish were identified to species, fork length was measured to the nearest millimeter and weight was measured to the nearest gram. Non-biological data recorded for each fish included time and location (GPS coordinates) of capture, habitat type at capture site, photos, and other general

conditions (i.e., weather conditions, substrate type, water temperature, turbidity, conductivity, and dissolved oxygen). Habitat unit designations were based on mapping conducted by Stillwater Sciences (2009) for the 2009 *O. mykiss* population surveys. Fish not selected for tagging were released immediately after necessary data was collected and they had recovered from anesthesia.

Tagging *O. mykiss*

HTI X-type acoustic transmitters were used for this study. These tags operate at 307 kHz and were programmed with tag periods ranging from 7000 to 7300 milliseconds using an HTI model 490-LP tag programmer. The separation between tag codes was 14 milliseconds. Healthy adult *O. mykiss* of suitable size were immediately tagged. The maximum permitted tag weight to body weight ratio of 3.5% was generally expected to correspond to adult *O. mykiss* greater than approximately 350 mm (14 in). However, in consultation with CDFG, the maximum tag weight to body weight ratio was increased to 4% after the first two days of sampling which corresponded to adult *O. mykiss* greater than approximately 300 mm (12 in). All fish were tagged at a mobile tagging station, which allowed all tagging to be completed near the original capture location.

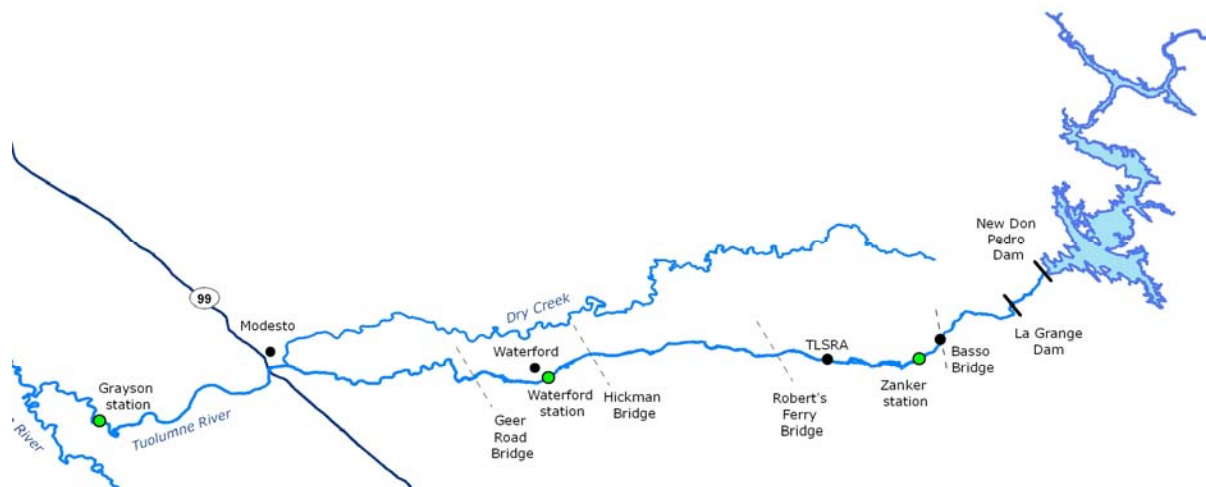


Figure 2. Map of the 2010 adult *O. mykiss* study area on the Tuolumne River.

Fish were surgically implanted with acoustic transmitters according to implantation procedures outlined in Adams et al. 1998 and Martinelli et al. 1998. A ventral incision approximately 20 mm long was made anterior to the apex of the pelvic girdle. The tag was inserted into the peritoneal cavity and the incision was closed with three interrupted sutures. Typical surgery times were less than four minutes. Fish were then placed into perforated holding containers in the river to recover from anesthesia. Fish were allowed to recover for 10-15 minutes before the container was turned on its side allowing for volitional release. Function of the tag was confirmed using an HTI model 492 acoustic tag detector prior to tag insertion and again during the recovery period.

Tracking *O. mykiss*

Fixed station acoustic arrays were installed near Basso Bridge (RM 47.5), the Waterford rotary screw trap site (RM 29.8), and the Grayson Rotary Screw Trap site (RM 5.2; Figure 2). Each array consisted of an acoustic tag datalogger (HTI Model 295G) attached to an omnidirectional hydrophone (HTI Model 590). The system was powered by a 12 volt deep cycle battery charged by a 3 ft by 5 ft solar panel (216 watt, 36 volt). These arrays were installed prior to the release of tagged fish, and were operational by February 18, 2010. A beacon tag was deployed at each site to continually document that the array was functioning properly and could detect passing tags. Data were downloaded and reviewed once per week, at minimum, to confirm proper function of the arrays, and to limit potential data loss in case of equipment failure or vandalism.

Mobile tracking was conducted by a raft outfitted with an HTI Model 295G datalogger with GPS tracking capabilities. Mobile tracking surveys consisted of actively searching for tagged fish to determine their specific locations, including macro or micro-habitat usage. The timing, frequency and location of mobile surveys were dependent on environmental conditions and detection data from fixed stations and mobile tracking. Mobile tracking surveys were also conducted within 10 days of each tagging event to confirm the location and proper function of each tagged fish.

Data recorded for each fish detected during mobile tracking included, tag code, time of detection, location of detection (GPS coordinates), surface water temperature at the hydrophone, and macro habitat unit type. Micro-habitat usage (e.g. depth, substrate, association with features such as undercut bank, woody debris, large boulder, etc.) was also evaluated by using signal strength to more precisely estimate the location of each fish. In some cases, after the general location of tagged fish was determined, snorkel and underwater video techniques were used to document fish location within the habitat unit, general behavior (spawning activity), and condition.

River conditions

Provisional daily average flow data for the Tuolumne River at La Grange was obtained from USGS at http://waterdata.usgs.gov/ca/nwis/uv/?site_no=11289650&agency_cd=USGS. Water temperature data were also obtained from hourly recording Hobo Pro v2 water temperature data loggers (Onset Computer Corporation) maintained by the Districts at five sites from below La Grange Dam (RM 51.8) to just above TLSRA (RM 42.9). At the time of this report, temperature data are available through September 27, 2010.

Results

Capturing study fish

During the spring period, FISHBIO staff conducted hook-and-line sampling on five days between March 23 and April 7, 2010 from La Grange (RM 50.5) to TLSRA (RM 42.6). Flows during this period ranged between 225 cfs and 650 cfs. A total of 17 *O. mykiss* were captured, with fork lengths ranging from 225-505 mm and weights ranging from 135->600 g (Appendix A).

The fall sampling period occurred over five days from October 15 to 28, 2010. Flows during this period ranged between 350 cfs and 550 cfs. A total of 25 *O. mykiss* were captured, forklenghts ranged between 190 mm and 540 mm and weights ranging from 77-1619 g (Appendix A).

Of the 42 *O. mykiss* captured, 19 did not meet minimum size requirements and two were rejected for other reasons. One of the rejected fish had an old hook lodged deep in its throat, and the other had already been tagged. None of the *O. mykiss* captured were adipose fin clipped.

During the fall sampling period, five Chinook salmon smolts were incidentally captured, with fork lengths ranging from 116-170 mm. Chinook salmon were not captured during the spring sampling. Non-salmonid species incidentally captured during hook and line sampling included Hardhead and Striped bass (Table 1).

Table 1. Number of *O. mykiss* captured and tagged, and incidental species captured during 2010.

Survey Date	Reach	<i>O. mykiss</i> captured	<i>O. mykiss</i> tagged	Incidental capture		
				CHN	HH	STB
3/23	La Grange	3	3			
3/24	Basso	7	0			
3/29	Basso	3	3		1	
4/6	La Grange	0	0			
4/7	Basso	4	0			
10/15	La Grange	4	1	3		
10/19	Basso	9	4	2		1
10/20	La Grange	5	3			
10/27	Basso	3	2			
10/28	La Grange	4	4			

Species codes: CHN- Chinook salmon, HH- Hardhead, STB- Striped bass

Tagging *O. mykiss*

A total of 20 adult *O. mykiss* were successfully implanted with HTI X-type tags over two discrete periods during the spring and fall 2010 (Table 2). Tagged fish body weight ranged from 313 to 1,619 g (314 - 540 mm forklenght). Average tag weight was 12.58 g (11.95 g to 13.35 g), and the average tag to body weight ratio was 2.2% (0.74% to 3.8%). The average surgery time (time that fish were removed from anesthesia until returned to fresh water) was 3 minutes 28 seconds, and average recovery time was 10.62 minutes (8.5 to 13.8 minutes). After recovery all fish were released in good condition at their original point of capture. One fish did not properly recover from tagging and, in compliance with permitting requirements, was sacrificed and provided to CDFG La Grange.

On March 23, two males (425 and 450 mm), and a post-spawn female (505 mm) were tagged between La Grange and Basso (Figure 3). On March 29, three female fish (353 -368 mm) were tagged between Basso and TLSRA (Figure 4). During the fall period, eight tagged fish (314 – 502 mm) were captured between La Grange and Basso (Figure 3), and six (320 – 463 mm) were captured between Basso and TLSRA (Figure 4).

Table 2. Date, location, and biological data for all *O. mykiss* tagged during 2010.

Capture Date	River Mile	Length (mm)	Weight (g)	Sex	Tag Code	Tag/Body Ratio	Habitat Unit	Habitat Type
3/23	50.0	425	>600	M	7054.8	<2.3%	023	Run Head
3/23	50.0	450	>600	M	7068.8	<2.2%	023	Run Head
3/23	49.2	505	>600	F	7012.8	<2.2%	033	Riffle
3/29	47.0	368	479	F	7110.8	2.8%	058	Run Head
3/29	45.0	360	395	F	7194.8	3.2%	086	Pool Head
3/29	45.0	353	396	F	7124.8	3.3%	086	Pool Head
10/15	51.6	314	313	unknown	7138.8	3.8%	005	Pool
10/19	47.0	463	1128	F	7026.8	1.2%	058	Run Head
10/19	46.0	370	508	unknown	7222.8	2.4%	067	Run
10/19	45.0	360	552	unknown	7208.8	2.2%	086	Pool
10/19	44.2	382	650	F	7166.8	1.9%	103	Run
10/20	52.1	350	520	unknown	7236.8	2.3%	--	Run
10/20	50.0	400	908	F	7040.8	1.4%	023	Run Head
10/20	49.3	360	492	unknown	7250.8	2.5%	031	Run
10/27	46.8	320	420	M	7264.8	2.8%	066	Run Head
10/27	46.8	350	477	F	7320.8	2.5%	066	Run Head
10/28	52.1	502	1207	M	7292.8	1.1%	--	Run
10/28	51.4	450	887	M	7152.8	1.4%	008	Run Head
10/28	49.2	380	690	F	7180.8	1.7%	033	Riffle
10/28	49.2	540	1619	F	7278.8	0.7%	033	Riffle

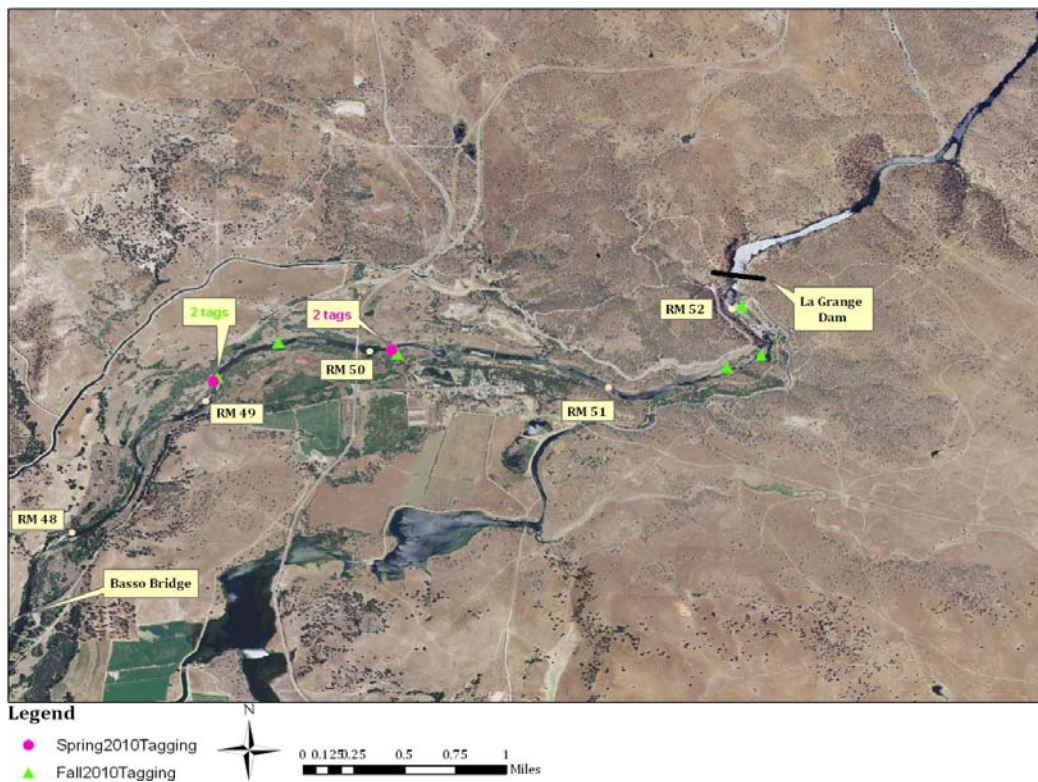


Figure 3. Release locations of tagged *O. mykiss* between La Grange Dam and Basso Bridge.

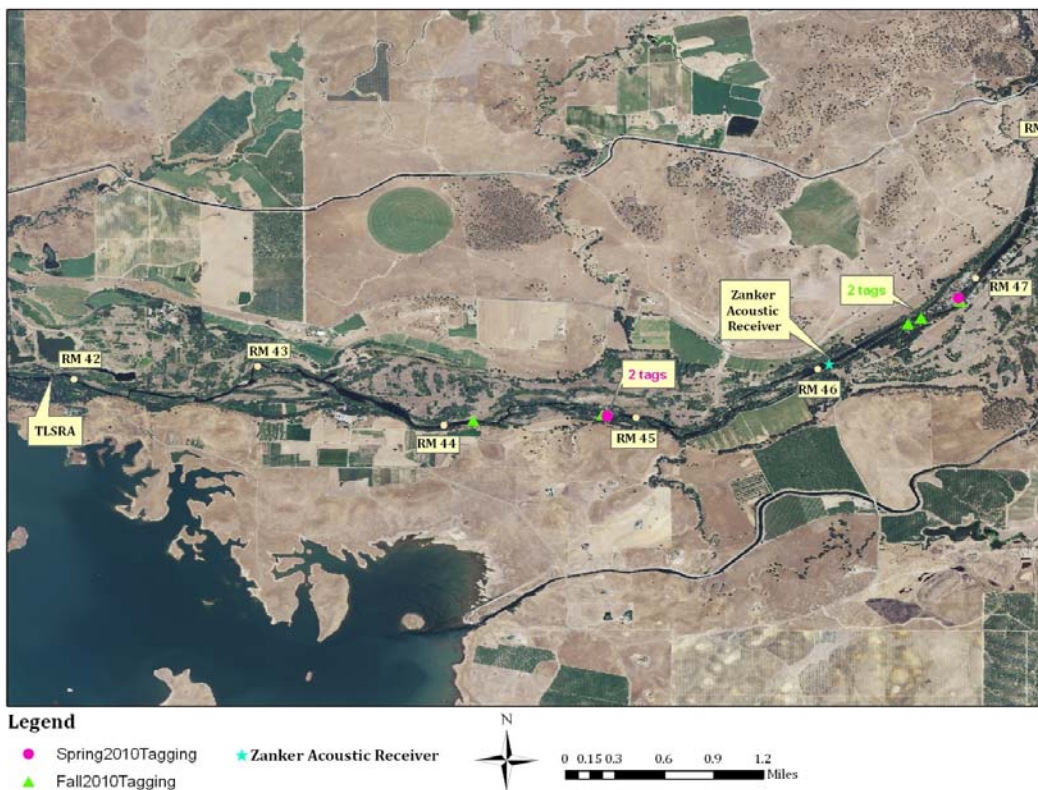


Figure 4. Release locations of tagged *O. mykiss* from Basso Bridge to TLSRA.

Fixed station monitoring

Two acoustic tagged fish were detected at fixed station arrays. Tag 7110.8 was released 1,200 m upstream of the Zanker fixed station array. This fish was detected 260- 425 m downstream of the release location between April 1 and July 27 through mobile tracking. This fish was next detected at the Zanker receiver between August 18 at 19:50 and September 10 at 11:28. The multiple detections in this area indicate that this fish was not migrating downstream, but rather utilizing the pool habitat where the receiver is located.

The other acoustically tagged fish detected by a fixed station array was not associated with this study. The tag (6192.6) was detected passing the Grayson receiver on May 15, 2010 at 15:24 hours. This tag was implanted in a yearling *O. mykiss* from the Mokelumne River Hatchery, and was released downstream in Old River on April 16, 2010 as part of a Department of Water Resources (DWR) South Delta Temporary Barriers study (Kevin Clark, DWR, personal communication). At the time of release, this fish measured 265 mm and weighed 194.4 g.

Mobile tracking

A total of 10 mobile tracking surveys were conducted between April 1 and November 1, 2010 (Table 3). Mobile tracking was limited to the reach between La Grange Dam and TLSRA, as no fish tagged for this study were detected moving past the Waterford or Grayson fixed receivers. The locations of all 20 tagged fish were confirmed within a few days after tagging, and movements of the six adult *O. mykiss* tagged during the spring were tracked from early spring through fall. Flows during this period ranged between 300 cfs and 5,520 cfs (Figure 5). Average daily water temperature near La Grange Dam (RM 51.8) ranged from 9.9- 12.1° C, while the temperature near TLSRA (RM 42.9) ranged from 9.8- 15.8° C during the study period (Figure 6).

Each of the six tagged *O. mykiss* tracked from early spring through fall exhibited both upstream and downstream movement. The distance between the most downstream detection and most upstream detection for each fish ranged from 145 m to 5,715 m, with four of the six fish covering a range of approximately 600 m to 1,000 m (Table 3).

The expected life of the HTI X-tags was approximately 300 days, but mobile tracking data suggested that of five of the six tags released during the spring expired within 219 days. As of November 1, one tag was still functioning. Tag life was likely reduced by the cool temperatures in the study reach. The tags used during the fall tagging period are LX-type tags, which feature an updated processor that is expected to increase the life of these tags.

Table 3. Distance between mobile tracking detections by survey date (upstream(+), downstream(-), not detected(ND)).

Tag ID	Distance Between Detections (m)										Total Range
	1-Apr	26-Apr	20-May	15-Jun	7-Jul	27-Jul	9-Sep	27-Sep	20-Oct	1-Nov	
7012.8	+30	-130	-30	+30	+560	ND	ND	ND	ND	ND	590
7054.8	-635	+20	+570	-145	-270	ND	-185	-10	ND	ND	645
7068.8	-2590	+30	-95	-85	+65	+2575	ND	+3075	-3855	-410	5715
7110.8	-260	-165	+30	ND	+50	-45	-585	ND	ND	ND	975
7124.8	-15	0	-80	ND	-35	-15	+120	ND	ND	ND	145
7194.8	-20	0	+620	-10	-640	+5	+195	ND	ND	ND	650

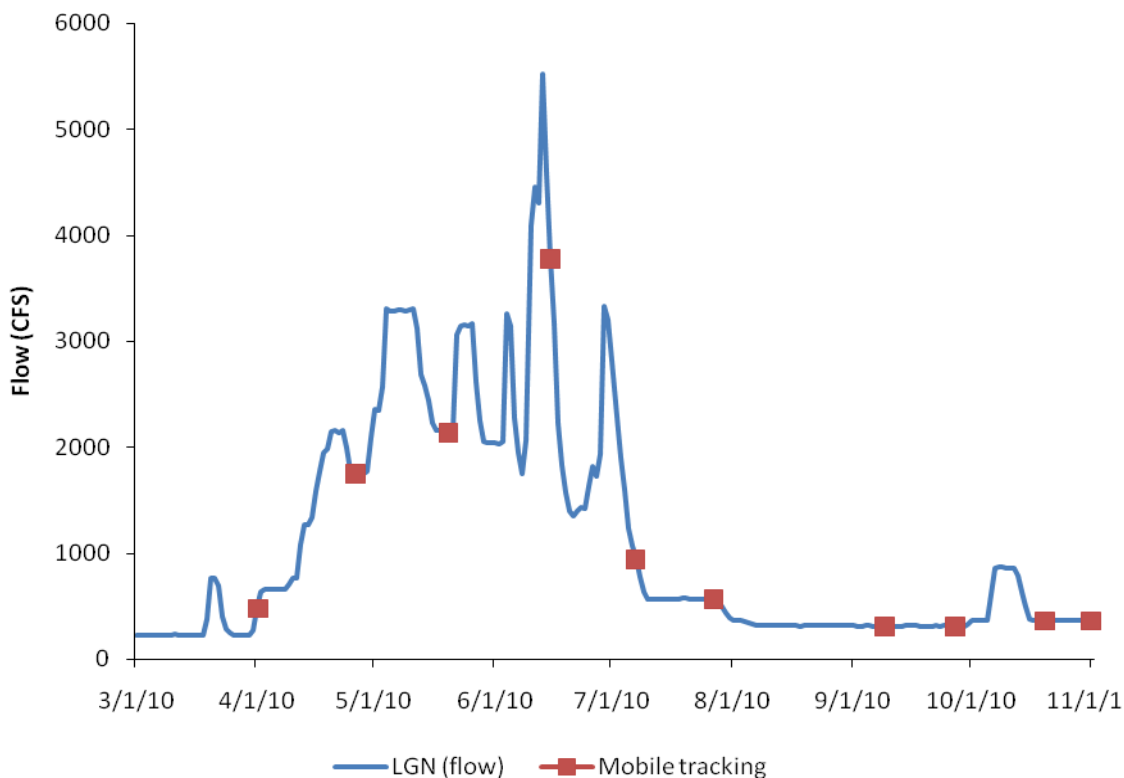


Figure 5. Tuolumne River flow at La Grange (LGN) and dates of mobile tracking surveys.

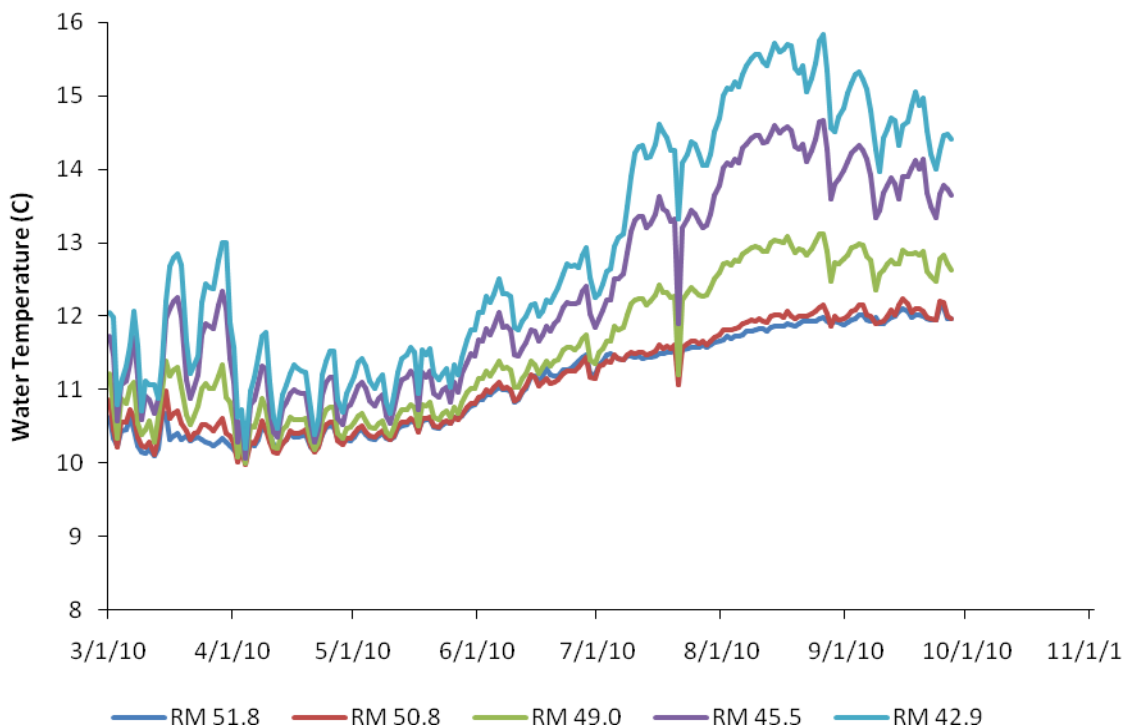


Figure 6. Tuolumne River average daily water temperatures between La Grange Dam and TLSRA.

Tag 7012.8 was implanted in an adult *O. mykiss* captured in habitat unit NSO 033 at RM 49.2 on March 23. During all mobile tracking surveys conducted between April 1 and June 15, this tag was detected within 130 m of the original release location. On July 7, this tag was detected 460 m upstream of the original location, but was not detected during any of the subsequent mobile tracking surveys. However, during hook and line sampling on October 20, an adult *O. mykiss* of similar size and with a surgery scar and a single suture still intact, was captured near the original capture location of 7012.8. The identity of the fish could not be confirmed since a signal was not detected. It is believed that the tag died sometime after July 7 when it was last detected, and there were no indications that the tag had been expelled from the fish. Also, had the tag been expelled, it would have still likely been detected during mobile tracking surveys.

Tag 7054.8 was implanted in an adult *O. mykiss* captured in the run directly upstream of the HWY 59 bridge (NSO 024) on March 23. This tag was detected 635 m downstream of the original capture location on April 1. During April and May it was detected moving back upstream towards the original capture location before moving downstream during June through September, returning to the approximate location where it was detected on April 1.

Tag 7068.8 was implanted in an adult *O. mykiss* captured in the run directly upstream of the HWY 59 bridge (NSO 024) on March 23, and this fish exhibited the longest range of movement. Tag 7068.8 was detected 2,590 m downstream on April 1, and was detected within 30 m upstream and 150 m downstream of this location from April 26 through July 7. On July 27, this tag was found to have returned upstream to the habitat unit where the fish was originally captured. This fish continued to move upstream and was detected directly below the La Grange powerhouse on September 27. During the October and November surveys, this fish was again detected moving downstream and was found 880 m and 1,290 m below the original capture location.

Tag 7110.8 was implanted in an adult *O. mykiss* captured in the run below Basso Bridge (NSO 059) on March 29. Between April 1 and July 27, this tag was detected in a riffle/run sequence (NSO 065-066) located 260 to 425 m downstream of the initial point of capture. On September 9, this tag was detected in a run habitat unit approximately 400 m downstream (NSO 067) of the lower boundary of the riffle/run sequence (NSO 065-066).

Tag 7124.8 was implanted in a female adult *O. mykiss* captured in the pool at NSO 087 on March 29, and this fish exhibited the shortest range of movement. On April 1 and 27, this tag was detected within this same pool (NSO 87). Between May 20 and July 27 this tag was detected in a riffle (NSO 089) 95 to 145 m downstream of the point of capture. On September 9, this tag was detected back in the pool where it was originally captured.

Tag 7194.8 was implanted in a female adult *O. mykiss* captured in the pool at NSO 087 on March 29. On April 1 and 27, this tag was detected within this same pool (NSO 87). On May 20 and June 15 this tag was detected approximately 600 m upstream in another pool directly below the mouth of Peaslee Creek (NSO 081). By July 7 this fish had returned to the pool where it was originally captured (NSO 87), and remained here through at least July 27. On September 9, the tag was detected in a run (NSO 083) approximately 200 m upstream.

Discussion

Spawning locations of tagged adult *O. mykiss*

Peak spawning activity likely occurs during January through March (McEwan 1996), and initiation of this study was delayed until March 2010 due to permitting issues, which precluded the opportunity to determine spawning locations of tagged *O. mykiss* during winter 2010. However, possible *O. mykiss* redds were identified in riffle NSO 033, and a large female *O. mykiss*, which appeared to have recently spawned, was captured nearby in the same unit suggesting that it may have spawned at this location.

Adult *O. mykiss* tagged during fall 2010 will be tracked during the expected winter spawning period (January-March 2011). It is recommended that tagging should occur during fall 2011 to ensure adequate tag life (estimated at 6-12 months) for tracking through the expected spawning period during January-March 2012, to avoid tagging ripe individuals, and to provide adequate recovery time prior to the expected spawning period.

Use of restored river reaches by tagged adult *O. mykiss*

During 2010, adult *O. mykiss* were not captured or detected in restored reaches of the Tuolumne River. However, two fish were captured and tagged (tags 7054.8 and 7068.8) just downstream of the CDFG gravel introduction riffle 1A/1B (NSO 18-22) in a unit identified as sensitive *O. mykiss* habitat (McBain&Trush 2004). While these fish were not detected within the restoration reach, they were repeatedly detected in the same location, and may have been attracted to this area by features associated with the restored habitat such as increased invertebrate production.

A total of 47 sites have been identified as sensitive *O. mykiss* habitat between La Grange Dam and Roberts Ferry Bridge (McBain&Trush 2004), and 85% of the adult *O. mykiss* tagged during 2010 were detected in these locations. However, adult *O. mykiss* were only detected in 19% (n=8) of the sensitive habitat sites surveyed.

Migration patterns of tagged adult *O. mykiss*

During 2010, movements of six tagged adult *O. mykiss* were tracked from early spring through fall under highly varying flow conditions due to flood control operations. Each of the six tagged *O. mykiss* tracked from early spring through fall exhibited both upstream and downstream movements, with no apparent correlations to flow or water temperature. However, conclusions are limited by the small sample size and highly variable instream conditions during the study period. All tagged *O. mykiss* remained in the Tuolumne River during the 2010 monitoring period.

Operation of fixed station acoustic arrays also provided information on straying of hatchery produced *O. mykiss* into the Tuolumne River. An acoustically tagged Mokelumne River Hatchery produced yearling *O. mykiss* released in Old River as part of DWR's South Delta Barriers Study was detected in the Tuolumne River at Grayson, and another five tagged *O. mykiss* from the same study releases were detected entering the Stanislaus River, indicating that at least 2% of the fish released strayed into the San Joaquin Basin tributaries. Straying of hatchery produced *O. mykiss* has also been documented at the Stanislaus River Weir.

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Appendix A. Date, location, and biological data for all *O. mykiss* captured during 2010.

Capture Date	Reach	Length (mm)	Weight (grams)	Sex	Tagged (Y/N)	Tag Code	Tag/Body Ratio
3/23	La Grange	425	>600	M	Y	7054.8	< 2.3%
3/23	La Grange	450	>600	M	Y	7068.8	<2.2%
3/23	La Grange	505	>600	F	Y	7012.8	<2.2%
3/24	Basso	293	306.4	unknown	N		
3/24	Basso	272	249.0	unknown	N		
3/24	Basso	271	222.8	unknown	N		
3/24	Basso	310	335.0	unknown	N		
3/24	Basso	282	263.0	unknown	N		
3/24	Basso	225	134.6	unknown	N		
3/24	Basso	293	--	unknown	N		
3/29	Basso	368	479.0	F	Y	7110.8	2.8%
3/29	Basso	360	395.0	F	Y	7194.8	3.2%
3/29	Basso	353	395.7	F	Y	7124.8	3.3%
4/7	Basso	310	215.2	unknown	N		
4/7	Basso	307	216.0	unknown	N		
4/7	Basso	283	--	unknown	N		
4/7	Basso	290	--	unknown	N		
10/15	La Grange	257	194.5	unknown	N		
10/15	La Grange	314	313.0	unknown	Y	7138.8	3.8%
10/15	La Grange	230	140	unknown	N		
10/15	La Grange	218	99.6	unknown	N		
10/19	Basso	463	1128.0	F	Y	7026.8	1.2%
10/19 ^a	Basso	375	553.0	unknown	N		
10/19	Basso	370	508.0	unknown	Y	7222.8	2.4%
10/19	Basso	190	77.1	unknown	N		
10/19	Basso	360	552.0	unknown	Y	7208.8	2.2%
10/19	Basso	382	650.0	F	Y	7166.8	1.9%
10/19	Basso	210	101.4	unknown	N		
10/19	Basso	195	79.4	unknown	N		
10/19	Basso	200	87.8	unknown	N		
10/20	La Grange	350	520.0	unknown	Y	7236.8	2.3%
10/20	La Grange	400	908.0	F	Y	7040.8	1.4%
10/20	La Grange	360	492.0	unknown	Y	7250.8	2.5%
10/20 ^b	La Grange	497	1224.0	F	N		
10/20	La Grange	390	716.0	unknown	N		
10/27	Basso	320	420.0	M	Y	7264.8	2.8%
10/27	Basso	350	477.0	F	Y	7320.8	2.5%
10/27	Basso	210	109	unknown	N		
10/28	La Grange	502	1207	M	Y	7292.8	1.1%
10/28	La Grange	450	887	M	Y	7152.8	1.4%
10/28	La Grange	380	690	F	Y	7180.8	1.7%
10/28	La Grange	540	1619	F	Y	7278.8	0.7%

^aFish did not recover from surgery, sacrificed and given to CDFG.

^bRecapture of tag code 7012.8, tag was no longer active.