

Scott River Adult Coho Spawning Ground Surveys 2012-2013 Season



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Abstract

Adult coho salmon spawning ground surveys were conducted between November 20th, 2012 and January 10th, 2013. During the survey a total of six (6) adult coho salmon carcasses and 24 redds were observed. Spawning was observed in a total of six tributary locations including the South Fork Scott River, Sugar Creek, French Creek, Miners Creek, Shackleford Creek and Mill Creek. No spawning was documented in Patterson Creek, but a live coho was observed in the upper reach. These locations are the same reaches where coho salmon have been observed spawning in previous surveys of this brood year, and have always been observed in the other brood years. Preliminary data from the California Department of Fish and Game (CDFG) video weir showed a total of 201 adult coho passing through the video weir, although it should be noted that this number is likely incomplete as the counting weir washed out on November 29th, 2013.

The 2012 Water Year was a Dry water year type and was followed after October 1st by below normal precipitation until late November. Flow conditions were low during the early portion of the survey season; two water lease transactions implemented by the Scott River Water Trust on Oct. 1st assisted with moving salmon over the Scott Valley Irrigation District Diversion at Young's Dam (RM 47). However, despite the leasing of 11 cfs of stockwater at Farmer's Ditch at RM 54, the tailings were not reconnected until rains began on November 20th, 2012. This disconnection delayed salmon access to Sugar Creek, the South Fork and the East Fork until that date. These low flow conditions also appear to have delayed or prevented coho salmon from passing the alluvial reaches of Kidder Creek and Etna Creek. No spawning was documented in these tributaries, although it should be noted that unsurveyed reaches in Big Slough area and lower Etna Creek may have had spawning.

Acknowledgements

The following entities cooperated in the survey effort this year:

California Dept. of Fish and Game (changed to CA Dept. of Fish & Wildlife in 2013)

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Scott River Water Trust (via NOAA grant)

Siskiyou Resource Conservation District

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United States Forest Service

Scott Valley Landowners

Northern California Resource Center

The following individuals provided assistance in the spawning ground survey effort:

Donald Flickinger- NOAA Fisheries

Parker Flickinger-Volunteer

Preston Harris-Siskiyou RCD

Matt Hatcher-Quartz Valley Indian Reservation

Sara Hayden-Northern California Resource Center

Kacey Munson-Siskiyou RCD

Julia Schreiber-Northern California Resource Center

Jennifer Silveira-Volunteer

Peter Thamer-Siskiyou RCD

Introduction

The Southern Oregon Northern California Coastal (SONCC) coho salmon (*Oncorhynchus kisutch*) are endemic to the Scott River system, though little was known about their population and distribution until recent studies. In the Klamath River Basin, the Southern Oregon-Northern California Coast coho salmon evolutionarily significant unit (ESU) were federally listed as threatened by the National Marine Fisheries Service in 1997. In 2001, the State of California began considering a listing of the species as threatened, and in August of 2004, the California Fish and Game Commission acted to add the coho to the list of endangered and threatened species. The listing became effective March 30th, 2005.

Adult coho spawning ground surveys have been performed annually in the Scott River Watershed since the winter of 2001 when the Klamath National Forest triggered the initial project in anticipation of an exceptional coho run (Maurer 2002). These surveys began as a cooperative effort among local landowners, agencies, and concerned volunteers. At that time it was recognized that baseline population and distribution data were needed in order to implement and assess effective restoration efforts.

In addition to spawning ground surveys, the California Department of Fish and Wildlife (formerly Fish and Game) installed an adult video weir at River Mile 18 in 2007. The video weir provides escapement numbers for the Scott Valley. The escapement estimates provided by the video weir are a good complement to the distribution data collected during the spawning ground surveys.

The past twelve years of population and distribution data have shown that adult returns to the Scott River have ranged from 62 to 1,622 adults and 7 to 728 redds documented. However, the Spawning Ground Surveys do not cover all potential spawning habitat and it is likely that actual redd numbers are higher. Similar to the rest of the SONCC, the Scott River has one stronger brood year and two weaker brood years.

Information on spawning distribution collected during the annual surveys has been utilized to plan and prioritize restoration and protection activities, and used by the Scott River Water Trust to prioritize water lease transactions.

The Scott River Water Trust (Water Trust) is a nonprofit organization that seeks to voluntarily increase stream flow in critical stream reaches to improve conditions for rearing salmonids including SONCC coho salmon. Information gathered during this effort helps to inform the Water Trust on the locations where SONCC coho salmon spawn and are therefore likely to rear during the summer. The Water Trust can then target those locations that are likely to be negatively affected by low flow conditions through voluntary leases of water from

current water right holders to improve rearing conditions for salmonids. In addition, information collected during these surveys can help identify potential habitat restoration projects for the Siskiyou Resource Conservation District (RCD) private and public landowners and cooperators.

Project Objectives

- 1.) Document the presence of coho salmon within the historic range of distribution.
- 2.) Survey “Index Reaches”, as delineated in the 2001-2002 survey, once per week, or as survey conditions (e.g. flow) allow.
- 3.) Document distribution of adult coho spawning by brood year. Document the upper extent of spawning in each tributary where coho salmon are observed.
- 4.) Determine the run timing and duration of adult coho spawning in the Scott River system.
- 5.) Collect one set of tissue samples for DNA analysis to understand the genetic relationship of the Scott River coho salmon to other stocks and collect a set of scale samples to better understand the life history of the Scott River coho salmon. The tissue and scale samples will be submitted to CDFG. In addition, otoliths are to be collected for life history analysis, and submitted to CDFG.
- 6.) Through the identification of 2012-2013 coho spawning areas, inform the Scott River Water Trust of the potential locations where coho juveniles may be found to help prioritize water lease locations for the 2013 summer.
- 7.) Identify Key reaches utilized annually by coho salmon for restoration and enhancement activities.

BACKGROUND

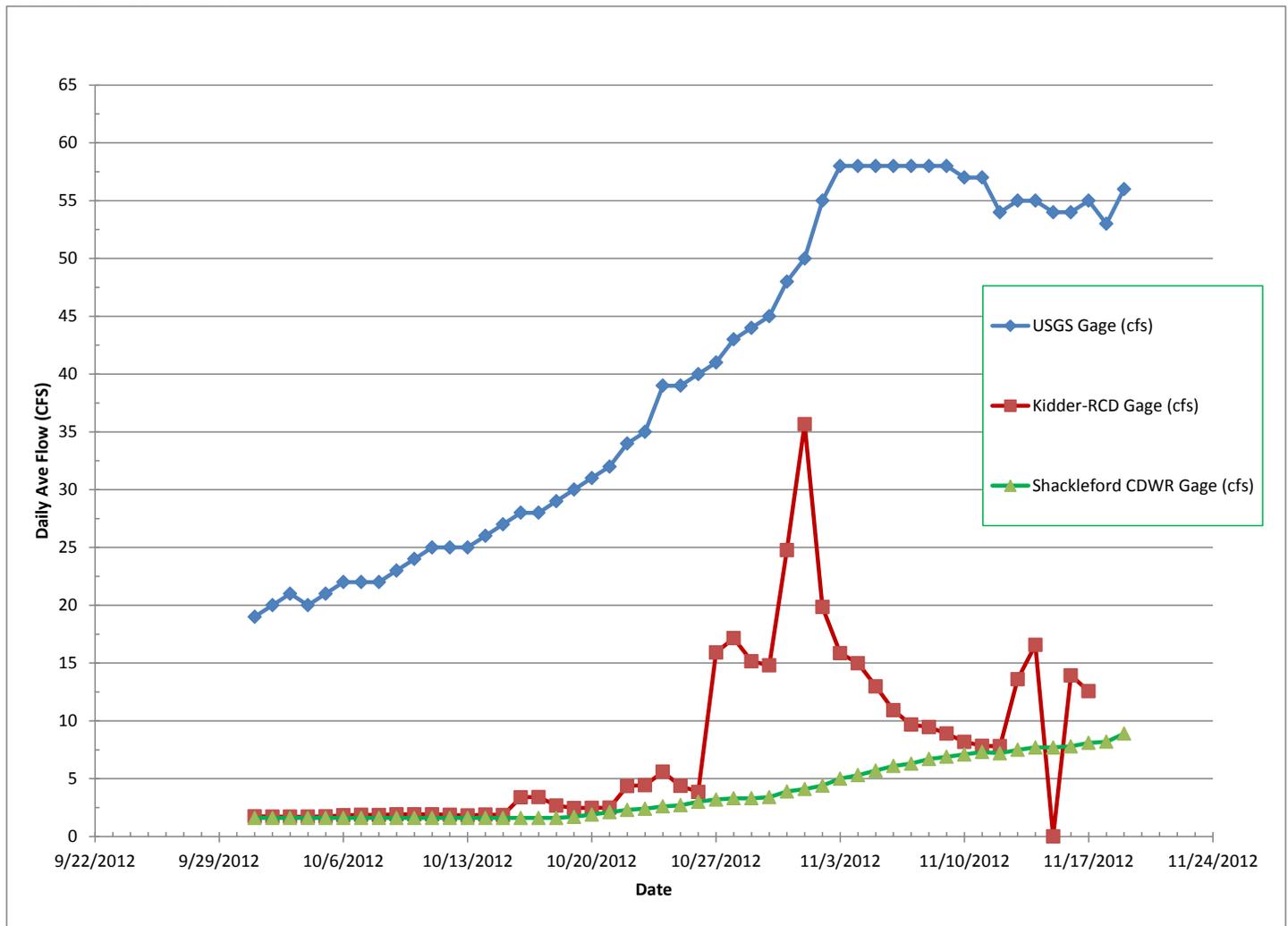


Figure I. Fall Flows in the Scott River and tributaries during the early survey period prior to the heavy rains and flooding that began on November 20th. All data preliminary. CDWR data can be found at <http://www.water.ca.gov/waterdatalibrary/docs/Hydstra/index.cfm?site=F25484&source=map>. NOTE that beaver activity at the gage site during the low flow period results in artificial high readings on the Shackleford Creek Gage.

The 2012 Water Year was a Dry water year type (based on rainfall and snow levels) and was followed after October 1st by below normal precipitation until late November. The RCD rain gage on Kidder Creek recorded 0.47 inches of rain on 10/22/12 and 0.94 inches of rain on October 31st/Nov 1, which explains the increased flow during those time periods. Shackleford Creek also received 1.07 inches of rainfall on 10/22/12 and xxxx? October 31st. However, the CDWR gage on Shackleford Creek is below all diversions. The Shackleford Creek Decree allows for agricultural diversions through October 31st, and stockwater after that, which amount to 4-6 cfs (based on past Watermaster records (Sari Sommarstrom, pers. comm.).

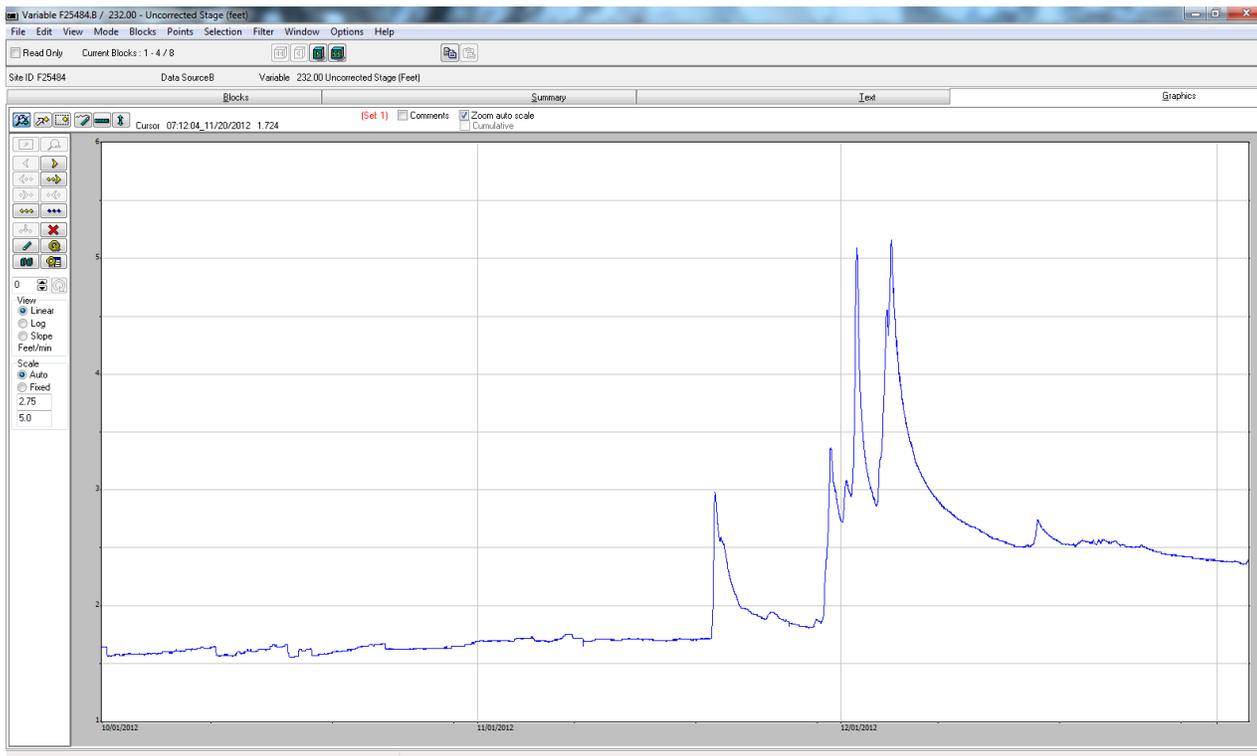


Figure II. Preliminary stage data for Shackleford Creek October 1 – November 20th, 2012. CDWR observed Shackleford Creek connected on November 20th, 2012, at approximately 150 cfs. (Joe Scott, pers. Communication)

Coho Population Expectations:

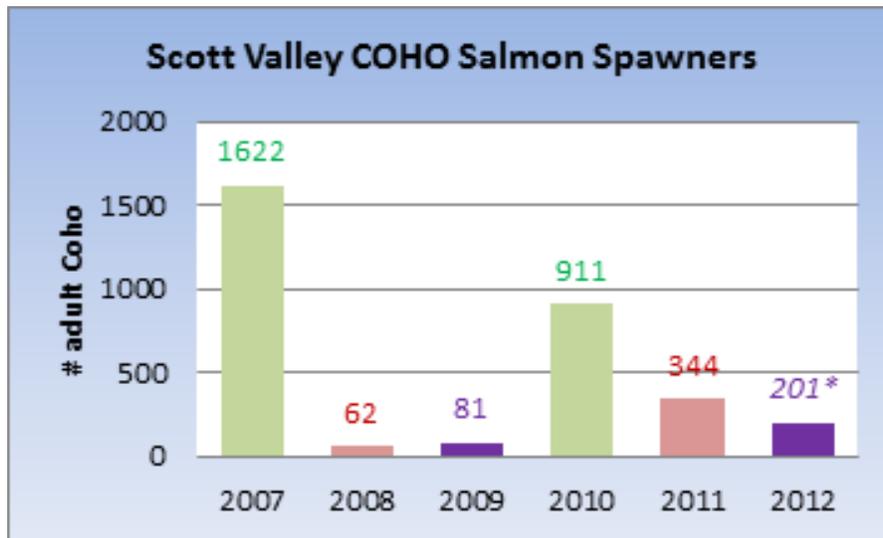
Coho Salmon Populations in the SONCC show a trend of two “weak” brood years and one relatively stronger brood year. Coho salmon populations in the Scott River Watershed show this trend as well. (NOAA 2012) Redd counts collected during spawning ground surveys since 2001 show this trend. The brood year documented in 2001 and forward is considered the “stronger” brood year. The 2012-2013 coho brood year is one of the “weak” brood years in the Scott River. Table I. shows redd counts for all years since they were implemented in 2001 and live counts through the video weir operated by the California Department of Fish and Wildlife.

Table I. Coho observations for the all Brood Years.

Year	Total Redds	Total Live through Video Weir.
2001*	211	ND
2002*	17	ND
2003	7	ND
2004	728	ND
2005	30	ND
2006	12	ND
2007	250	1622
2008	24	62
2009	6	81
2010	160	911

2011	26	344
2012	24	191

*Survey reaches were expanded (more distance added) in 2003 so 2001 and 2002 data are not directly comparable.



*data only until 11/28 when weir washed out

Figure III. Total Adult Coho Count through the CDFW video weir at River Mile 18, for the period of record 2007-2012.

METHODS

Project Location

The 2012-2013 survey effort took place in the Scott River Watershed, a sub-basin of the Klamath River Basin. The Scott River is located in Siskiyou County, CA. The legal description of the mouth of the Scott River is T45N R10W Sec 6.

Crew training –

Crew training was organized by California Dept. of Fish and Game (CDFG) and the Siskiyou RCD. Training was held on November 14th, 2012 at the Siskiyou RCD office. Training included: Fish ID, tissue and scale sampling techniques, identification of marks and tags that have been applied throughout the Klamath Basin, GPS use and naming conventions, data sheets, and redd identification. See **Appendix A. Training Materials**.

All Siskiyou RCD field crew members participated in the Annual Adult Chinook Spawning Ground Surveys & training provided by CDFG, so they were already familiar with the basics of fish ID and Redd surveys. A landowner volunteer was also present for the training and walked several surveys with the RCD.

Spawning Ground and Carcass Surveys

Stream surveys were completed by a two person field crew. A stream survey is completed by walking instream, or on the bank (to avoid disturbing redds) beginning upstream and moving downstream. Crew members walk on opposite sides of the stream, looking for redds and fish. The location of any fish, redd, or carcasses was recorded by GPS, and noted on the data sheet. In addition, flagging marked with the date was hung at each redd so inform subsequent survey crews that this redd location had already been sampled. This strategy reduced the potential for double counting redds over the duration of the survey.

Tissue, otolith and scale samples were taken from all carcasses, and the species, sex, fork length, and any marking recorded on the data sheet.

During redd surveys, the following data was collected from redds, if it did not disturb the spawning fish: redd length, width, pot depth, and substrate composition. Substrate composition categories are: Sand (<.2 cm), small gravel (2-5 cm), large gravel (6-9 cm), small cobble (10-13 cm), and large cobble (> 13 cm).

See **Appendix A** for sample datasheets.

Survey Locations

Adult coho spawning ground surveys were completed in the Tributaries: South Fork Scott, Sugar Creek, French-Miners Creek, Etna Creek, Patterson Creek, Kidder Creek, Shackelford-Mill Creek, Kelsey Creek, Canyon Creek, and Tompkins Creek. Some reaches of these streams were not surveyed during the season due to low flow conditions, or a lack of legal access: Lower South Fork, and Upper Etna, Middle Kidder, Upper Shackelford, Mill Creek. Streams not surveyed in 2012-2013 include: East Fork Scott River, Moffett Creek, Indian Creek, Patterson Creek (Fort Jones), Rattlesnake Creek, Scott Bar-Mill, , Wildcat Creek, Rail Creek and Kangaroo Creek.

Table II. Survey Reach Descriptions depicts all stream reaches surveyed since 2001, and indicates which reaches were surveyed in 2012-2013, by whom, the number of surveys, and the total miles surveyed. Reaches were surveyed a minimum of once, and reaches designated as index reaches in 2001 were attempted to be surveyed weekly, when flow conditions allowed. Reaches designated in the past as Index Reaches are: Upper South Fork, Lower Shackelford/Mill, Lower Mill, Middle Patterson, Lower and Middle French, Miners, Lower and Upper Sugar, and the Mainstem Tailings. See **Map 1** for a depiction of reaches surveyed in 2012-2013.

Table II. Survey Reaches 2012-2013

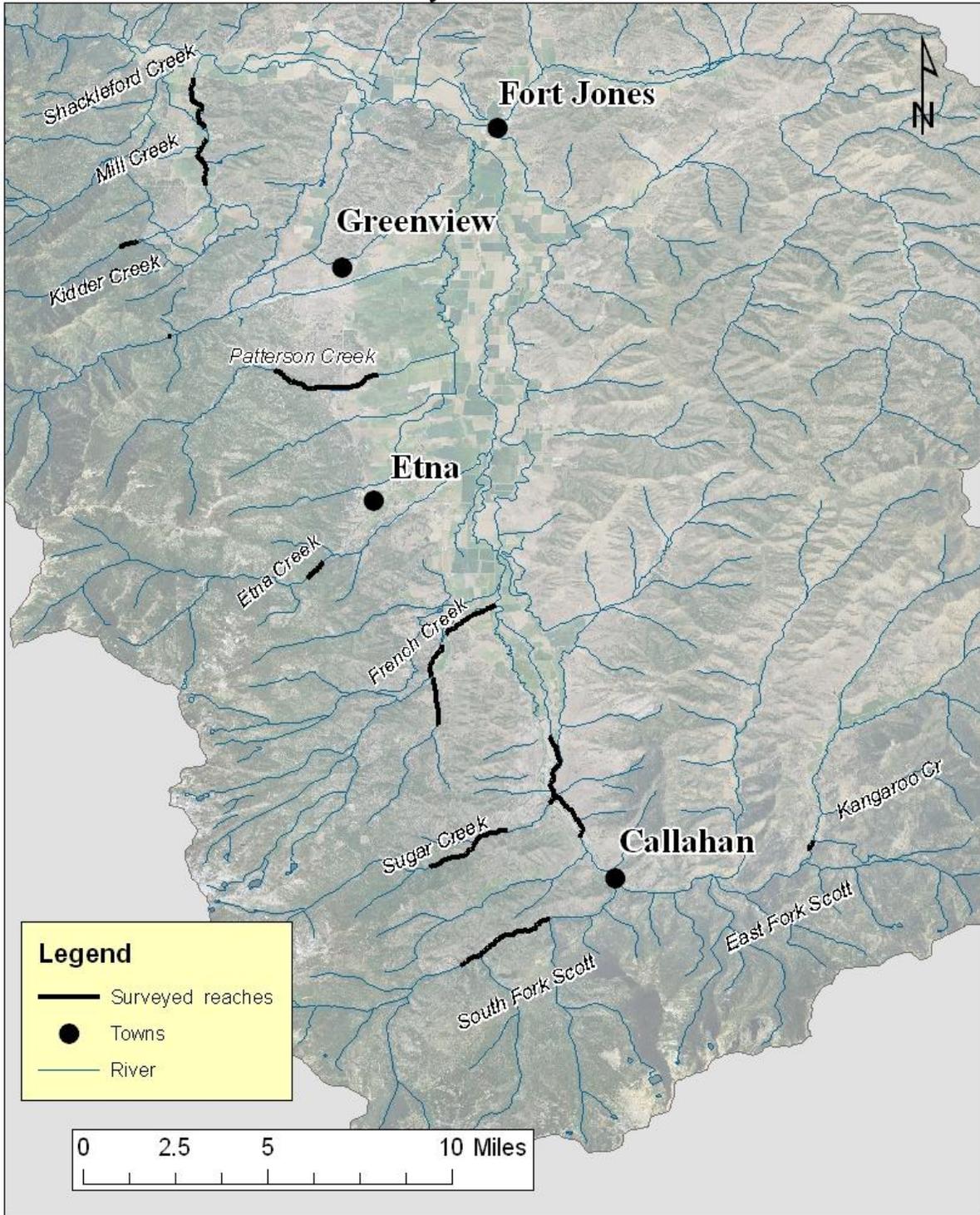
Watershed	Reach Description	Survey Crew	Begin Mile	End Mile	# of Surveys	Total Miles
Mill Cr. (Scott Bar)		CDFG	NS	NS	NS	NS
Tompkins Creek						
Lower.	Lowest 1.25 miles of Tompkins Creek	CDFG	1.8	0	2	1.8
Upper	From USFS road # 46N64 crossing to Potato Patch	CDFG	2	1	2	1.0
Middle Creek	Lowest .4 miles of Middle Creek	QVIR/CDFG	0	0.4	2	0.4
Kelsey Creek	Lower Kelsey from barrier to mouth	CDFG	0.6	0	2	0.6
Kelsey Spawning Channel	Spawning channel	CDFG	0.2	0	2	0.2
Canyon Creek	mouth up	CDFG	1.1	0	2	1.1
Boulder Creek	County bridge to mouth	NS	NS	NS	NS	NS
Shackleford-Mill Creek						
Lower Shackleford-Mill	From Milepost 2 on Dangel lane to mouth (expanded reach)	RCD	2.17	0	3	2.17
Upper Shackleford	Below the falls	QVIR	5	4.5	1	0.5
Lower Mill	From the QV road bridge to road crossing ~ 300 meters below conf of Shack	RCD	1.6	0	5	1.6
Middle Mill	From the Quartz Valley Rd bridge to above Emigrant Cr.	RCD/Menke	NS	NS	NS	NS
Emmigrant Creek(trib to Mill)	Confluence with Mill Creek to County Road	RCD/Menke	NS	NS	NS	NS
Upper Mill Creek	From county road crossing to 1/2 mile above	RCD	3.8	3.3	2	0.5
Kidder Creek						
Lower	Below Hwy 3 bridge	RCD			2	0
Middle	Above Hwy 3 bridge outside of Greenview	NS	NS	NS	NS	NS
Upper	Upper FGS property	RCD	-	-	1	0.7

Watershed	Reach Description	Survey Crew	Begin Mile	End Mile	# of Surveys	Total Miles
Patterson(Etna)						
Lower	Confluence of Johnson and Patterson Creek to 1/2 mile below Hwy 3	RCD	1.5	0	0	0
Mid (FGS)	From Upper Youngs Diversion to Hwy 3 (New Reach)	RCD	6.2	4.6	4	1.9
Upper (FGS)	combined into above reach	RCD	-	-	-	-
Etna Creek						
Lower	200 yards below Highway 3 to mouth	RCD	2.25	0	0	0
Middle	From Etna City Diversion to End of FGS	RCD	5.1	3.7	2	1.4
Upper	From Mill Creek to Alder Creek	RCD	8	6.35	0	0
Ruffy Gap (Trib to Etna)	area above mouth	RCD	0.2	NS	NS	0
French Creek						
Lower	Hwy 3 to mouth (New Reach 2003)	RCD	0.7	0	3	0.7
Middle	Confluence w/Miners to bottom of Tobias. (Expanded Reach)	RCD	2.43	0.8	3	1.63
North Fork Area	From below North Fork to confluence of French and Miners	RCD	3.43	2.43	1	1
Paynes Creek Area	French Creek from 1/4 mile us Paynes Creek to 1/4 mile ds	RCD	5.25	NS	NS	NS
Duck Lake Area	Above and below mouth of Duck Lake	RCD	6.3	NS	NS	NS
Miners Creek	Confluence with French Creek to upper Phelps Property	RCD	0.9	NS	NS	NS
Paynes Cr.	Lowest .2 miles	RCD	0.2	NS	NS	NS
North Fork French Cr.	Timber Products	TP	0.7	NS	NS	NS
Tailings (INDEX)	From .30 miles below Wildcat Cr. To 1/2 mile upstream from Messner gulch.	RCD	55	52.25	3	2.75

Watershed	Reach Description	Survey Crew	Begin Mile	End Mile	# of Surveys	Total Miles
Sugar Creek						
Lower	From Hwy 3 to Jeffy Bridge	RCD	0.7	0	1	0.7
mid					1	0.3
Upper	From bridge crossing on Rd # 40N23 to cattle guard on Sugar Cr. Rd.	RCD /NOAA	4	1.9	5	2.1
Wildcat	Mouth up 2 mile	RCD	NS	NS	NS	NS
South Fork						
Lower S. Fork	USFS piece	RCD/NOAA	0.7	0.3	NS	0
Upper S. Fork	800 meters above Fox Cr. to Boulder Cr.	RCD/NOAA	4	2.1	2	1.9
Boulder Creek	Mouth area	RCD/NOAA			2	0
Fox Creek	Mouth Area	RCD/NOAA			2	0
East Fork						
E. Fork-Lower Masterson	Beginning 1.4 miles above mouth of Grouse Cr.	RCD	6.3	4.9	3	1.4
East Fork-Upper Masterson	AP Cattle Ranch	RCD	12.1	NS	NS	NS
Upper East Fork	Confluence of Crater and Houston Creek downstream	RCD	13.8	NS	NS	NS
Grouse Cr.	lower .6mile	RCD	0.6	0	1	0.6
Kangaroo Cr. - Lower	Lower 1 mile of creek	RCD	1.1	NS	NS	NS
Kangaroo Cr. - Upper	USFS piece	RCD	2.1	NS	NS	NS
Rail Creek(new)	Rd 41N39 to end of USFS land	RCD	1.25	NS	NS	NS
Mainstem Scott	Tailings	RCD		1	2	2.65
Mainstem Scott	Reach 13	RCD		4	2	1
Mainstem Scott	Reach 14	RCD		0	2	5
					Total	35.60

Map 1. Spawning Ground Reaches Surveys in 2012-2013

**Scott River Coho Surveys 2012
Surveyed Reaches**



Biological Sample Collection

Tissue samples were collected by clipping a one cm² piece of operculum tissue, using a hole punch. Samples were placed in absorptive paper, and placed into labeled envelopes. Scale samples were collected below the dorsal fin, but above the lateral line. Samples were collected by scraping clean with a knife blade in the direction from head to tail, then removing scales by scraping tail to head.. Scale samples were placed in a labeled scale envelope. When possible, both left and right otoliths were collected using a pocket knife. The otoliths were then cleaned, dried, and placed in a labeled envelope. All samples were then provided to the California Department of Fish and Game, in Yreka.

GPS data collection

Hand-held Global Positioning System (GPS) units were used to record the location of the beginning and end of each survey reach, and location of each carcass, redd, and live fish identified.

GPS waypoints were assigned an ID based on a stream code, sequential number, and a letter code denoting carcass (C), redd (R) or live fish (F).

Ex.) F C 0 4 C = French Creek # 4 Carcass

In addition, the GPS coordinates in Lat/Long were recorded on the field data sheet, along with the ID code assigned to that datapoint.

Boulder Cr. (South Fork)	BO	Mill Cr. (Scott Bar)	SB
Boulder Cr.(Scott)	BS	Mill Creek	ML
Canyon Cr.	CA	Miners Cr.	MI
Clark Cr.	CL	Moffet Creek	MO
East Fork Scott	EF	North Fork French	NF
Emigrant Creek	EM	Patterson Creek (Scott)	PS
Etna Cr.	ET	Patterson Creek(Etna)	PA
French Cr.	FR	Rattlesnake Cr.	RA
Grouse Creek	GR	Ruffy Gap Trib	RU
Horse Range Cr.	HR	Shackleford	SH
Indian Creek	IN	Shackleford-Mill	SM
Johnson Creek	JO	South Fork Scott	SF
Kangaroo Cr.	KA	Sugar Creek	SU
Kelsey Channel	KC	Thompkins Creek	TO
Kelsey Creek	KE	Wildcat Cr.	WI
Kidder Creek	KI	Wooliver	WO
McAdams Cr.	MC	Scott River Tailings	TA
Meamber Gulch	ME	Scott River Chinook Reach	S## (Example – S08 =
Middle Creek	MI	Scott Reach 8)	

Fish ID and Mark Identification

Fish ID

Positive identification of coho salmon was a crucial step in conducting the spawning ground surveys, and the collection of the tissue and scale samples. Morgan Knechtle, CDFG, provided hatchery carcasses of all three species (coho, chinook, steelhead) present in the Scott River Watershed, to ensure that the crew was fully aware of key identifying features.

The following characteristics are used to identify coho salmon:

Gums: Coho salmon have white gums at the base of the teeth only, typically the rest of the gum is gray.

Spots: These spots are black in color and can vary from circular to irregularly shaped spots. Both sexes have spots on the back, dorsal fin, and upper lobe of the caudal fin, with no spots on the lower lobe.

Color: Many coho salmon, both male and female, can exhibit extremely brilliant pink to red coloration of the lower 2/3 of the body.

Scott River Adult Coho Spawning Ground Surveys 2012-2013

Kype: Both males and females can have a fairly pronounced kype

Nares: Nares are enlarged and white in coloration. This characteristic is useful in identification of live fish due to the visibility.

Caudal Peduncle: the caudal peduncle is thicker than that of a Chinook. This is most noticeable when picking up a carcass, making it difficult to hold in one hand.

Anal Fin: The anal fin of coho salmon have 12-17 rays, and the outermost rays are longer than the inner rays, which is not the case with Chinook or steelhead.

Sex: Males generally are larger, have larger hooked kypes, and brilliant pink to red coloration. To verify the sex the anal opening was squeezed to determine the presence of milt (male) or eggs (female).

Origin: Hatchery fish are identified by either the lack of an adipose fin, or by a maxillary clip. (Right maxillary clip = Trinity River Hatchery, Left maxillary clip = Iron Gate Hatchery) Adipose clipped fish have the snout removed and submitted to CDFG for coded-wire tag recovery.

Results

Survey Timing

Adult coho salmon spawning ground surveys were conducted between November 20th, 2012 and January 10th, 2013. The first survey is typically conducted in French Creek, due to the connection that it maintains with the Scott River. Live coho were observed in the Scott River in late October. However, no observations of active spawning were made during the Chinook Spawning Ground Surveys completed in the mainstem Scott. Surveys were started in the tributaries based on ability for the fish to access them. The Scott River was connected up to RM 51 but dry through the tailings reach until November 20th, 2012, despite the lease of 11 cfs (in addition to 6 cfs bypassing) from the diversion at River Mile 54. This disconnection prevented coho access to Sugar Creek, the South Fork, and the East Fork Scott River until this date. Flow conditions did not allow coho to access Shackleford-Mill Creek until November 20, 2012 (Joe Scott, CDWR, pers. comm. – via email).

Water Year Conditions

Conditions during the fall of 2012 were dry, with the river at September baseflow conditions for much of the fall. The Scott River was at less than 50 cfs daily through October and much of November, until the first significant rain event on November 20th, 2012. Many locations of the Scott River mainstem were extremely low or dry during October. These low flows prevented coho salmon from accessing many of the key tributaries until after November 20th. Figure I. below shows the flows in the Scott River mainstem, Kidder Creek and Shackleford Creek prior to the November rain event. The California Department of Water Resources estimates that approximately 15 cfs are needed at the gage on Shackleford Creek in order for adult salmon to be able to access Shackleford (S. Sommarstrom, pers. communication). According the Figure I. flows were less than 15 cfs in Shackleford Creek leading up to the rain on November 20th.

Run timing and duration of coho spawning.

Initial coho sightings

Scott River Adult Coho Spawning Ground Surveys 2012-2013

The first sighting of live coho adults in the Scott River occurred on October 27th 2012, at the Scott River CDFG Video Weir, just upstream of Indian Scotty Campground at river mile 18 (Knechtle 2012). The Video Weir was first installed in 2007 to provide escapement estimates for chinook and coho spawners returning to the Scott River Valley. The weir complements the spawning ground surveys by providing escapement estimates for the Scott River above River Mile 18. However, the weir does not capture the escapement for the entire Scott River, as it is located upstream of potential coho habitat in Canyon Creek, Kelsey Creek, Tompkins Creek and Lower Mill Creek.

RCD crews identified the first coho redd in Shackleford-Mill Creek on December 5th, 2012. The first coho carcass was found in French-Miners Creek on December 13th, 2012.

Figure IV. Adult coho run timing in the Scott River – 2012-2013

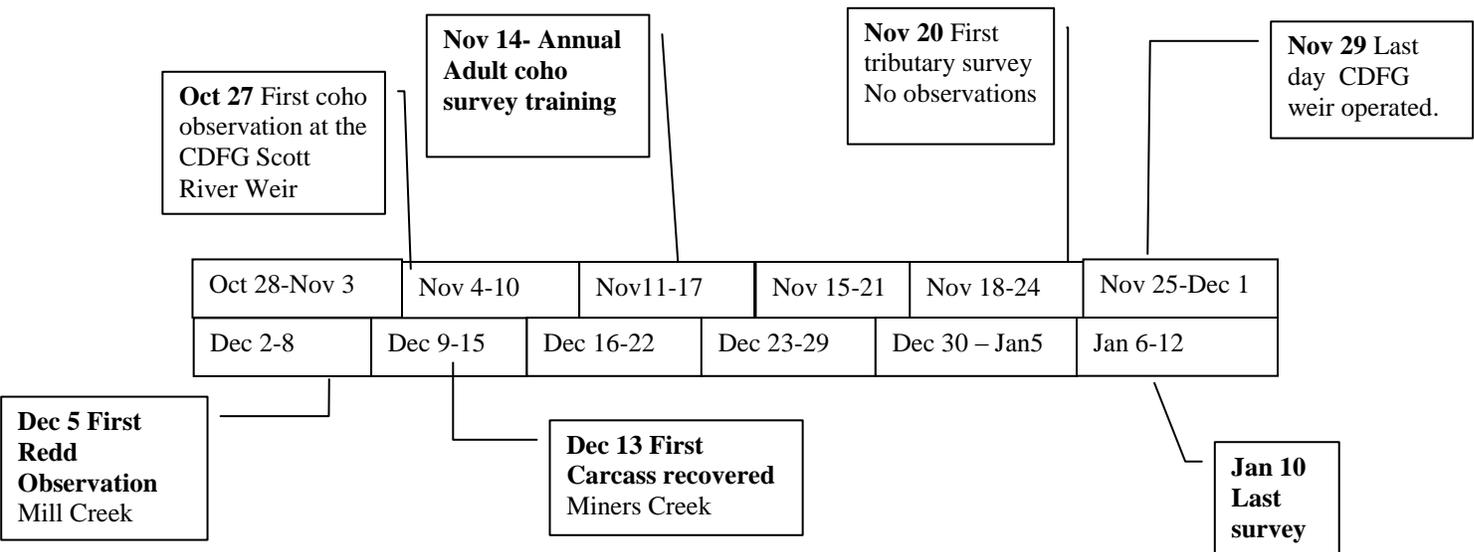


Figure IV. Shows the relationship between flow events and coho migrations. Observations from past coho survey efforts have shown that coho clearly migrate upstream when there are “pulses” of water movement. This migration pattern was observed in 2009-2010, and 2011-2012 (M. Knechtle, personal communication, CDFG). This migration pattern was partially observed in 2012. Figure II shows coho were migrating through the CDFG weir in the absence of a pulse flow event during the early season. Due to the weir washing out during high flow on Nov 29th, it is not possible to determine if coho moved during that flow event.

Scott River Adult Coho Spawning Ground Surveys 2012-2013

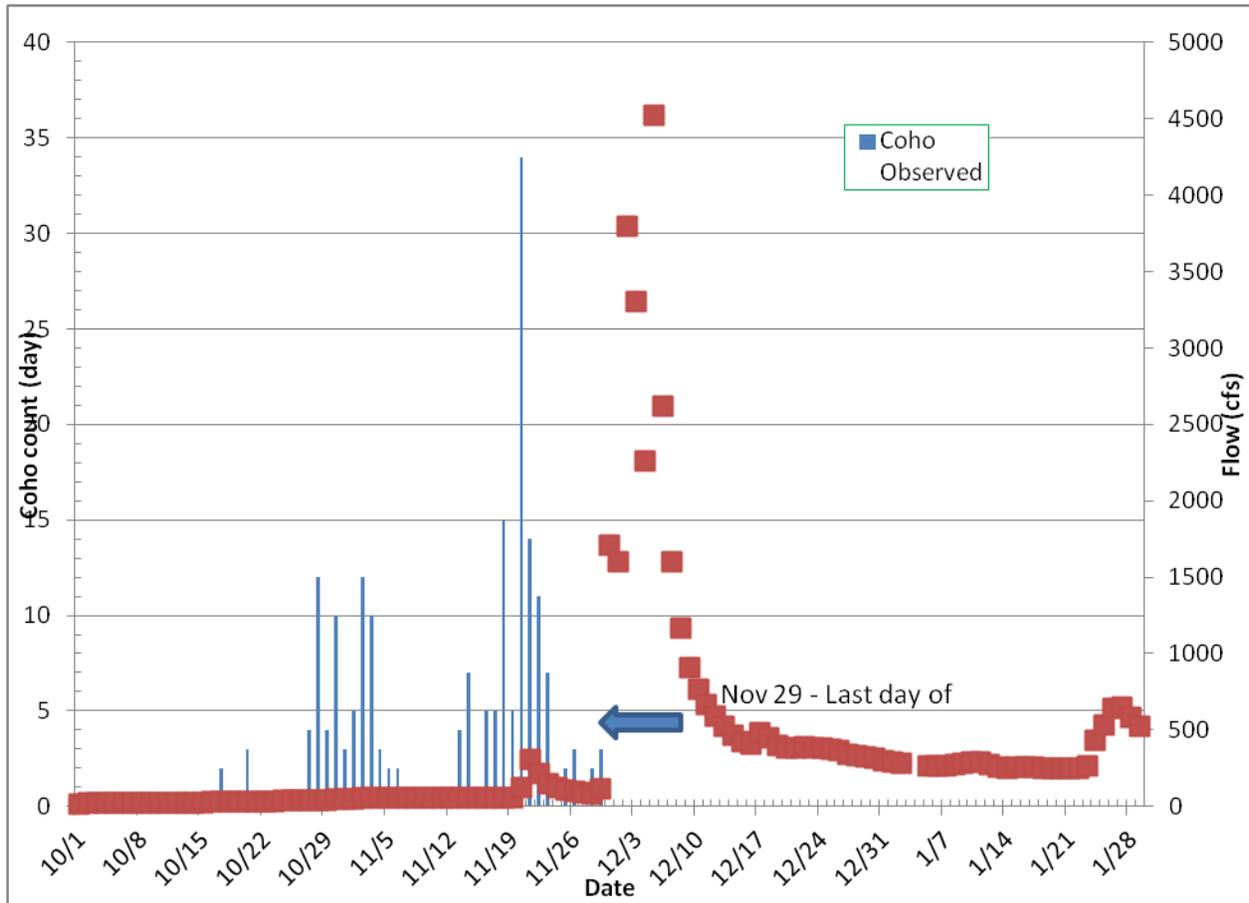
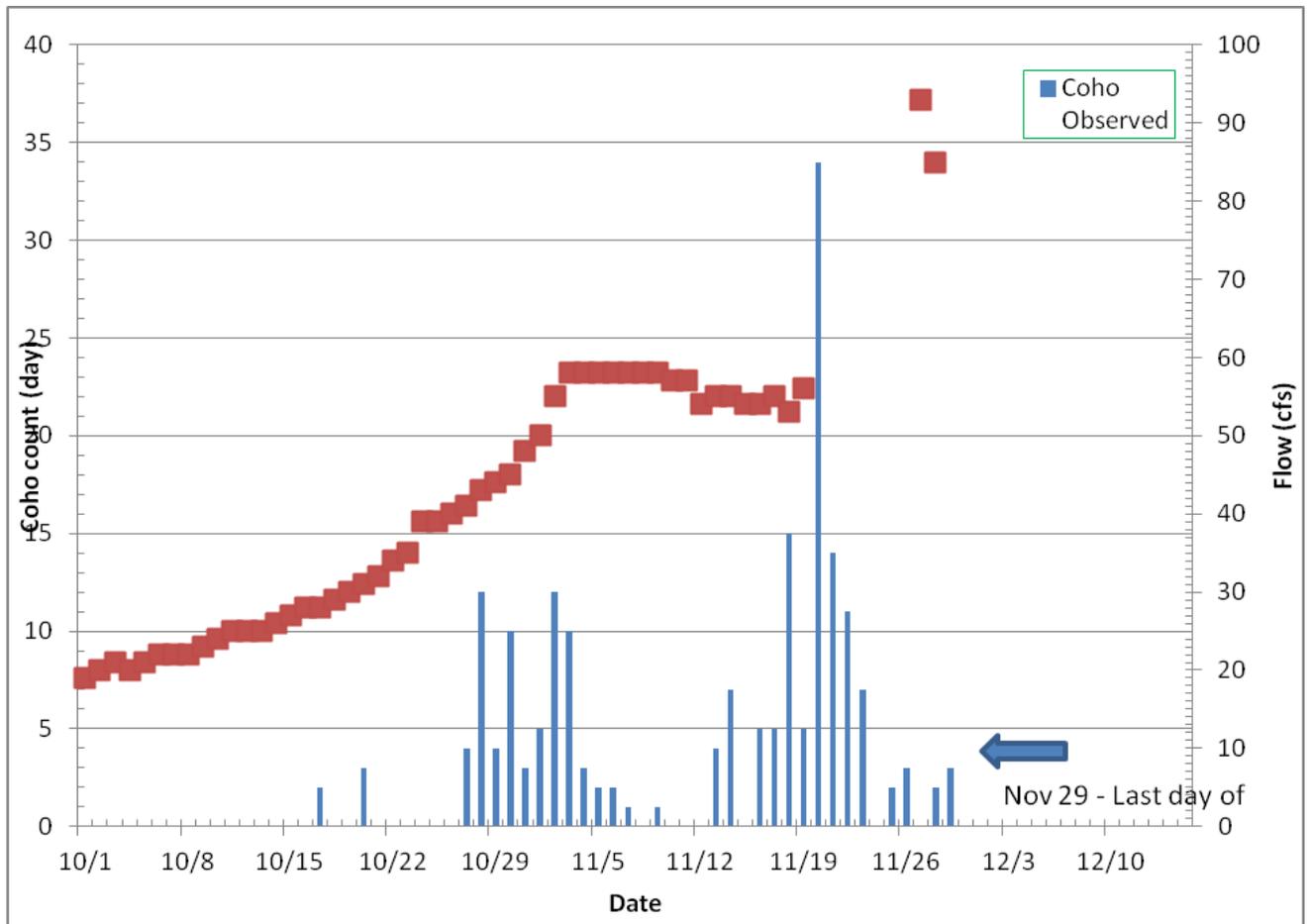


Figure V. Streamflow at USGS gauge during survey period, and coho migration at the CDFG weir. (Note: USGS data is preliminary only.)

Scott River Adult Coho Spawning Ground Surveys 2012-2013



There were two peak periods of coho movement through the CDFG weir. The first occurred from October 27th –November 7th, with 68 coho observed. The second period was from November 13-29, with 117 observed coho passing during this time period. It is likely that more adults migrated into the Scott after November 29th, when the weir stopped operating.(CDFG Weir data 2012 – Yreka). High flows on November 28th damaged the video weir, the last day of operation was Nov 29th 2012. Three coho were observed passing through the video weir that day. Based on previous years’ observations, it is possible that more coho migrated upstream during the high flow event.

**Redd Survey Results:
Mainstem Scott River**

Adult Chinook surveys were completed from October 15th until early December 2012, During these surveys no coho observation or redds were documented. There were no coho carcasses recovered downstream of the counting weir or redds /carcasses observed in tribs surveyed downstream of the counting station.

Tributary Observations

During the 2012-2013 survey season, coho salmon redds were observed in six tributaries of the Scott River: South Fork Scott River, French Creek, Miners Creek, Shackleford Creek, Mill Creek, and Sugar Creek (Map 2). These locations are the same locations coho have been documented previously for this brood year.

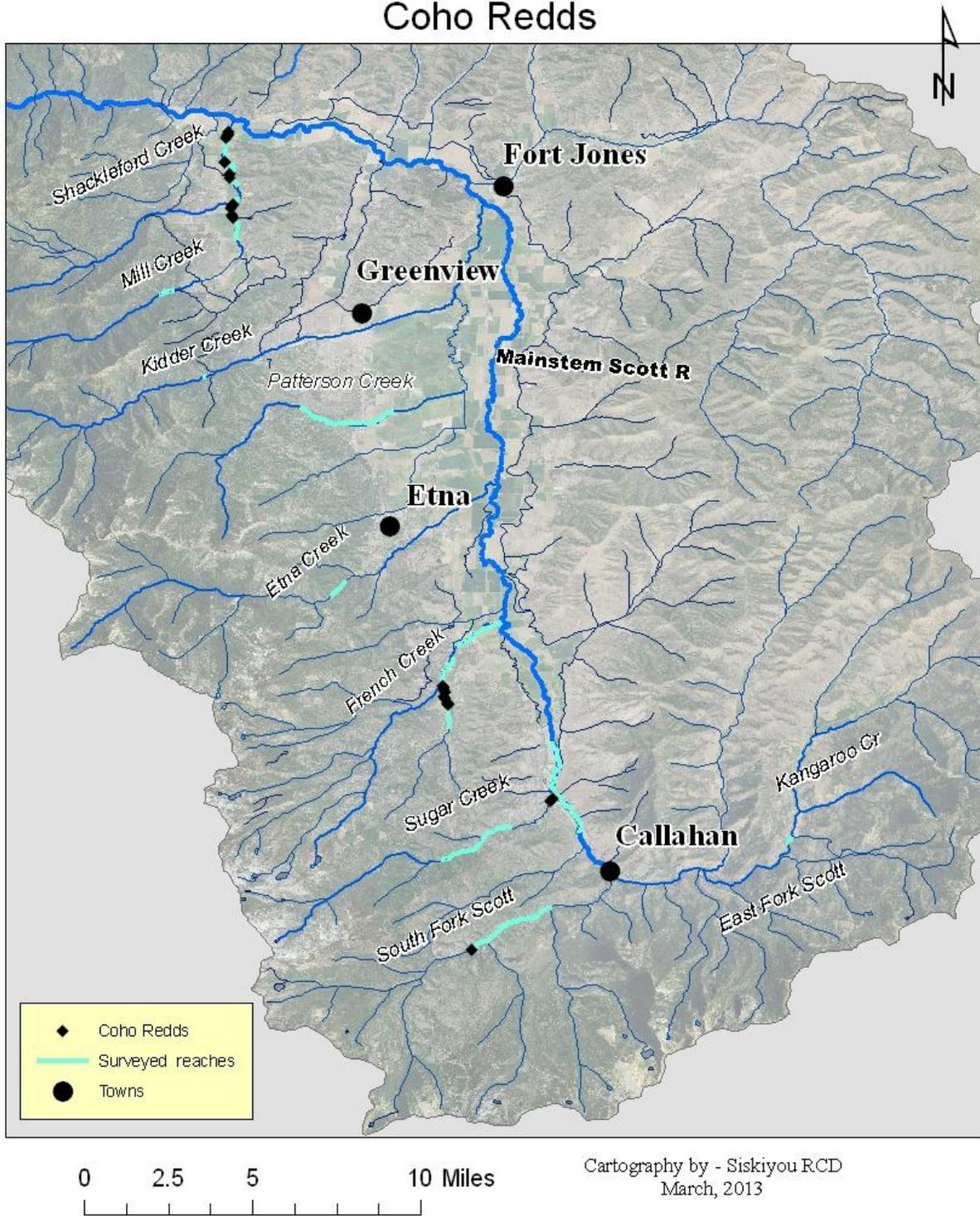
Table III. Results by Reach, documents the redds, and carcasses identified during the survey season.

Table III. Results by Reach 2012-2013-

Stream	Reach	Total Redds(a)	Total Carcasses (b)
Kidder Creek	Upper	0	0
Sugar Creek	Upper	0	0
South Fork Scott River	Upper	1	0
Scott River	Tailings	0	0
East Fork Scott River	Grouse	0	0
Mill Creek	Upper	0	0
Patterson	Middle / Upper	0	0
Etna Creek	Upper	0	0
French Creek	Lower	0	0
French Creek	upper/middle	2	0
Miners Creek	Mouth Up	5	3
Shackleford Creek	Upper	7	3
Mill Creek	Lower	7	0
Sugar Creek	Lower	2	0
	Total	24	6

A total of 24 redds were observed during the survey season, and 6 carcasses were sampled. See **Map II.** for redds observed during the 2012-2013 survey season.

Scott River coho surveys - 2012 Coho Redds



Map II. Coho Redd observations during the 2012-2013 season.

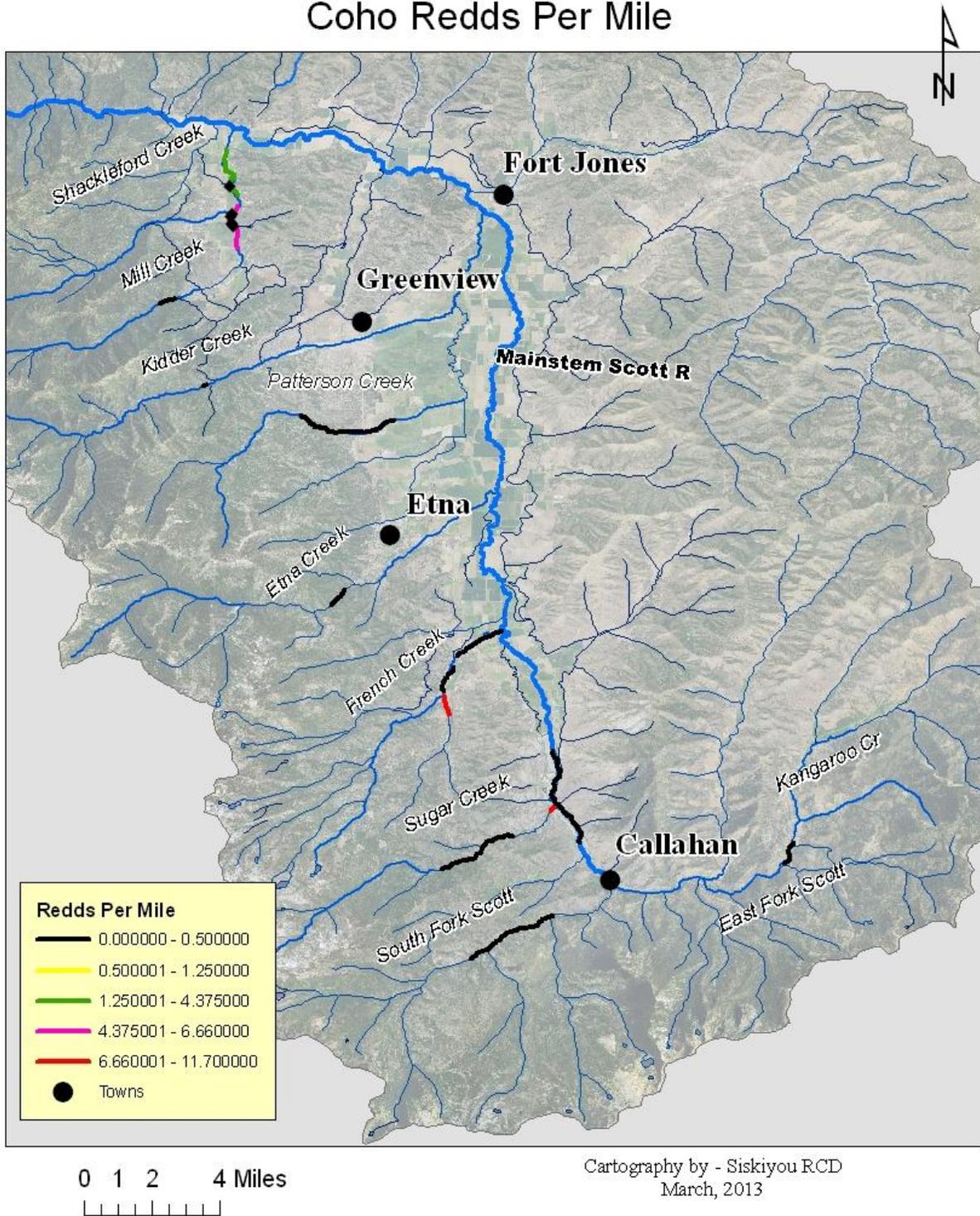
Scott River Adult Coho Spawning Ground Surveys 2012-2013

The number of redds and the density of the number of redds observed per stream mile in the tributary streams reaches sampled is presented in Table III. The locations where coho salmon adults were observed to spawn are shown in Map 3. The highest spawning density was observed in Sugar Creek (4.0 Redds/mile) and Lower Mill Creek (5 redds/mile). The next highest spawning densities were observed in lower Miners Creek and middle French Creek (3.3 redds/mile each).

Table IV. Number of Redds per Mile for Each Reach 2012-2013

Stream	Reach	Distance (miles)	Number Redds	Redds per Mile
Kidder Creek	Upper	0.1	0	0.0
Sugar Creek	Upper	2.1	0	0.0
South Fork Scott River	Upper- Boulder Creek	2.2	1	0.5
Scott River	Tailings	3.1	0	0.0
East Fork Scott River	Mouth of Grouse Down	0.7	0	0.0
Mill Creek	Upper	0.4	0	0.0
Patterson	Middle	1.7	0	0.0
Etna Creek	Diversion Dam Down	0.6	0	0.0
French Creek	Middle 1	0.6	2	3.3
French Creek	Lower	1.6	0	0.0
Miners Creek	Mouth up	1.5	5	3.3
Sugar Creek	Lower	0.5	2	4.0
Shackleford Creek	Mill Creek Down	1.6	7(a)	1.9
Mill Creek	Lower	1.4	7	5.0

Scott River coho surveys - 2012 Coho Redds Per Mile



Map 3. Redds Observations Per Mile in each stream Reach.

Scott River Adult Coho Spawning Ground Surveys 2012-2013

Six carcasses were found during the 2012-2013 Adult Spawning Ground Surveys. Five of the six carcasses were sampled for tissue, scales and otoliths. The sixth carcass was a partial head, and no samples were collected. Table V contains details for each carcass.

Table V. Sample data for each carcass sampled by the RCD 2012-2013.

Date	Stream	Reach	Lat	Long	Sex	forklength (cm)	clips	Scale	Tissue	otolith
1/4/2013	Shackleford-Mill	lower	41.61494	122.96547	m	37	n	y	y	y
1/4/2013	Shackleford-Mill	lower	41.92022	122.96641	m	unk	n	y	y	y
12/13/2012	Miners Creek	lower	41 22.944	122 52.186	f	68	n	y	y	y
12/13/2012	Miners Creek	lower	41 22.944	122 52.186	m	42	n	y	y	y
12/18/2012	Miners Creek	lower	-	-	Head only					
12/18/2012	Shackleford-Mill	lower	41 36.455	122 57.829	m	65	n	y	y	y

Discussion

Run Timing and Duration

Data collected from spawning ground surveys and the CDFG weir during this period indicates that the run timing is very similar from year to year, but is very flow dependent. Coho appear to enter the Scott River system in mid-October. Despite the coho arriving in the watershed in October, active spawning still was not observed until late November, as observed in previous years. Migration and spawning appeared to be mostly completed by the last week of December. No new activity was observed in January.

Coho Spawning Distribution

During the 2012-2013 spawning season, coho were observed only in tributaries where this brood year had previously been documented. Fall rains did not reconnect the tributaries through normally dry alluvial fans until late November (e.g., Patterson, Kidder, Etna). These locations, (i.e., Patterson, Etna and Kidder) did not have any observed spawning. No success was made during this survey season to identify new spawning reaches. There is potential that coho spawn in reaches of the East Fork, Kidder and Etna that have not previously been surveyed. This possible access was due to late rains and flow conditions. Coho were unable to access tributaries such as Moffett, Indian, and Rattlesnake during the spawning period. The upper extent of coho spawning has been well established for most perennial tributaries (Yokel 2005). Based on this

year's and previous year's information, coho appear to distribute throughout the watershed based upon flow conditions.

The highest spawning densities were observed in Lower Mill, Sugar Creek, Miners Creek and Lower French. It should be noted that the analysis by density is misrepresentative for the shorter survey reaches (e.g. Sugar Creek). These locations all provide both quality spawning habitat and quality rearing habitat, and are the same locations where spawning has been observed in the past for this brood year (Quigley 2003, Yokel 2006). Beaver dams were observed in the same locations they have been in past years: mouth of French Creek, mouth of Sugar Creek, and on lower Mill Creek. In addition to these established beaver dams, dams were observed along the mainstem Scott River, with six observed upstream from French Creek. The mainstem dams were blown out during the high flows on November 28th, 2012.

There was only one location where spawning was not documented upstream of the existing beaver dam. That location was Mill Creek, where coho were not observed in the survey reach. However, there is one reach upstream that has not been surveyed for several years which has suitable habitat.

Conclusions

Tributaries that annually support coho spawning are: French/Miners, Shackleford/Mill Creeks. Patterson Creek likely, both the lower portion and the upper reaches have potential to support coho annually as well. These locations should continue to be a high priority for Water Trust Transactions, as well as protection, restoration, and enhancement

Based on redd counts and adult count at the video weir, numbers for this brood year appear to be improving. It is highly likely that this increase in the brood year is due to the protection and enhancement efforts implemented in the watershed. All locations with known coho spawning and rearing have had fish screens on all agricultural diversions for the past decade. Livestock exclusion fencing has been in place in mainstem and tributary locations for more than a decade at most locations. This fencing, combined with riparian replanting efforts has allowed the riparian corridors in French and Shackleford-Mill Creek to recover greatly from the 1964 flooding.

Recommendations

Scott River Adult Coho Spawning Ground Surveys 2012-2013

Future survey efforts should focus on acquiring access into the lower reaches of Kidder, Patterson and Etna Creek. These reaches are typically dry in the summer, but have been shown to provide spawning habitat in the past (Quigley 2005). Suitable rearing habitat is available upstream and downstream in each of these tributaries. In addition, several miles of the East Fork Scott River have never been surveyed for coho salmon and future surveys should also seek permission to gain access to these locations.

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Scott River Adult Coho Spawning Ground Surveys 2012-2013

Coho redds per mile - 2007 - 08

Reach	Length (mi.)	# Redds	Redds/mile
Upper Mill Creek (Scott Bar Mill)	0.6	0	0.0
Upper Thompkins Creek	1.3	0	0.0
Lower Thompkins Creek	0.5	0	0.0
Middle Creek	0.3	0	0.0
Boulder Creek	0.2	0	0.0
Middle Etna (above Etna Diversion)	2.2	0	0.0
Middle Miners Creek	1.1	0	0.0
Middle Sugar Creek	2.1	0	0.0
Grouse Creek	0.9	0	0.0
East Fork below Rail Cr.	2.6	2	0.8
Upper French Cr. - Horse Range Cr.	0.7	1	1.5
East Fork below Grouse Cr.	0.6	1	1.6
Canyon Creek	0.9	2	2.3
Lower South Fork Scott River	0.4	1	2.6
Scott River - Tailings	3.1	8	2.6
Upper French Creek - N. Fork to Miners	1.0	3	2.9
Lower Mill Creek (Scott Bar Mill)	0.3	1	3.1
Kelsey Creek	0.6	2	3.2
Lower Kidder Creek	1.3	5	3.7
Wildcat Creek	0.8	3	4.0
Upper Mill Creek (Shackleford)	0.9	4	4.6
Lower Patterson	1.1	5	4.7
South Fork Scott River	2.5	16	6.3
Middle Etna (below Etna Diversion)	0.7	5	7.5
Lower Miners Creek	0.9	7	7.8
Shackleford Creek	0.3	3	10.0
Upper Kidder Creek	0.2	2	10.3
Mid French Creek	1.0	10	10.4
Lower Sugar Creek	0.3	3	11.3
Lower Patterson Creek	0.4	5	12.3
Lower French Creek	0.6	9	13.8
East Fork above Grouse Creek	1.1	16	14.2
Mid French Creek	0.6	10	15.6
Middle Patterson Creek	1.7	27	15.7
Shackleford Creek	2.3	39	16.6
Upper Patterson Creek	0.3	9	30.2
Lower Mill Creek (Shackleford)	1.4	57	40.7

Scott River Adult Coho Spawning Ground Surveys 2012-2013

Redds per mile 2008-2009

Name	Length (miles)	No_Redds	Redds_per_mile
Upper Scott Bar Mill Creek	0.60	0	0.00
Lower Scott Bar Mill Creek	0.35	1	2.90
Upper Thompkins Creek	1.35	0	0.00
Lower Thompkins Creek	0.46	0	0.00
Middle Creek	0.31	0	0.00
Kelsey Creek	0.62	2	3.23
Canyon Creek	0.88	2	2.27
Boulder Creek	0.16	0	0.00
Upper Mill Creek	0.87	4	4.60
Lower Mill Creek	1.40	57	40.71
Shackleford Creek	2.35	39	16.60
Upper Kidder Creek	0.19	2	10.50
Lower Kidder Creek	1.34	5	3.73
Upper Patterson	0.30	9	30.00
Middle Patterson - above HWY3	1.72	27	15.70
Lower Patterson - below HWY3	0.41	5	12.30
Lower Patterson	1.06	5	4.72
Middle Etna - above Etna Diversion	2.22	0	0.00
Middle Etna - below Etna Diversion	0.67	5	7.46
Upper French Cr. - Paynes Creek Area	0.69	1	1.45
Upper French Cr. - Below North Fork	1.04	3	2.88
Mid French Creek	0.96	10	10.40
Mid French Creek	0.64	10	15.63
Lower French Creek	0.65	9	13.85
Miners Creek	1.06	0	0.00
Miners Creek	0.90	7	7.78
Mid Sugar Creek	2.08	0	0.00
Lower Sugar Creek	0.27	3	11.10
Wildcat Creek	0.75	3	4.00
Scott River - Tailings	3.07	8	2.61
South Fork Scott River	2.54	16	6.30
Lower South Fork Scott River	0.38	1	2.63
East Fork - Above Kangaroo Cr.	2.62	2	0.76
East Fork - Above Grouse Cr.	1.15	16	13.90
East Fork - Below Grouse Cr.	0.63	1	1.59
Grouse Creek	0.88	0	0.00

Scott River Adult Coho Spawning Ground Surveys 2012-2013

Redds per mile 2010-2011

Stream	Reach	Distance (miles)	Number Redds	Redds per Mile
East Fork Scott River	Below Grouse	0.5	0	0
French Creek	Horse Range	0.7	0	0.0
Kidder Creek	Gage Site	Spot	1	NA
Sugar Creek	Upper	2.1	1	0.5
South Fork Scott River	Middle	2.2	1	0.5
Canyon Creek	Mouth to Mauer	1.1	1	0.9
Scott River	Tailings	3.1	3	1.0
	Mouth to Potato			
Tompkins Creek	Flat	2.6	3	1.2
East Fork Scott River	Newton	4.8	8	1.7
Mill Creek	Middle	1.7	4	2.4
Patterson Creek	Hayden	0.8	2	2.5
Kangaroo Creek	Newton	0.8	2	2.5
Mill Creek	Upper	0.4	1	2.5
Patterson	Middle	0.7	2	2.9
Kidder Creek	Below HWY3	1.3	4	3.1
Patterson Creek	Upper	0.3	1	3.3
Patterson	Middle	1.7	6	3.5
East Fork	Above Grouse	1.1	7	6.4
	Diversion Dam			
Etna Creek	Down	0.6	4	6.7
Kelsey	Mouth to falls	0.6	5	8.3
French Creek	Middle	0.6	6	10.0
Sugar Creek	Lower	0.3	3	10.0
Rail Creek	Newton	0.2	2	10.0
French Creek	Middle	0.8	10	12.5
Sugar Creek	Gozzarino	0.3	5	16.7
Shackleford Creek	Mill Creek Down	1.6	32	20.0
Mill Creek	Lower	1.4	52	37.1