

Scott River Adult Coho Spawning Ground Surveys
2007-2008 Season



Report Prepared by Brannon Walsh
Siskiyou Resource Conservation District

For the United States Fish and Wildlife Service
Agreement # 813337J039
Draft September 2008

Contents

Abstract 3

Introduction..... 3

 Project Objectives 4

Project Location 4

 Survey Locations 4

 Crew training 8

 Spawning Ground and Carcass Surveys 8

 Biological Sample Collection 9

 GPS data collection..... 9

 Fish ID and Mark Identification 9

 Fish ID 9

 Mark and Recapture..... 10

 Temperature Data 10

 Cooperators 11

Results..... 11

 Run timing and duration of coho spawning..... 11

Summary 14

 Redd Survey Results..... 14

 Flow Conditions..... 17

 Positive Identification of Fish..... 19

 Biological Sample Collection 19

 CDFG Scott River Weir..... 19

 Stream Temperature..... 19

 Site Specific Factors 21

 Table VI. Site Specific Factors 21

 Mark and Recapture..... 21

 Extent of Spawning and Habitat Characterization..... 22

 French Creek..... 22

 Shackleford-Mill Creek 23

 East Fork Scott..... 24

 South Fork Scott 24

 Sugar Creek..... 25

 Scott River Mainstem – Tailings Reach 25

 Etna Creek..... 25

 Patterson Creek 25

 Kidder Creek..... 26

 Scott Canyon Tributaries 26

Discussion..... 27

 Run Timing and Duration 27

 Comparison to 2001/02 and 2004/05 Survey Results..... 27

Abstract

In 2007, adult coho spawning ground surveys were continued in the Scott River Watershed in order to expand current knowledge of the endangered fishery. Similar to 2004, 2007 marked the return of the strong coho brood year. Thus, surveys were completed wherever access, staffing, and environmental variables would permit. A total of 45.95 miles were surveyed (6.45 miles on the mainstem and 37.5 miles on tributaries). Surveys consisted of trained crews walking established reaches either instream or on the bank in order to collect information concerning lives, carcasses, and redds. Most reaches were surveyed weekly; however, some reaches were surveyed only once. Streams that were surveyed include: East Fork Scott River, Grouse Creek, South Fork Scott River, Sugar Creek, French-Miners Creek, Etna Creek, Patterson Creek, Kidder Creek, Shackleford-Mill Creek, Kelsey Creek, Canyon Creek, Thompkins Creek, Wildcat Creek, and Scott Bar Mill. The survey season lasted from November 20th, 2007– January 18th, 2008. During this period a total of 259 redds, 130 carcasses, and 599 live fish were identified. A comparison of only the reaches surveyed in both 2004/05 and 2007/08 shows a decrease in redds from 567 to 250. Under the 2001 reach designation total redds observed for 2001/02, 2004/05, and 2007/08 are 205, 458, and 122, respectively. Although numbered tags were applied to carcasses throughout the survey effort, an insufficient amount were recaptured (<25) to accurately perform Patterson or Schaefer population estimates.

Introduction

Coho salmon (*Oncorhynchus kisutch*) in the Klamath River Basin, the Southern Oregon-Northern California Coast ESU, were 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. These surveys began in December 2001 as a cooperative effort between 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.

Spawning ground and carcass surveys in the Scott River Watershed aim to address the following goals:

- ◆ Determine and map the distribution and upper extent of coho spawning, in order to identify locations for habitat restoration projects.
- ◆ Determine the timing of adult coho migration and spawning.
- ◆ Estimate population sizes utilizing different tributaries.
- ◆ Sample biological parameters.

- ◆ Observe spawning habitats utilized by coho salmon in order to characterize preferred coho spawning habitat.

Project Objectives

- 1.) Document the presence of coho salmon within the historic range of distribution and in tributaries not previously documented within the Scott River system.
- 2.) Survey “Index Reaches”, as delineated in the 2001-2002 survey, once per week, or as survey conditions (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.
- 5.) Collect two (2) sets of tissue samples for DNA analysis to understand the genetic relationship of the Scott River coho salmon to other stocks and collect two sets of scale samples to understand the life history of the Scott River coho salmon. One set of tissue and scale samples will go to NOAA Fisheries and one to CDFG. In addition, otoliths are to be collected for life history analysis, and submitted to CDFG.
- 6.) Determine additional site specific information as they relate to spawning: redd composition, substrate composition, temperature, and stream gradient.
- 7.) Population estimates: Perform mark and recapture on carcasses to determine escapement numbers.

Project Location

The 2007/08 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.

Survey Locations

Adult coho spawning ground surveys were completed in the Scott River mainstem, and in the following tributaries: East Fork Scott River, Grouse Creek, South Fork Scott River, Sugar Creek, French-Miners Creek, Etna Creek, Patterson Creek, Kidder Creek, Shackleford-Mill Creek, Kelsey Creek, Canyon Creek, Thompkins Creek, Wildcat Creek, and Scott Bar Mill. Some reaches were not surveyed during the season due to flow conditions, or a lack of access. Streams not surveyed at all due to flow barriers include: Moffet Creek, Indian Creek, Patterson Creek (Fort Jones), and Rattlesnake Creek.

See **Table I.) Survey Schedule** for a description of reaches surveyed, and the survey schedule.

Scott River Adult Coho Spawning Ground Surveys 2007-2008

Table 1. Survey Schedule

Watershed	Reach Description	Begin Mile	End Mile	# of Surveys	Survey Crew	Total Miles
Mill Cr. (Scott Bar)						
Lower	Lowest ½ mile up of Mill Creek	0.4	0	1	CDFG	0.4
Upper	From RM 2.5 to RM 1.8	2.5	1.8	1	CDFG	0.7
Tompkins Creek						
Lower	Lowest 1.25 miles of Thompkins Creek	1.8	0	1	CDFG	1.8
Upper	From USFS road # 46N64 crossing to	2	1	2	CDFG/RCD	1.0
Middle Creek	Lowest .4 miles of Middle Creek	0.4	0	1	RCD	0.4
Kelsey Creek	Lower Kelsey from barrier to mouth	0.6	0	3	RCD	0.6
Kelsey Spawning Channel	Spawning channel	0.2	0	3	RCD	0.2
Canyon Creek	From the uppermost Maurer property line to the mouth of Canyon Creek	1.1	0	2	RCD	1.1
Boulder Creek	County bridge to mouth	0.2	0	1	RCD	0.2
Shackleford-Mill Creek						
Lower Shackleford-Mill	From Milepost 2 on Dangel lane to mouth (expanded reach)	2.17	0	6	RCD	2.17
Upper Shackleford	Below the falls	5	4.5	1	QVIR	0.5
Lower Mill	From the QV road bridge to road crossing ~ 300 meters below conf of Shackleford (expanded reach)	1.6	0	5	RCD	1.6
Middle Mill	From the Quartz Valley Rd bridge to above Emigrant Cr.	3.1	1.7	0	RCD	1.4
Emmigrant Creek(trib to Mill)	Congfluence with Mill Creek to County Road	0.1	0	0	RCD	0.1
Upper Mill Creek	From county road crossing to 1/2 mile above	3.8	3.3	3	RCD	0.5
Kidder Creek						
Lower	Below Hwy 3 bridge			1	RCD	1.1
Middle	Above Hwy 3 bridge outside of Greenview			0	RCD	0.8
Upper	Upper FGS property			2	RCD	0.5

Scott River Adult Coho Spawning Ground Surveys 2007-2008

Watershed	Reach Description	Begin Mile	End Mile	Survey Schedule	Survey Crew	Total Miles
Patterson(Etna)						
Lower	Confluence of Johnson and Patterson Creek to 1/2 mile below Hwy 3 (Note this reach is split with lack of access in the center)	1.05 1.5	0 1.25			
					2 RCD	1.30
Mid (FGS)	From Upper Youngs Diversion to Hwy 3 (New Reach)	6.2	4.6	6		1.6
					RCD	
Upper (FGS)	From the Falls down	7.9	7.6	4		0.3
					RCD	
Etna Creek						
Lower	200 yards below Highway 3 to mouth (New Reach)	2.25	0	0		2.25
					RCD	
Middle	From Etna City Diversion to End of FGS property above town; Schmalenberg	5.2 4.1	4.6 3.7	6		1
					RCD	
Upper	From Mill Creek to Alder Creek	8	6.35	1		1.65
					RCD	
Ruffy Gap (Trib to Etna)	area above mouth	0.2	0	0		0.2
					RCD	
French Creek						
Lower	Hwy 3 to mouth (New Reach 2003)	0.7	0	6		0.7
					RCD	

Scott River Adult Coho Spawning Ground Surveys 2007-2008

Watershed	Reach Description	Begin Mile	End Mile	Survey Schedule	Survey Crew	Total Miles
Paynes Cr.	Lowest .2 miles	0.2	0	1	RCD	0.2
North Fork French Cr.	Timber Products	0.7	0	0	TP	0.7
Mainstem Tailings (INDEX)	From .30 miles below Wildcat Cr. To 1/2 mile upstream from Messner gulch.	55	52.25	3	RCD	2.75
Sugar Creek						
Lower	From Hwy 3 to mouth	0.7	0	9	RCD	0.7
Upper	From bridge crossing on Rd # 40N23 to cattle guard on Sugar Cr. Rd.	4	1.9	6	RCD /NOAA	2.1
Wildcat	Mouth up 2 mile			1	RCD	
South Fork						
Lower S. Fork	USFS piece	0.7	0.3	4	RCD/NOAA	0.4
Upper S. Fork	800 meters above Fox Cr. to Boulder Cr.	4	2.1	6	RCD/NOAA	1.9
Boulder Creek	Mouth area			1	RCD/NOAA	0
Fox Creek	Mouth Area			1	RCD/NOAA	0
East Fork						
E. Fork-Lower Masterson	Beginning 1.4 miles above mouth of Grouse Cr.	6.3	4.9	4	RCD	1.4
East Fork-Upper Masterson	AP Cattle Ranch	12.1	7	1	RCD	5.1

Scott River Adult Coho Spawning Ground Surveys 2007-2008

Watershed	Reach Description	Begin Mile	End Mile	Survey Schedule	Survey Crew	Total Miles
Upper East Fork	Confluence of Crater and Houston Creek downstream	13.8	12.8	0	RCD	1.0
Grouse Cr.	lower .6mile	0.6	0	1	RCD	0.6
Kangaroo Cr. - Lower	Lower 1 mile of creek	1.1	0.1	0	RCD	1
Kangaroo Cr. - Upper	USFS piece	2.1	1.4	0	RCD/USFS	0.5
Rail Creek(new)	Rd 41N39 to end of USFS land	1.25	1.75	0	RCD/USFS	0.5
				Total		47.20

Crew training

Crew training was organized by California Dept. of Fish and Game (CDFG) and the Siskiyou RCD. Training was held on November 16th 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 had participated in the Adult Chinook Spawning Ground Surveys (CDFG) for several years, and had participated in the Scott River Adult Coho Spawning Ground surveys in previous years.

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 was hung at Redds to mark for the next survey crew, preventing double counting of redds. Carcasses are processed and then chopped to prevent double counting. Tissue and scale samples were taken from a subset of carcasses, and the species, sex, forklength, and any marking recorded on the data sheet. Additionally, otoliths were collected from a subset of carcasses sampled. One member of each crew had a State of California Scientific Collection Permit.

During redd surveys, the following data was collected on redds, if it did not disturb the spawning fish: redd length, width, pott 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.

Biological Sample Collection

Tissue samples were collected by clipping a one cm² piece of operculum tissue. 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 with a knife blade in the direction from head to tail. 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.

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. However, large concentrations of redds within ten meters of each other received only one GPS point. Only carcasses which were sampled were marked, and live fish sightings were grouped. The exception to this was if the fish or carcass was found in a unique location, or beyond the upper extent previously observed. In that case a GPS point was taken.

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. See **Appendix A** for further detail on naming conventions.

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. Mark Hampton, 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.

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.

Mark Identification

During this season, many tags were applied to Klamath River adult coho by various agencies throughout the Klamath Basin.

Karuk Tribe

The Karuk Tribe applied radio tags to twenty-two (22) coho at Ishi Pishi Falls near Somes Bar. Radio tagged fish were marked with spaghetti tags, and each fish had a unique radio signal. A total of ten (10) of these tagged fish entered the Scott River. (Pers. Comm. Alex Corum, Fisheries Biologist – Karuk Tribe)

All field crew were notified to look for these tags, and trained in the identification of tags.

Mark and Recapture

Mark and recapture surveys were conducted throughout the survey universe in the same methods as those completed by CDFG during the annual Fall Chinook Spawning Ground Surveys. However, because of the low number of both marks and recaptures estimates could not be completed.

Individually numbered tags were applied to each fresh carcass found during each survey. Tags are applied to the inside lower right jaw. The tag number applied was recorded on the field data sheet. All carcasses were inspected for tags upon retrieval. Recaptured carcasses were recorded on the field data sheet.

Temperature Data

Stream temperature data was collected in Sugar Creek, French Creek, Mill Creek (shack), and the South Fork of the Scott River during the survey period. Data collection was done using Onset

HoboTemps continuous dataloggers. Data was collected at hourly intervals. See **Appendix D. Stream Temperature Data**

Cooperators

The following entities cooperated in the survey effort this year:

- California Dept. of Fish and Game
- National Oceanic Atmospheric Administration
- Natural Resource Conservation Service
- United States Fish and Wildlife Service
- United States Forest Service
- Scott Valley Landowners
- Quartz Valley Indian Reservation

Results

Run timing and duration of coho spawning.

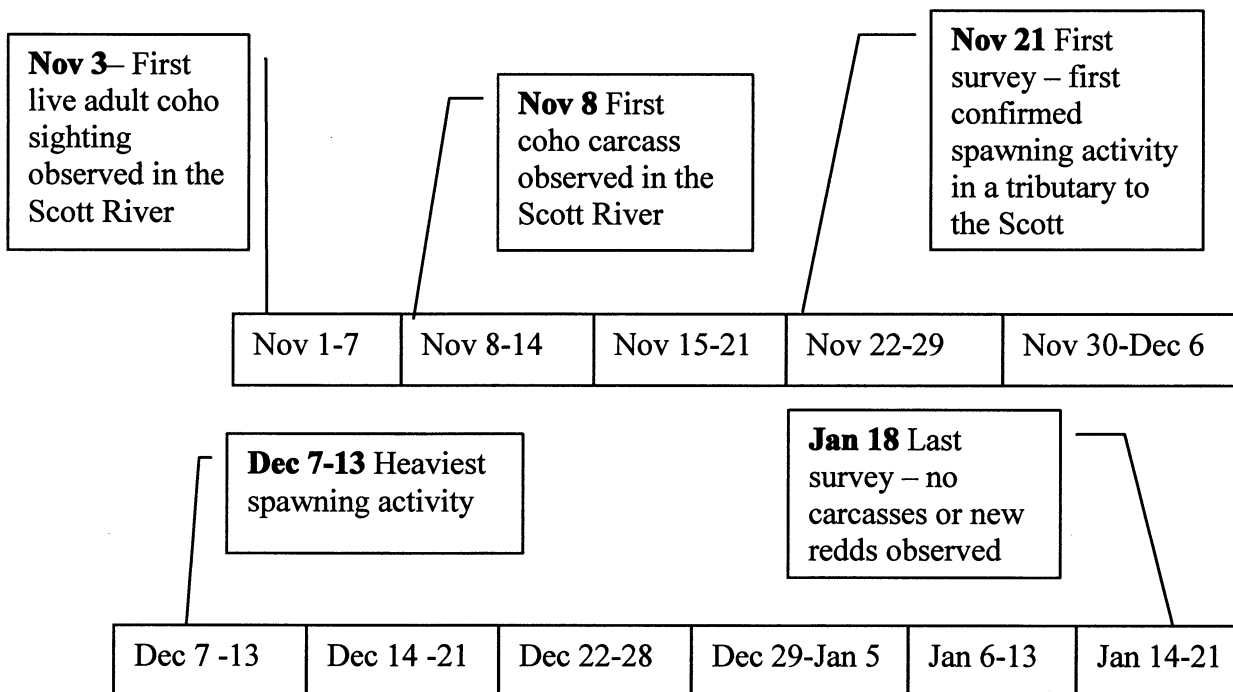


Figure I. Adult coho run timing in the Scott River – 2007/08

Initial coho sightings

The first sighting of live coho adults in the Scott River was on 11/03/07, at the Scott River Weir, just upstream of Indian Scotty Campground (CDFG). By November 8th, RCD crews had identified a coho carcass in Reach 14 on the mainstem Scott River and by 11/20/07 live fish had been documented in lower Sugar Creek. On 11/15/07, coho radiotagged by the Karuk Tribe were tracked a ¼ mile downstream of the mouth of Shackleford Creek and by 12/05/07 coho had been documented entering Shackleford-Mill, and French Creek.

Initial spawning period

The first documented coho spawning activity occurred in Middle French Creek on November 21st. By December 5th, active spawning and redd formation had been documented in most of the major tributaries including: Shackleford-Mill, French Creek, Sugar Creek, Etna Creek, as well as, the Scott River Tailings Reach.

Run timing in the tributaries

Date	Redds	Lives	Carcasses
11/30/2007	13	11	1
12/6/2007	3	11	2
12/12/2007	14	38	2
12/19/2007	7	2	11
12/31/2007	2	3	14
1/9/2008	0	0	4

Table I. Lower Shackleford Creek – Run timing

Shackleford Creek was connected throughout the coho season; however, fish densities did not peak until after the heavy rains of December 2nd. Following pulse flows in early December, peak spawning occurred between December 12th and December 19th. Large numbers of carcasses were found beginning December 19th. No new spawning activity or live fish were observed after December 31st.

Date	Redds	Lives	Carcasses
11/20/2007	0	2	0
11/30/2007	1	1	1
12/6/2007	1	64	1
12/11/2007	0	0	1
12/18/2007	0	40-45	1
12/27/2007	1	55+	0
1/2/2008	0	30	1
1/11/2008	0	3	3
1/15/2008	0	2	2

Table II. Lower Sugar Creek – Run timing

A total of 3 redds were documented during the 2007/08 survey season. The run timing of Sugar Creek mirrored that of Shackelford Creek, with peak influx of adults occurring around the first week of December and activity tapering off after January.

Similar to 2004, in 2007, spawning in the Lower Sugar Creek Reach was limited due to a lack of adequate spawning gravels. Additionally, a natural barrier caused by low flows and a braided stream channel is thought to have impeded adult coho passage upstream of highway three. This potential barrier could have affected the ability of coho to access the upper Sugar Creek reaches.

Date	Redds	Lives	Carcasses
12/5/2007	0	1	0
12/11/2007	10	3	0
12/18/2007	6	5	1
12/26/2007	3	5	4
1/3/2008	6	1	8
1/11/2008	2	0	0

Table III. Mid-Patterson – Run timing

In Patterson Creek the majority of documented spawning occurred between December 11th and January 3rd. However, new redds were identified after the first week of January.

Date	Redds	Lives	Carcasses
12/14/2007	5	0	1
12/21/2007	7	13	0
1/7/2008	5	9	2
1/15/2008	0	0	1

Table IV. Lower East Fork Scott River – Run timing

Spawning activity in the Lower East Fork occurred between December 14th and January 7th.

Summary

Moderate precipitation increased flows in the Scott River to 1400 cfs on October 19th. The flow regime peaked two more times during the coho run, to a lesser extent, on November 20th and January 4th. Most tributaries gained connectivity on October 19th and remained connected throughout the survey season. In general, run timing peaked around the second and third week of December with spawning and live fish activity tapering off after the first week of January.

Redd Survey Results

The survey season lasted from November 20th, 2007– January 18th, 2008. During this period a total of 259 redds, 130 carcasses, and 599 live fish were identified. However, in reaches surveyed weekly some fish were likely double counted. This is because fish generally spawn for several days, and could still be on the redd during the next survey.

Due to lack of access, staffing, or connectivity several reaches were not surveyed including: Middle Mill, Emmigrant Creek, Middle Kidder, Lower Etna Creek, Ruffy Gap, Upper French (Duck Lake Area), Upper French (Upper bridge to Horse Range), Horse Range Creek, Indian Creek, Johnson Creek, Kangaroo Creek, Moffett Creek, North Fork French, and Rail Creek. Additionally, both the Lower Patterson and Upper Masterson reaches were only partially surveyed because of breaks in access.

Due to operator error, a large number of redds in Lower Shack-Mill reach did not receive GPS coordinates but were flagged. In order to obtain geospatial data for redds in that reach, the crew on a subsequent survey recorded the location of every flagged redd but did not record redd dimensions.

Table V. Results by Reach, documents the redds, carcasses, and live fish identified during the survey season.

Table V. Results by Reach 2007-2008

Stream	Reach Description		Mileage	Live Fish ^a	Carcass ^a	Redds
Boulder Creek(Scott)	Lower	Lower Bridge to Scott	0.20	0	0	0
Canyon Creek (Index)	Lower	Lower 1.1 miles	1.10	0	0	2
Clarks Creek		TP property	NS	NS	NS	NS
East Fork -Lower Masterson (INDEX)		~ 1 mile above Grouse Cr. To below Grouse	1.40	19	4	17
East Fork Upper Masterson		Above Rail Creek to Kangaroo Creek	5.10	3	0	2
East Fork*	Upper	Gregg Ranch	NS	NS	NS	NS
Emmigrant (trib to Mill)	Lower	Mouth up	NS	NS	NS	NS
Etna*	Lower	Hwy 3 to mouth	NS	NS	NS	NS
Etna	Middle	Split Reach (formerly Lower Etna)	1.00	14	0	5
Etna	Upper	Mill Creek to City Diversion	1.60	0	0	0
French Creek	Lower	Hwy 3 to mouth	0.70	22	14	13
French Cr. (INDEX)	MID	From confluence with Miners down	0.80	-	-	9
French Creek	Middle	From bottom of Mid-to just above Hwy 3	0.83	30	9	11
French Creek	Upper	Upper Bridge to Horse Range	NS	NS	NS	NS
French Creek*	Upper	Paynes Creek area	0.50	0	0	1
French Creek*	Upper	Duck Lake area	NS	NS	NS	NS
French Creek		Below N Fork to mouth of Miners	1.00	0	0	3
Grouse Creek (trib to East Fork)	Lower		0.60	0	0	0
Horse Range Cr. (trib to French)			NS	NS	NS	NS
Indian Creek	Upper		NS	NS	NS	NS
Johnson Creek	Upper		NS	NS	NS	NS
Kangaroo	Middle	USFS	NS	NS	NS	NS
Kangaroo*	Lower		NS	NS	NS	NS
Kelsey Creek		Barrier to mouth	0.60	2	0	2
Kelsey Spawning Channel		USFS artificial spawning channel	0.20	0	0	0
Kidder Creek	Lower	Below Hwy 3	1.10	7	0	5
Kidder Creek	Middle	Mid Kidder - above Hwy 3	NS	NS	NS	NS
Kidder Creek	Upper	Upper FGS	0.50	0	0	2
Mcadams			NS	NS	NS	NS
Meamber Gulch	Lower		NC	NS	NS	NS
Middle Creek	Lower		0.40	0	0	0

a, - for index reaches, live fish counts and carcass counts could not be separated from the overall reach on that stream. Total counts are referred to under the 2004 reach designation.

NC= Not connected, NA = No access, NS = not surveyed

* = New reach in 2004

Shaded reaches surveyed in 2001-2002

Scott River Adult Coho Spawning Ground Surveys 2007-2008

Stream	Reach Description		Mileage	Live Fish ^a	Carcass ^a	Redds
Mill Creek (Shackleford)	Middle	Above Quartz Valley Road Bridge	NS	NS	NS	NS
Mill Creek (Shackleford)	Upper	Lowest FGS to Bridge	0.50	3	0	4
Mill Creek (Shackleford)	Lower a	Lower .6 miles of Mill Creek	0.60	39	24	34
Mill Creek (Shackleford)*	Lower b	From Quartz Valley Rd Bridge to top of Lower a	1.00	20	8	23
Miners Creek	Lower a	lowest .3 mi	0.3	30	3	6
Miners Creek	Lower b	Upper Phelps to top of Lower a	0.60	8	1	1
Moffet Creek	Middle	USFS	NC	NC	NC	NC
North Fork French	Lower		NS	NS	NS	NS
Patterson*	Lower		1.30	24	0	9
Patterson	Middle	Lower FGS to Hwy 3	1.60	15	15	27
Patterson	Upper	Uppermost FGS from Falls down	0.30	24	0	9
Patterson (Fort Jones)	Lower		NC	NC	NC	NC
Rail Creek	Upper	USFS	0.50	0	0	0
Rattlesnake Creek	Upper		NC	NC	NC	NC
Ruffy Gap (trib to Etna)		Lowest	NC	NC	NC	NC
Scott Bar Mill	Lower	Lower	0.40	0	0	1
Scott Bar Mill	Upper	Upper	0.70	0	0	0
Shackleford - 2004*	Lower	Mile 2 to Lower Bridge	1.67	53	25	34
Shackleford	Lower	Lower Bridge to Scott	0.50	30	8	5
Shackleford	Upper	Shackleford at the falls	0.50	2	0	3
Tompkins Creek	Lower	Mouth up	1.80	0	0	0
Tompkins Creek	Upper	Low water crossing to Potatoe Patch	1.00	0	0	0
South Fork (INDEX)	Lower	USFS	0.40	7	0	1
South Fork (INDEX)	Upper	Above Fox Creek to Boulder Creek	1.90	38	2	16
Sugar Creek (INDEX)	Lower	Hwy 3 to mouth	0.70	191	10	3
Sugar Creek	Upper	From Upper FGS bridge to CattleGuard	2.10	0	0	0
Scott River Tailings		Rm 53.45-52.35	1.10	-	-	0
Scott River Talings- 2004*		Rm 55-53.45	1.65	18	3	8
Wildcat		Lower 2 miles	2.00	-	-	3
Totals			40.75	599	126	259

a, - for index reaches, live fish counts and carcass counts could not be separated from the overall reach on that stream. Total counts are referred to under the 2004 reach designation.

NC= Not connected, NA = No access, NS = not surveyed

* = New reach in 2004

Shaded reaches surveyed in 2001-2002

Flow Conditions

Moderate precipitation as snow and subsequent cold temperatures resulted in relatively low flows during the 2007/08 survey season. The largest flow event occurred on October 19th and allowed for most major tributaries to regain connectivity. The flow regime peaked two more times, to a lesser extent, on November 20th and January 4th. Overall, flows during the survey period were fairly low and consistent with only a few instances of high water. These conditions were ideal for the observation and positive ID of live fish and redd formation.

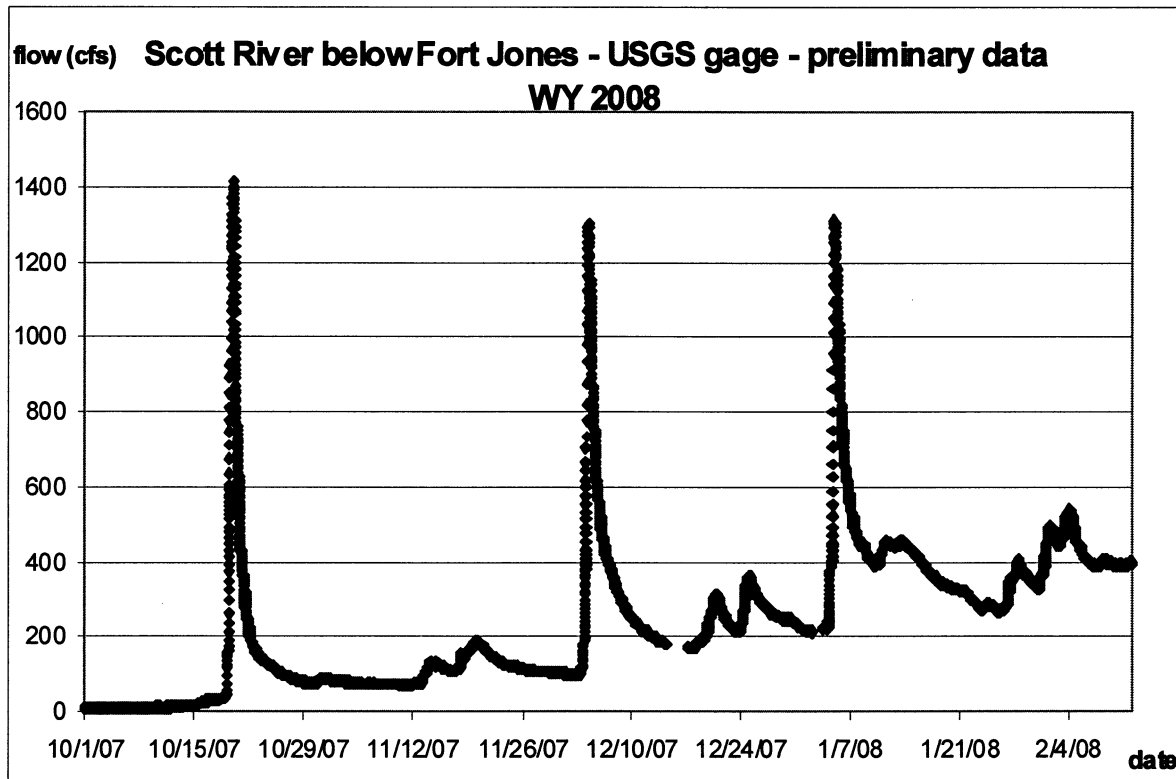


Figure II. Streamflow at USGS gauge during survey period. (Note: USGS data is preliminary only.)

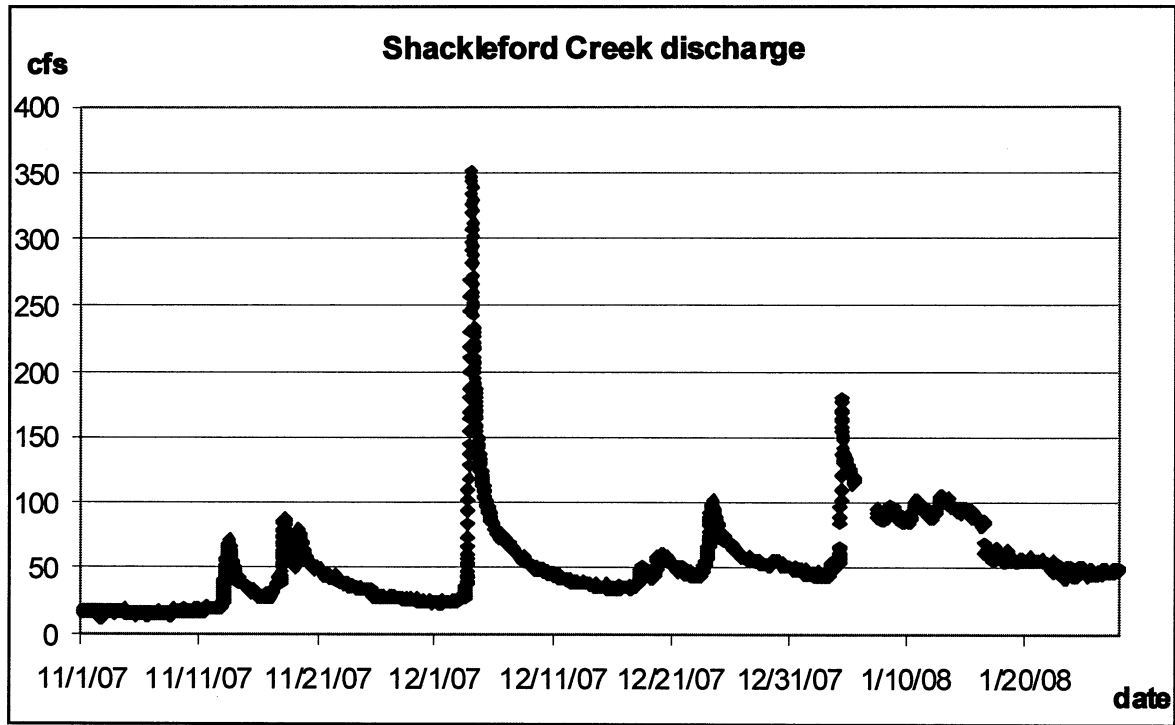


Figure III. Streamflow below the Quartz Valley Rd Bridge during the survey period.

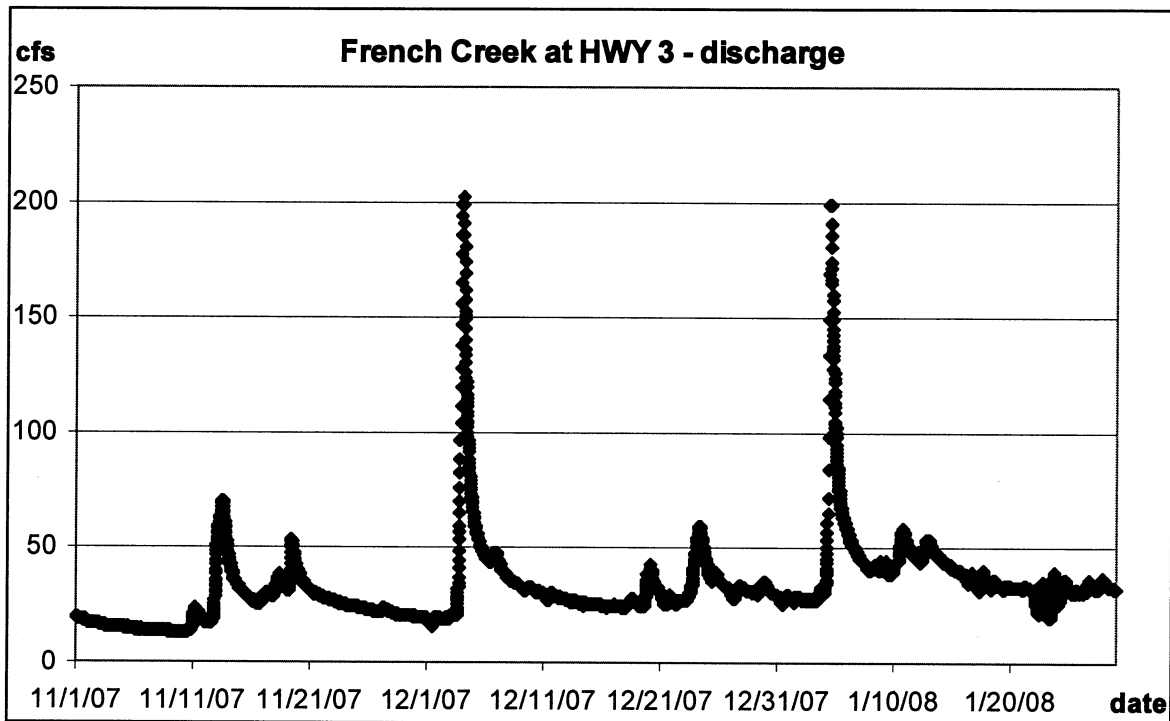


Figure IV. Streamflow at the Highway 3 Bridge during the survey period.

Positive Identification of Fish

In all reaches surveyed weekly there was a low incidence of fish on redd observations. Positive identification of fish on redds was as low as 9% in Middle French creek, and as high as 64% in Lower Shackleford Creek. The percentage of the total redd observations that included a confirmed coho on redd for the 2007/08 survey season was 29%. Variables that could have influenced a crews ability to document fish on redds include: the skittish behavior of coho salmon, the abundance amount of cover in particular reaches, and the infrequent survey schedule.

Another possible source of positive fish and redd identification error was the presence of Chinook salmon during the coho run. In 2007, the Chinook run was late entering the Scott River and Chinook were observed spawning in the tributaries until mid-December.

Biological Sample Collection

A total of 130 carcasses were recovered in the Scott River Watershed. Of those identified, 54 (47%) were male and 62 (53%) were female. Crews were unable to determine the sex of fourteen carcasses due to heavy predation. The average fork length for male carcasses was 69.1 cm with a range of 58-63 cm. The average fork length for females was 65.6 cm with a range of 57-78 cm. In addition, three Chinook carcasses were recovered during the survey period.

Tissue and scale samples were collected from 103 carcasses (45 males, 58 females). Otoliths were collected from 94 carcasses (45 males, 52 females).

CDFG Scott River Weir

In the fall of 2007, the California Department of Fish and Game (CDFG) installed and operated an Alaskan style weir just upstream of Indian Scotty Campground. The weir included a camera flume and operated during the coho salmon run. Recording began on 10/30/07 and the first coho was recorded on 11/3/07. The last coho was recorded migrating through the weir on 12/20/07 and the weir was removed on 1/3/08. The preliminary total count of coho observed at the weir stands at 1300. (Pers. Comm. Diana Chesney, CDFG)

Stream Temperature

Stream temperature data was collected at hourly intervals during the late fall/winter of 2007/08 in several tributaries including: Lower East Fork, Lower South Fork, Lower Sugar, Mid-French, and Lower Mill. Temperatures in the selected tributaries varied significantly. Shackleford-Mill Creek is on average 2-4 °C warmer than all others measured. Both Sugar Creek and French Creek approach 0 °C during the coldest months. The effects of stream temperature on adult spawners are very much unknown. However, stream temperature plays a large role on the incubation and emergence rate of juvenile salmon.

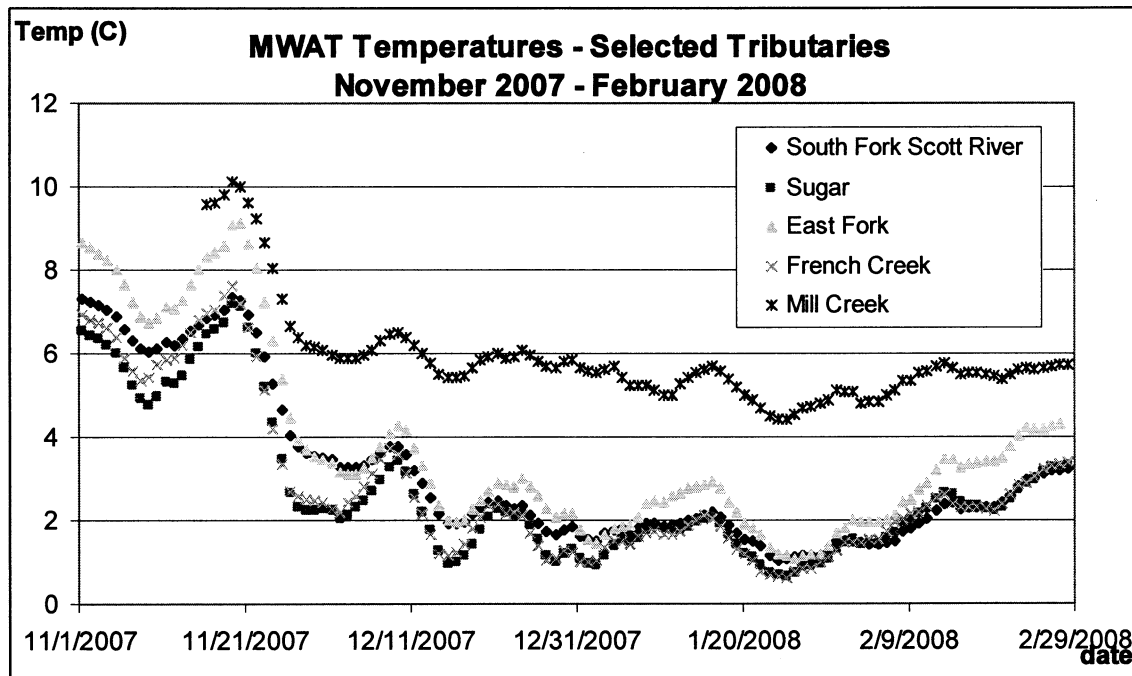


Figure V. MWAT Temperatures for Selected Tributaries

Site Specific Factors

During redd surveys, redd dimensions (length, width, pott depth), and substrate composition were measured when it would not cause disturbance to the spawning fish.

See **Table VI. Site Specific Factors**, for average conditions by reach.

Stream	Reach	Ave Length (M)	Ave Width (M)	Ave Pott Depth (M)	Substrate Dominant/ Sub-dominant	Total Redds Measured
Canyon	Lower	2	1	0.14	2/3	1
East Fork	Lower	2.75	1.21	0.18	2/3	17
East Fork	Upper	1.8	1	0.15	?	2
Etna	Mid	2.62	1.10	0.19	1/2	4
French	Lower	3.08	1.48	0.19	2/3	13
French	Mid	1.64	1.31	0.24	2/1 & 2/3	9
French	Middle	3.36	1.50	0.27	2/3	11
French	N. Fork Area	2.88	1.13	0.16	2/1	4
Miners	Lower A	2.32	1.21	0.10	1/2	5
Miners	Lower B	0.94	0.60	0.21	1/2	2
Kelsey	Lower	2.50	1.25	0.14	2/3	2
Kidder	Upper	3.75	2.80	0.13	2/3	2
Kidder	Lower	2.16	1.12	0.22	?	5
Mill	Lower	3.74	1.53	0.17	2/3	14
Mill	Lower A	3.74	1.45	0.26	2/3	28
Mill	Lower B	3.59	1.25	0.25	2/3	21
Mill	Upper	3.19	1.56	0.15	2/3	4
Patterson	Lower	1.84	0.97	0.15	?	6
Patterson	Middle*	2.76	1.17	0.27	2/3	25
Patterson	Upper	2.74	1.19	0.16	2/3	9
Scott	Tailings	2.68	1.31	0.16	2/3	8
Shackleford	Lower	2.76	1.48	0.22	2/3	5
Shackleford	Lower*	3.34	1.54	0.28	2/3	33
South Fork	Lower	5.50	1.50	0.08	2/3	1
South Fork	Upper	1.77	0.95	0.20	2/3	16
Sugar	Lower	3.33	1.05	0.18	1/2 & 2/1 & 3	3

Table VI. Site Specific Factors

Mark and Recapture

In 2007/08, mark and recapture efforts were unsuccessful. Crews were unable to tag a significant number of fish due to the small number of carcasses recovered. Additionally, very few tagged carcasses were recaptured. Environmental variables such as deep pools, dense woody debris, and predation could have affected recapture rates. Without a sufficient number of marks and recaptures (>25), Schaeffer and Peterson population estimates could not be completed to a reasonable level of accuracy.

Extent of Spawning and Habitat Characterization

Flow conditions during the survey period (November 20th – January 18th) allowed for distribution of coho spawning throughout most of the basin. Coho were observed in all tributaries surveyed with the exception of: Middle Creek, Boulder Creek(Scott), Boulder Creek (S. Fork), and Grouse Creek. In addition, lack of connectivity prevented access to Moffet-McAdams, Rattlesnake Cr., Indian Creek, and Patterson Cr. (Fort Jones) The following is a description of spawning distribution, and habitat characterization by tributary, for selected survey reaches.



French Creek

French-Miners Creek was surveyed in six reaches totaling 5.93 miles. Three reaches were surveyed weekly: Lower French Creek, Mid- French Creek, and Miners Creek. Additional reaches surveyed once were French Creek near Paynes Creek, French Creek below the North Fork, and North Fork French Creek. French Creek near Duck Lake Creek and lower Paynes Creek were not surveyed. See **Map 1** for redd distribution. The upper extent of spawning documented was approximately $\frac{1}{4}$ mile upstream from the confluence of Paynes Creek. However, the heaviest spawning activity was French Creek below the confluence of French and Miners Creek, and in lower Miners Creek. Surveys have never been completed in Miners Creek above the .9 mile point, spawning likely occurs above this point.

Habitat Characterization - Mid French

The section from Miner's Cr. confluence to the lower Miner's Cr. Road bridge (Index Reach in 2001) offers a combination of frequent occurrence of spawning gravels with exceptional cover. Large amounts of the available spawning gravels appeared to have a high occurrence of fine sediment interspersed, with the occurrence of sand (DG) in many redds. This reach has a relatively mature riparian corridor mostly comprised of alders with an under story of willows, small trees, shrubs and blackberries. The channel is relatively well populated with small and

larger wood, creating several log jams. A large amount of stable undercut banks exist and overhanging terrestrial vegetation is prevalent. The majority of the spawning coho were observed utilizing areas of suitable gravel adjacent to the channel margins, perhaps to gain the benefit of terrestrial cover and areas sheltered by wood. The one observed side channel had limited spawning, probably because this was one of the few areas that did not offer any overhead cover.

From the Miner's Cr. Road bridge down there is a younger riparian corridor that consists mostly of willows and small alder. This area has good to excellent occurrence of spawning gravel and several areas of utilized side channel / ditch inlet. Most side channel/ ditch inlet locations were utilized by at least a pair of salmon. Spawning was usually along a margin, near optimal overhead cover.



Shackleford-Mill Creek

Shackleford

Two reaches were surveyed in Shackleford Creek. See **Map 2** for redd distribution. Spawning was documented in the upper reach, below the falls.

Mill Creek

Three reaches were surveyed in Mill Creek. The lower reach (2 mi) was established as a mark and recapture reach. See **Map 3** for redd distribution.

Habitat Characterization –Lower Mill Creek

This reach exhibited large amounts of suitable sorted spawning gravel. Most of the available gravel appeared to be low in interspersed fine sediment. Coho were observed spawning throughout the reach, mostly utilizing channel margins and side channels that offered direct cover from riparian vegetation (mostly willow, alder, sedge, blackberry), due to the small channel size and ideal substrate (gravels). Coho were also found in more mid-channel locations without direct cover from the surrounding riparian. The riparian corridor is mostly intact but less mature and not as wide as some reaches surveyed. Moderate amounts of small wood and larger wood were interspersed throughout reach.

The existence of a huge beaver dam at the lower end of the reach created an area that has multiple side-channels surrounded by cover (mostly willow) creating a point on the stream that has greatly increased habitat for spawning and rearing.

Habitat Characterization - Lower Shackleford

The stream channel is considerably larger (flow volume and wetted width) than Lower Mill Cr. because of the influence of Shackleford Creek. This reach maintains a good riparian corridor and decent wood occurrence, until the last 1/3 mile. The last 1/3 mile of Shackleford has no riparian or channel structure. Overall the reach has excellent gravel quality and occurrence with little fine sediment. Spawning was throughout this reach, with side-channels highly favored. Also main stem margins were utilized in association with overhead cover. Relatively large amounts of side-channels that were connected during the time of spawning started to become de-watered due to low flows caused by extreme cold weather.

East Fork Scott

The East Fork Scott River was surveyed in two reaches: Lower Masterson Road, Upper Masterson Road for a total of 6.5 miles. The biggest gap in this survey effort was the lower five miles from Grouse Creek to the confluence with the South Fork. Spawning likely occurs in this reach, however, access was not granted to survey.

South Fork Scott

The South Fork Scott River was surveyed in two reaches totaling 2.3 miles. See **Map 4** for redd distribution. The Lower South Fork is approximately .4 miles of USFS land just behind the town of Callahan. The Upper South Fork reach is from 800 meters upstream from Fox Creek to Boulder Creek. The biggest gap in the survey is approximately 2 miles between Boulder Creek and the lower South Fork, due to lack of access.

During this survey period no spawning was observed in the Lower South Fork reach. The uppermost extent of spawning was in the Upper South Fork Reach. The spawning habitat available in the South Fork of the Scott is not comparable to that found in many other tributaries (such as Shackleford Mill or French Creek). This is due to the higher gradient, and larger substrate size.

Habitat Characterization – Upper South Fork

This reach appears to be largely limited for spawning by the area of sufficient sorted gravels and side channel occurrence. The small amount of side channels in the surveyed area – both natural and ditch inlets – were usually occupied with at least a single redd. Additionally, one ditch inlet

possibly had multiple redds. A few redds were observed in margins of the main channel when suitable gravel was associated with overhead cover. A large part of the reach did not have much suitable gravel. This is likely caused by a higher gradient channel and a stream structure impacted by historic mining and upslope management. Overhead cover in South Fork included terrestrial vegetation and an assortment of small and larger woody debris.

Sugar Creek

Sugar Creek was surveyed in two reaches totaling 2.8 miles: Lower Sugar Creek is Hwy 3 to the mouth, and Upper Sugar Creek is from mile 2 to mile 4. Low flows and a braided stream channel upstream of highway three prevented fish from accessing the upper sugar reach. The Lower Sugar Creek was not heavily used because of its poor stream bed composition consisting of mostly sand and small gravel.

Scott River Mainstem – Tailings Reach

The tailings reach was a total of 2.75 miles, beginning approximately 0.4 miles downstream from the confluence of Wildcat Creek to 1.5 miles downstream from Sugar Creek. Spawning was documented in the reach during late November through mid-December. Most of the spawning occurred in the upper section of the reach (above Sugar Creek) which had not been surveyed previous to 2004.

Etna Creek

Two reaches were surveyed on Etna Creek totaling 2.65 miles. The lower reach was not surveyed due to access issues. The upper extent of the survey was at the confluence of Mill Creek, at river mile 8.0. The upper extent of spawning was documented below the Etna City Diversion (RM 5.5).

Habitat Characterization –Middle Etna

The two reaches surveyed between the Etna City Diversion and Etna City were believed to be limited in spawning by the lack of suitable gravels. The area surveyed was a relatively large high gradient channel that contained substantial amounts of cobble. There is a good to excellent amount of cover from wood and riparian vegetation throughout the reach.

Patterson Creek

Three reaches were surveyed on Patterson Creek, totaling 2.9 miles. The lower reach (Lower Patterson) was a split reach, due to lack of access and was only surveyed once. The upper extent of spawning documented was approximately $\frac{1}{4}$ mile downstream from the falls at river mile 7.7. The heaviest spawning occurred in the middle reach, however; peak spawning might have been missed in the lower reach. See **Map 5** for redd distribution.

Habitat Characterization –Middle Patterson

This reach is relatively low gradient, with abundant suitable gravels. Gravels in this reach appear clean, with little sediment. Cover is abundant, in the form of woody debris, log jams, and riparian vegetation.

Kidder Creek

Three reaches were surveyed on Kidder Creek, totaling 2.40 miles. However, the lower two reaches were surveyed only once and incompletely due to issues with access. The highest survey reach was at 8.0 miles from the mouth. The upper extent of spawning documented was approximately one-half mile upstream from the Kidder Creek gauging station.

Scott Canyon Tributaries

Scott Bar Mill, Tompkins Creek, Middle Creek, Kelsey Creek, Canyon Creek and Boulder Creek were surveyed in the Scott River Canyon. Two reaches were surveyed in each of Tompkins Creek and Scott Bar Mill. Spawning was documented in Scott Bar Mill, Tompkins Creek, Kelsey Creek and Kelsey Spawning Channel and Canyon Creek. See **Map 6** for redd distribution.

Mill Creek (Scott Bar)

Two reaches of Mill Creek near the town of Scott Bar were surveyed once during the 2007/08 season. Both reaches were surveyed by CDFG staff on 1/02/07 and no live fish, redds or carcasses were observed.

Habitat Characterization –Lower Scott Bar Mill Creek.

This reach is low gradient, with pockets of abundant spawning gravels separated by larger cobble. The riparian corridor consists of large and small woody vegetation thick enough to prevent access to the stream in some places. No signs of coho salmon were seen in this reach. However, one redd without fish was observed below the low water crossing. (Pers. Comm. Jim Whelan, CDFG) Due to lack of access, the stream below this reach was not surveyed.

Discussion

Run Timing and Duration

Based on observations made at the Scott River Weir, located just upstream of Indian Scotty Bridge, coho had entered the Scott River as early as November 3rd, 2007 (CDFG). Flows during the 2007/08 survey period were relatively low due to moderate precipitation as snow and subsequent cold temperatures. However, a minor flood event on October 19th, 2007 increased mainstem flows to 1400 cfs and allowed most major tributaries to regain connectivity. Spawning activity and redd formation was observed in the tributaries by late November. In general, spawning activity peaked around the second week of December and tapered off by the first week of January. Run timing in 2007 peaked at approximately the same time as in 2004; however, in a few tributaries peak spawning occurred one week earlier or lasted several weeks longer.

Probable Overlap of Chinook and Coho Spawning

Most likely due to the flow regime, there was an observed overlap of the Chinook and coho runs in 2007/08. At the tail end of Chinook surveys crews recovered four (4) coho carcasses and observed coho actively spawning in the mainstem Valley reaches adjacent to Chinook. Additionally, following heavy rains that connected tributaries to the mainstem, Chinook carcasses were recovered in several tributaries including French Creek and Shackleford-Mill Creek.

Comparison to 2001/02 and 2004/05 Survey Results

Making comparisons between survey years is a difficult task. This is primarily due to the ever-changing nature of the survey effort. For example, in 2007/08, several reaches were surveyed incompletely or not at all due to a number of factors including: access, staffing, and environmental variables. In order to compare parameters across survey years it is necessary to standardize the survey universe. This often requires omitting discrepancies amongst survey years and splitting reaches after the survey. It must also be stated that these comparisons are not wholly accurate. Without surveying the entire extent of coho habitat each year it is not possible to make comparisons with full confidence.

The 2001/02 survey results do not directly compare to the two subsequent years for the following reasons: Due to the short time frame, volunteer nature, and flow conditions experienced during the 2001/02 surveys, most reaches were surveyed at most three times, including the index reaches. Flow conditions varied greatly during the 2001/02 survey period, with multiple winter storms in December making the stream unsurveyable.

Survey conditions in 2007/08 were similar to those of 2004/05. The flow regime was relatively stable and consistent low flows allowed for positive fish and redd identification. Additionally, moderate precipitation in mid-October reconnected most of the major tributaries and allowed for most reaches to be surveyed.

A comparison of only the reaches surveyed in both 2004/05 and 2007/08 shows a decrease in redds from 567 to 250. The number of redds observed under the 2001 reach designation in 2001/02, 2004/05, and 2007/08 are 205, 458, and 122, respectively.

References

California Data Exchange Center – Flow data for Shackleford and French Cr.

<http://cdec.water.ca.gov/cgi-progs/queryF?s=FCC>

<http://cdec.water.ca.gov/cgi-progs/queryF?s=SCK>

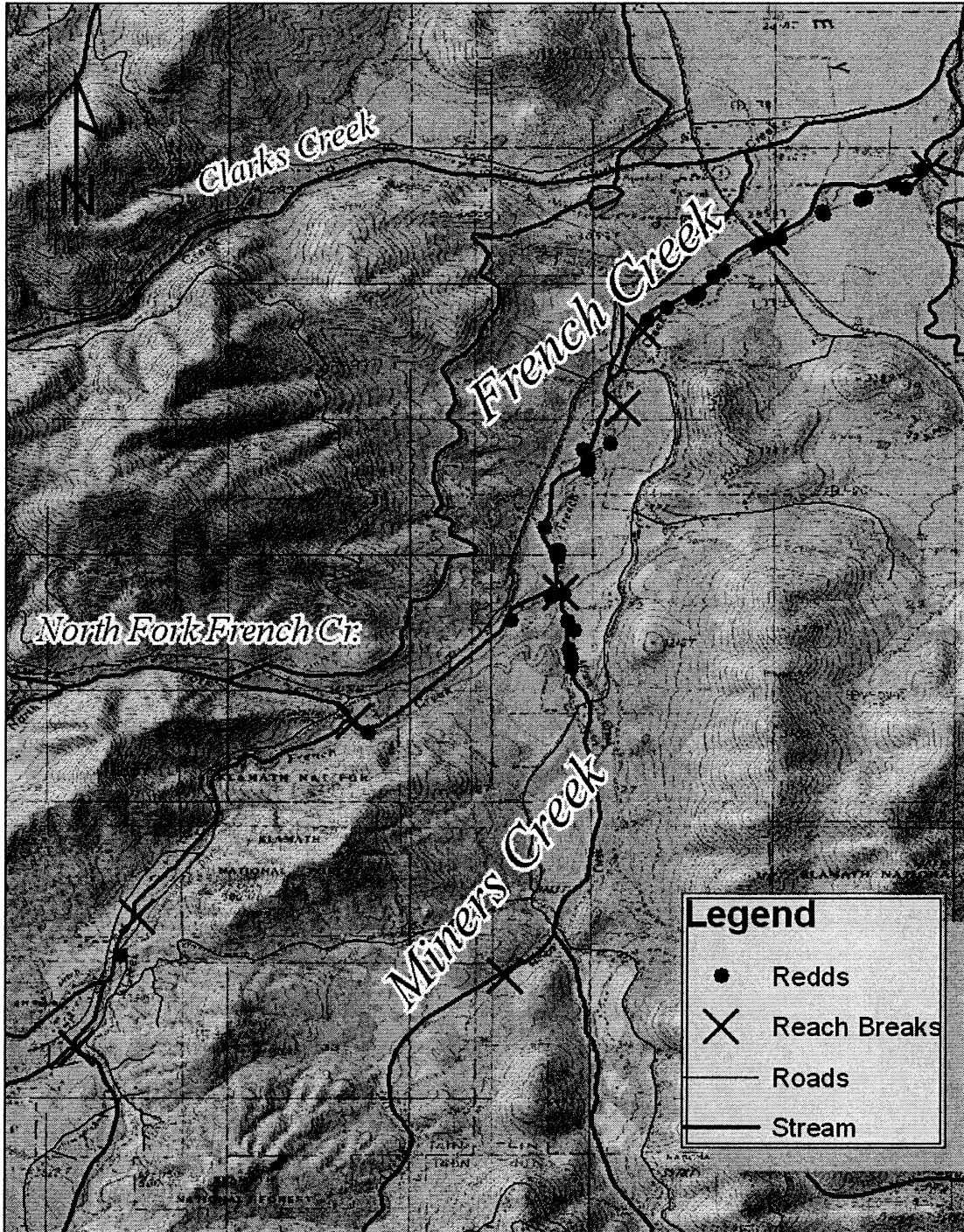
United States Geological Survey – Flow data for Fort Jones Gauge

http://waterdata.usgs.gov/ca/nwis/uv/?site_no=11519500

Quigley, D. 2004-2005 Scott River Watershed Adult Coho Spawning Ground Surveys 2005.
Siskiyou RCD

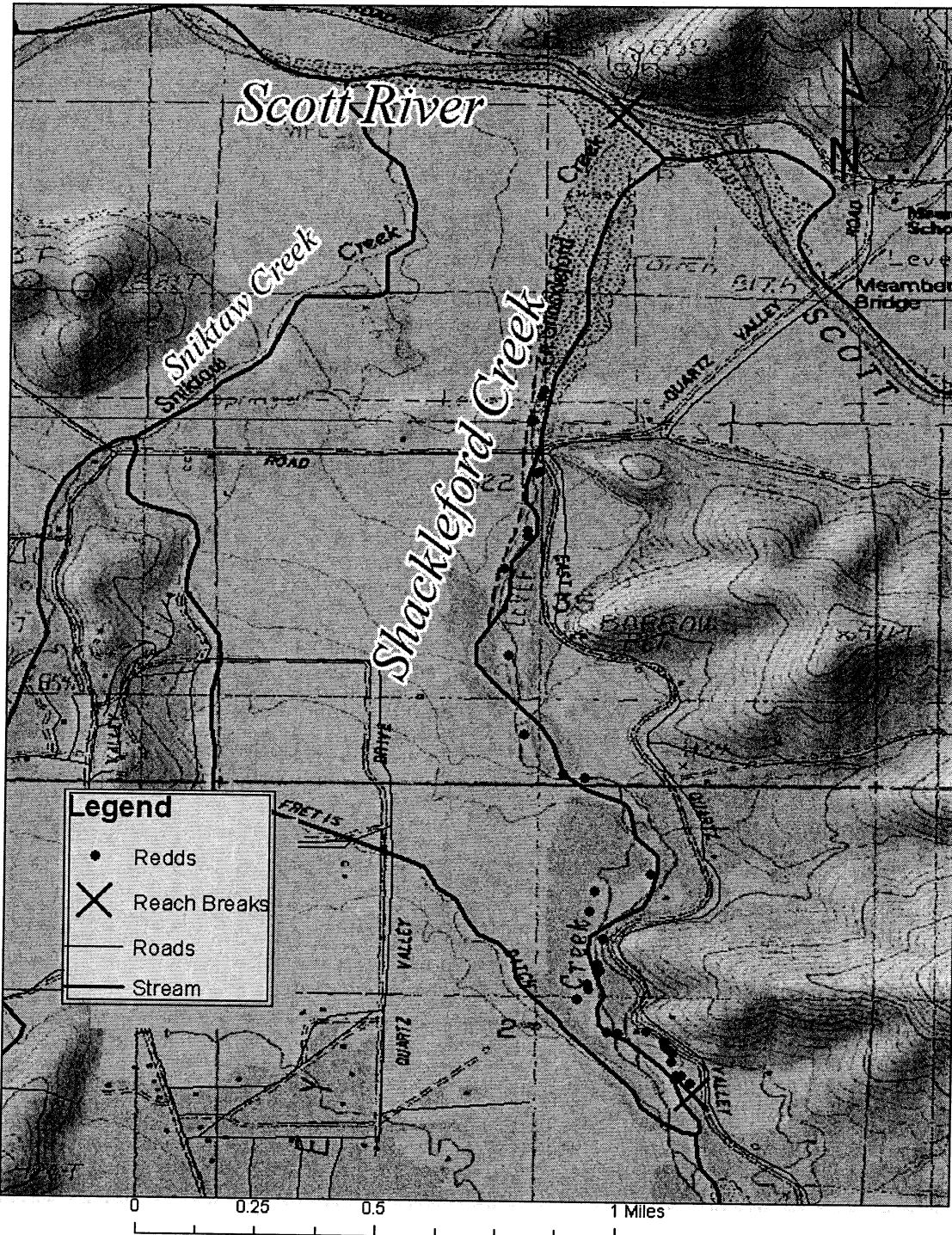
Map 1 – French Creek Spawning Distribution

Coho redds – French Creek – 2007-08



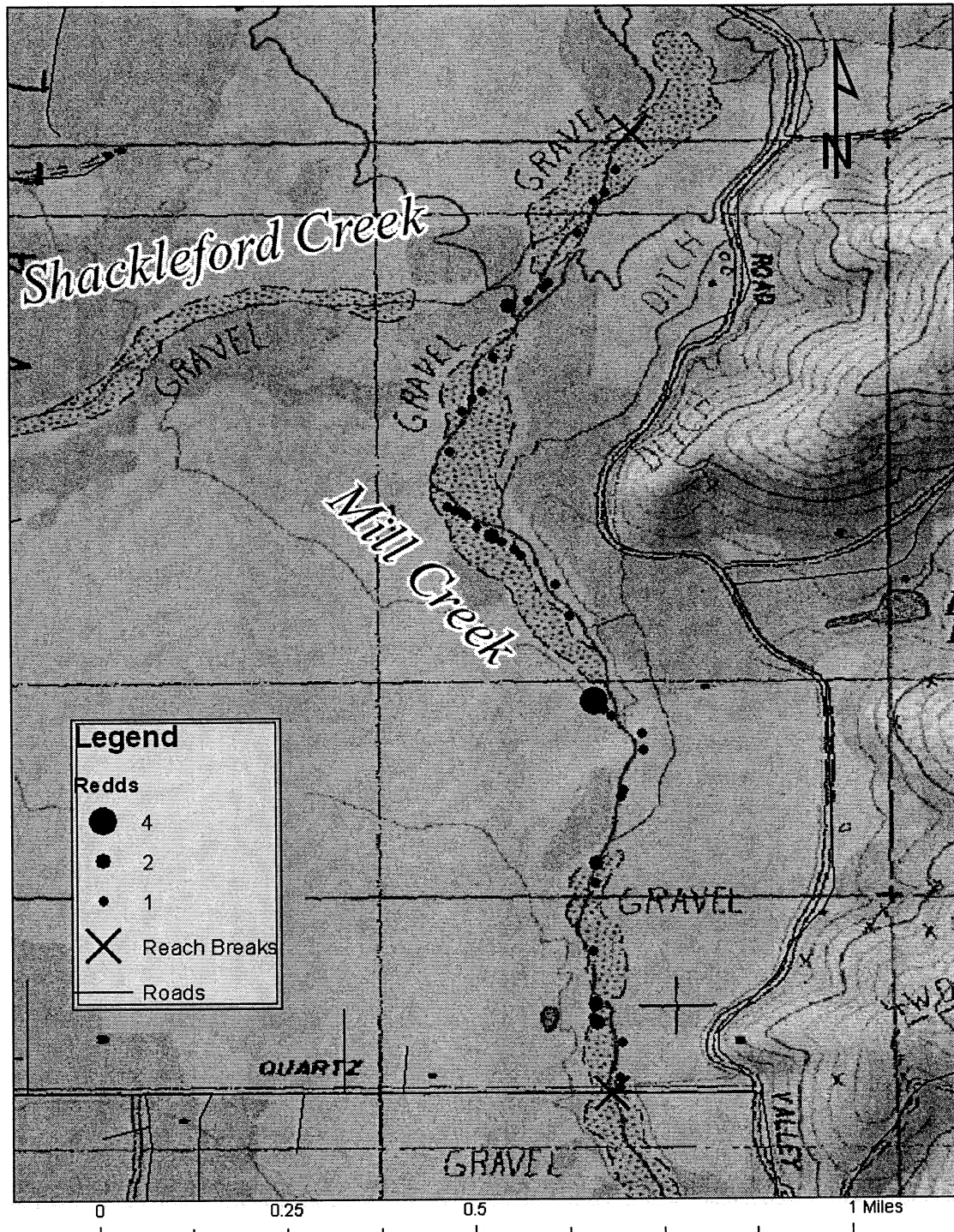
0 0.25 0.5 1 Miles

Coho redds - Shackleford Creek - 2007-08



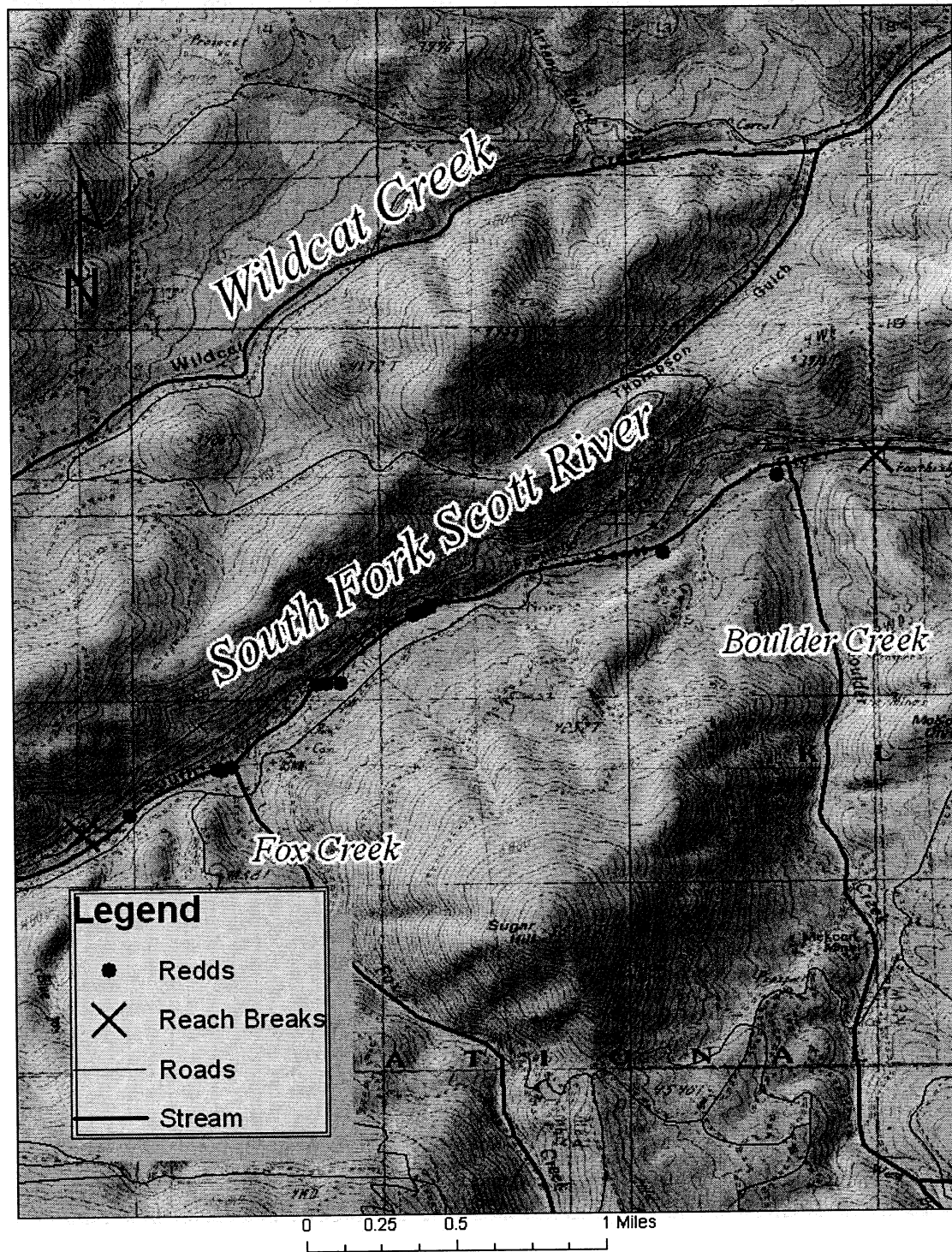
Map 2 - Shackleford Creek adult coho Spawning Distribution

Coho redds - Lower Mill Creek - 2007-08



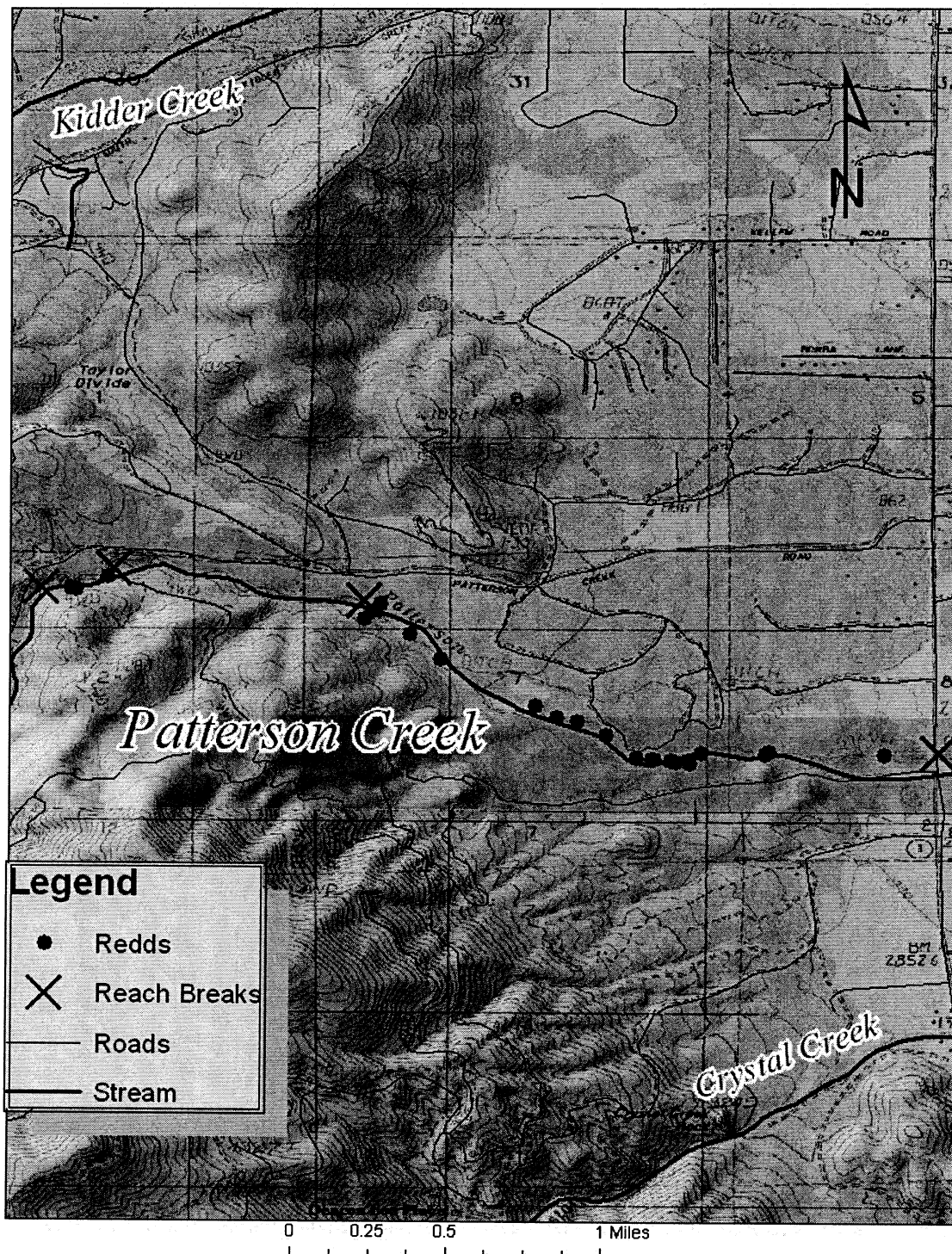
Map 3 - Mill Creek Spawning Distribution

Coho redds - South Fork Scott River - 2007-08



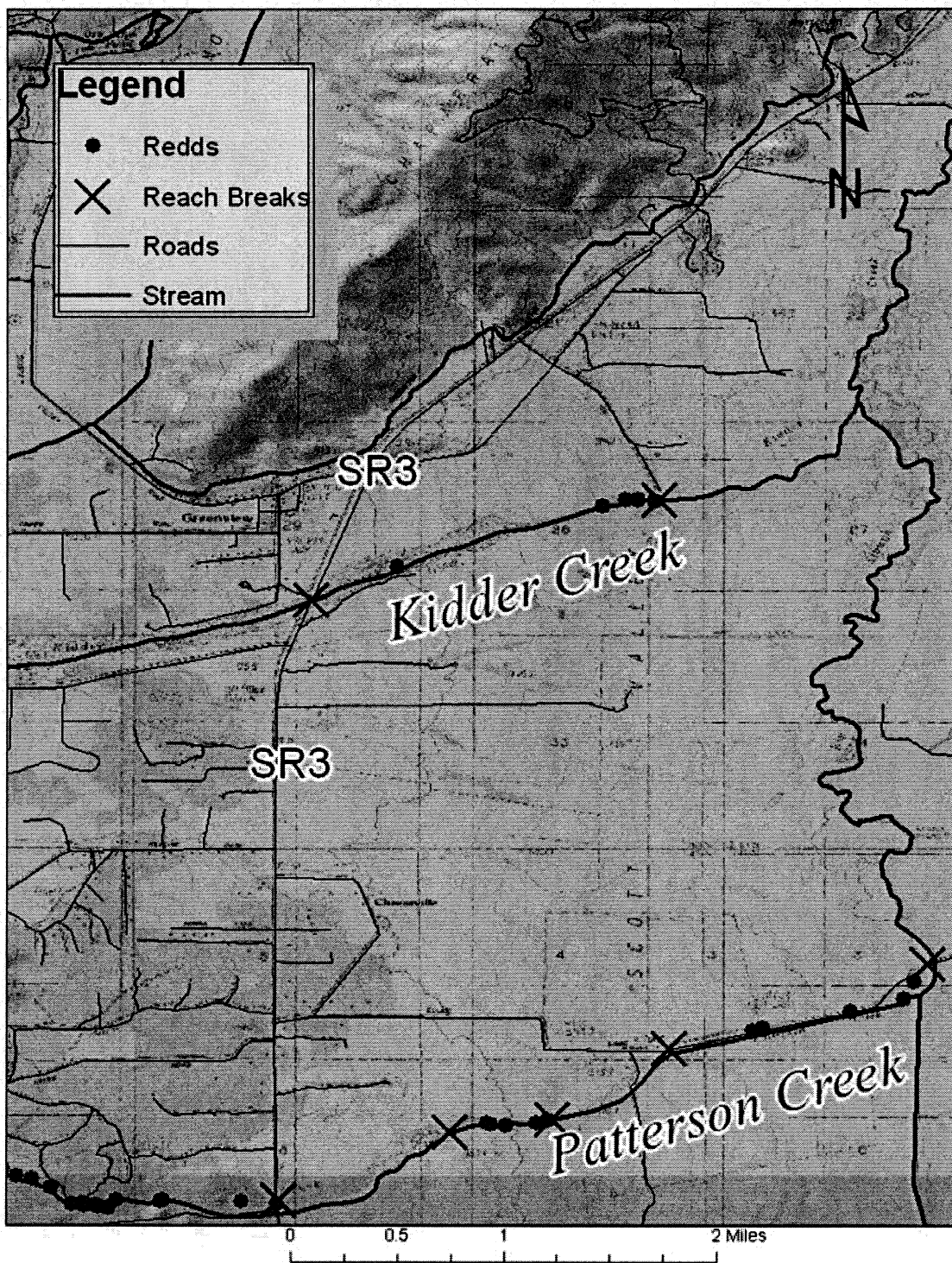
Map 4 - South Fork Scott River Spawning Distribution

Coho redds - Patterson Creek - 2007-08



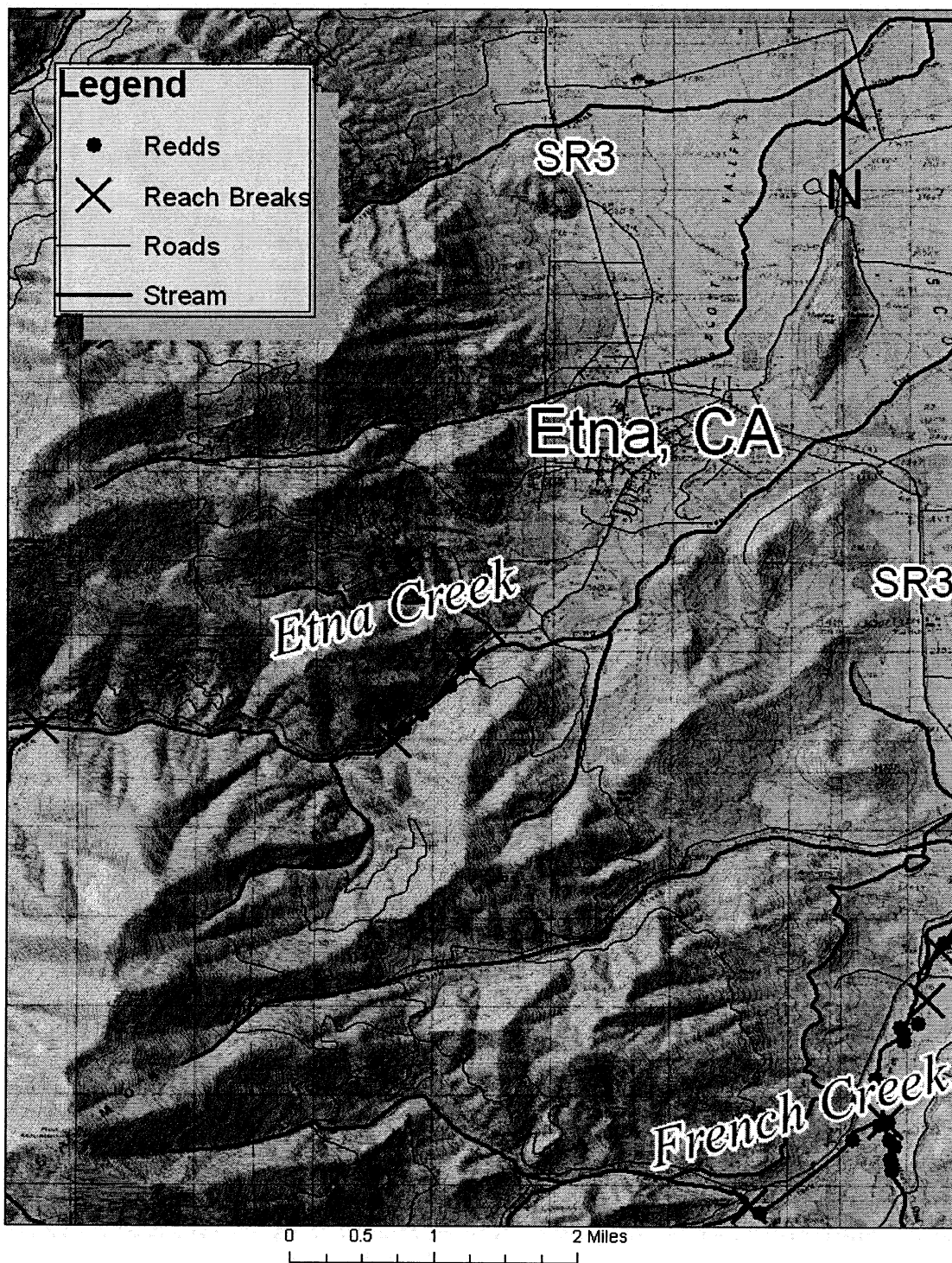
Map 5 - Patterson Creek above Highway 3 - Spawning Distribution

Coho redds - Kidder Creek - 2007-08



Map 6 - Kidder and Patterson Creek below Highway 3

Coho redds - Etna Creek - 2007-08



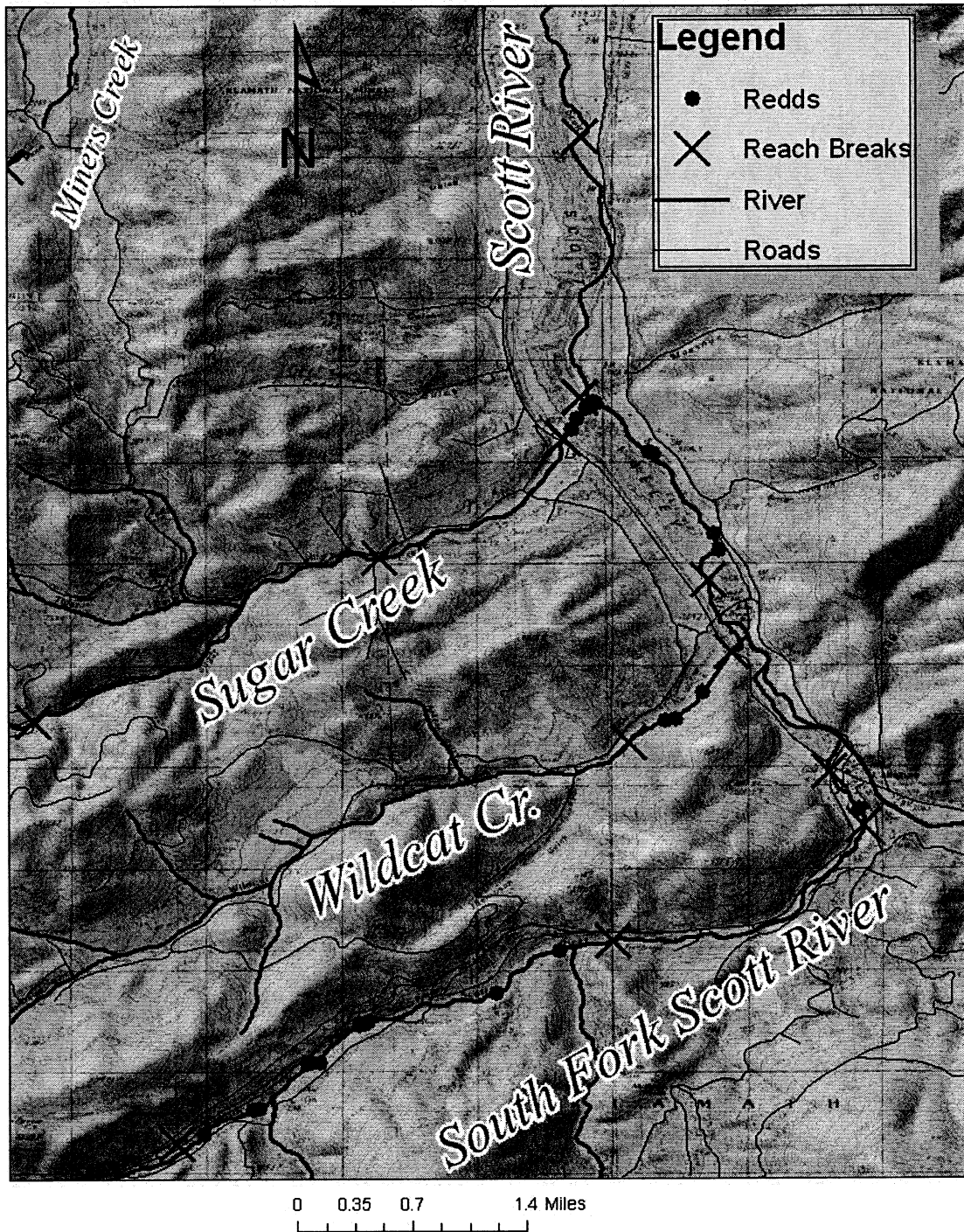
Map 7 – Etna Creek Spawning distribution

Coho redds - Scott River Tributaries - 2007-08



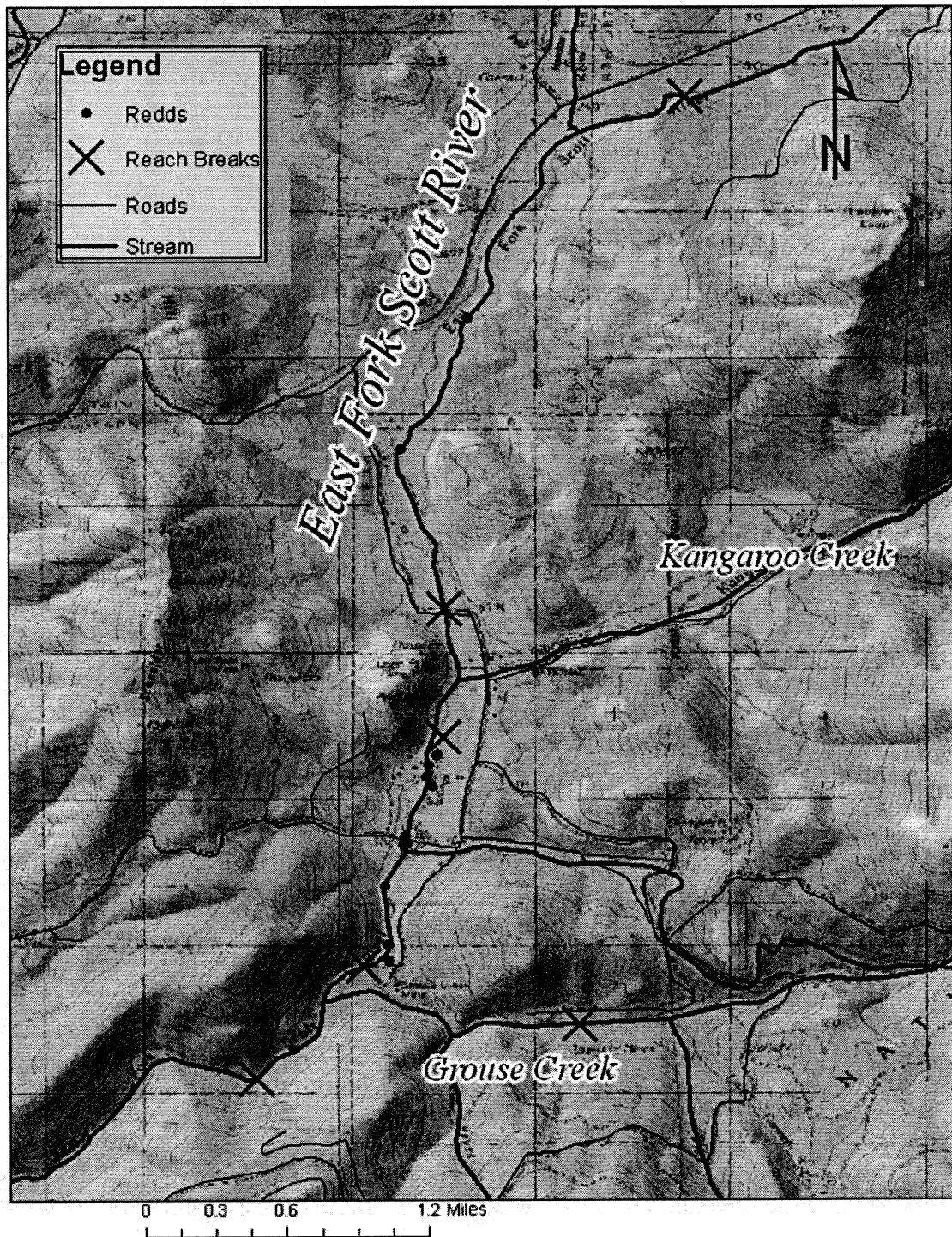
Map 8 – Scott River Tributaries Spawning Distribution

Coho redds - Sugar Creek, Mainstem Tailings, Wildcat Creek, & South Fork Scott - 2007-08



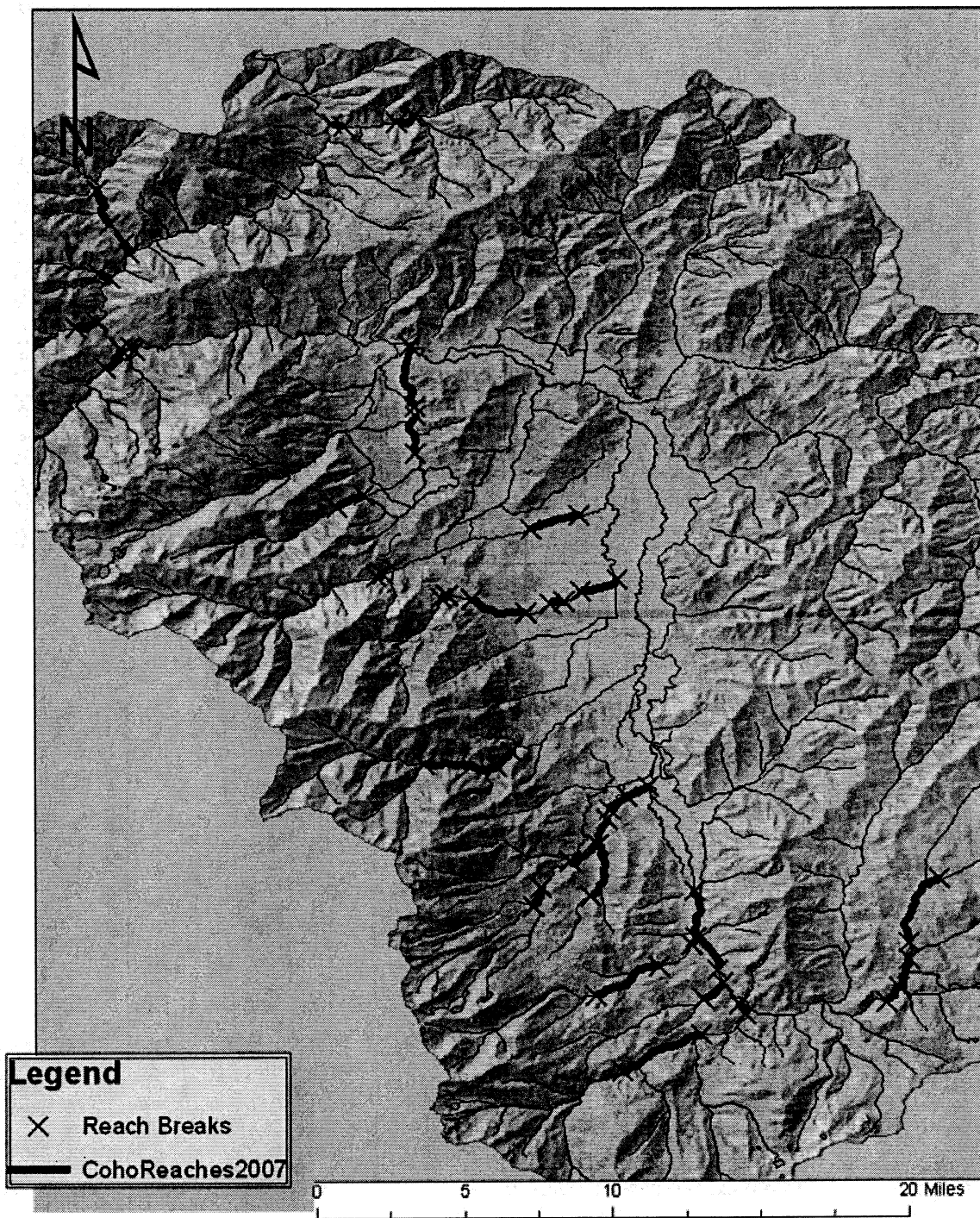
Map 9 – Scott River tailing reach and adjacent tributaries.

Coho redds - East Fork Scott River - 2007-08



Map 10 – East Fork – documented coho spawning.

Coho spawning ground reaches - Scott River 2007-08



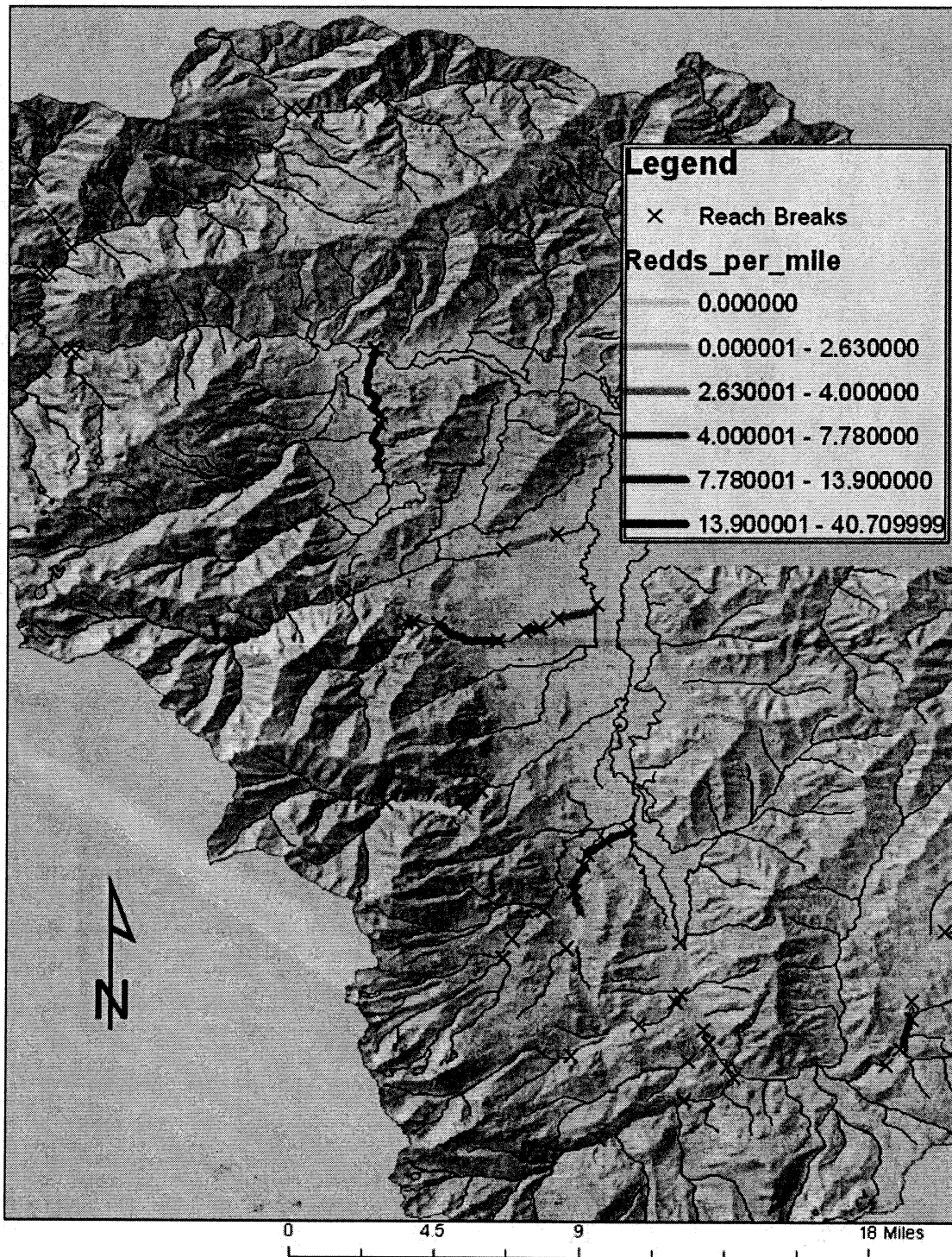
Map 11 – Reaches surveyed in 2007-2008 coho spawning ground surveys.

Scott River Adult Coho Spawning Ground Surveys 2007-2008

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

Table VII – coho redds per mile in Scott River during 2007-2008.

Scott River 2007-2008 - coho redds per mile



Map 12 – coho redds per mile in the Scott River during 2007-2008.

