

# Scott River Coho Salmon Spawning Ground Surveys 2023-2024 Season



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## Executive Summary

During the 2023-2024 coho salmon spawning season, staff from the Quartz Valley Indian Reservation (QVIR), Scott River Watershed Council (SRWC) and Siskiyou Resource Conservation District (SRCD) conducted spawning ground surveys on 38.3 miles of 17 streams in the Scott River watershed. Between November 2, 2023 and January 16, 2024, a total of 251 coho salmon redds and 168 carcasses were documented in the cooperative survey effort. The highest concentration of redds per survey mile were found at the Scott River at Sugar Creek Confluence, the Middle French Creek, the Lower and Middle Sugar Creek and the East Fork Scott River at Kangaroo Creek reaches.

An important observation for this cohort revealed a decrease in the number of redds within the Shackleford Creek and Mill Creek reaches in 2023-2024. In 2020-2021, nearly 44% of all the redds documented in the Scott River were within the Shackleford Creek and Mill Creek (SRCD 2021), the first major tributaries returning coho salmon encounter upon entering Scott Valley. On the contrary, the surveys carried out in 2023-2024 indicated that less than 10% of the documented redds were accounted for in those surveys.

Fall and early winter streamflow conditions play a crucial role in determining accessibility of various locations within the Scott Valley for returning salmonids. The comparison of environmental conditions and flow regimes between 2022 and 2023 may offer valuable insight into the necessary flow and timing required to allow distribution to the upper watershed. Additionally, 2020 experienced similar flow conditions as 2022 therefore this report documents a direct comparison on impacts to this cohort in several of the survey reaches.

The sections surveyed, highlighting the impact of flow-related distribution, are particularly noticeable in Etna Creek, Sugar Creek, and South Fork. In the 2020-2021 season, no redds were observed in either Sugar Creek or South Fork, primarily attributed to restricted access through the tailings reach of the Scott River caused by low flows. Likewise, there were no documented redds observed in the surveyed reach of Etna Creek in 2020-2021. However, in the 2023-2024 season, there was a notable increase in spawning density in Etna Creek, attributed to improved flow conditions that provided volitional passage. While the South Fork survey for 2023-2024 indicated just one documented redd, the first permissible surveys conducted in the East Fork during the same period identified 39 redds. This accounts for roughly 15% of the overall redd count. It is assumed that in 2020-2021, no spawning occurred due to fish passage problems within the tailings under low flow conditions.

## Introduction

The survey activities for the 2023-2024 period were conducted within the Scott River watershed, a sub-basin situated within the Klamath River Basin. Flowing through Siskiyou County, California, the Scott River is a significant tributary that joins the Klamath River at river mile 143 (RKM 238). Coho salmon (*Oncorhynchus kisutch*) typically return to the Scott River for spawning between mid-October and early January, overlapping runs of Chinook salmon (*Oncorhynchus tshawytscha*) and steelhead trout (*Oncorhynchus mykiss*) occurring from mid-September through early December and November through April, respectively.

The coho salmon within the Scott River system are classified under the Southern Oregon Northern California Coast (SONCC) Evolutionarily Significant Unit. Recognizing the significance of their status, the National Marine Fisheries Service (NMFS) designated coho salmon as threatened under the Federal Endangered Species Act in 1997. The State of California initiated discussions about potentially listing coho salmon as threatened in 2001. Anticipating a substantial run in the Scott River, the Klamath National Forest (KNF) took the lead in conducting the first cooperative spawning ground survey effort during the 2001 spawning season (Maurer 2002). This survey marked the beginning of a collaborative undertaking involving local landowners, various agencies, and dedicated volunteers. It was evident at that time that essential baseline population and distribution data were crucial for the implementation and assessment of effective restoration plans and initiatives.

In 2004, the California Fish and Game Commission took action to include coho salmon in the state's list of endangered and threatened species, and the official threatened listing took effect on March 5th, 2005. Since the inception of the surveys in 2001, the annual collection of coho spawning distribution data on the Scott River has persisted, providing valuable insights into the ongoing status of these vital populations.

Apart from the spawning ground surveys, data on coho salmon population, including run size and timing, has been collected since 2007 at the Scott River Fish Counting Facility (SRFCF), overseen by the California Department of Fish and Wildlife (CDFW). Positioned at river mile 18.2 (RKM 31), this counting station operates during the migration period of Chinook and coho salmon. It features a temporary weir that channels fish through a video flume, where their species is identified and counted. The information obtained from this video weir is integrated with downstream mark-and-recapture population estimates derived from the spawning ground surveys, contributing to the determination of escapement for the Scott River. Also being operated at the weir site is a passive integrated transponder (PIT) array. This includes an antenna fitted around the flume that detects and records data from previously PIT-tagged fish passing through the site. A summary of the adult coho salmon PIT tag detections in the 2023-2024 season is available (Appendix A).

The annual spawning ground surveys in conjunction with the CDFW SRFCF play a vital role in monitoring various parameters related to coho spawning, such as abundance, range, distribution, and timing. This long-term monitoring effort not only yields valuable data on an annual basis but also facilitates the analysis of long-term trends. Identifying critical coho spawning habitats allows for the identification of stream reaches where juvenile coho salmon may rear during the subsequent summer, particularly in low-flow conditions that can impact their growth and survival. Over the long term, the accumulated distribution data has played a crucial role in developing strategic recovery plans and guiding the design, implementation, and assessment of well-informed restoration projects throughout the Scott River watershed. All the collaborating organizations utilize standardized protocols established in 2001 (Appendix B).

### **Project Purpose and Objectives**

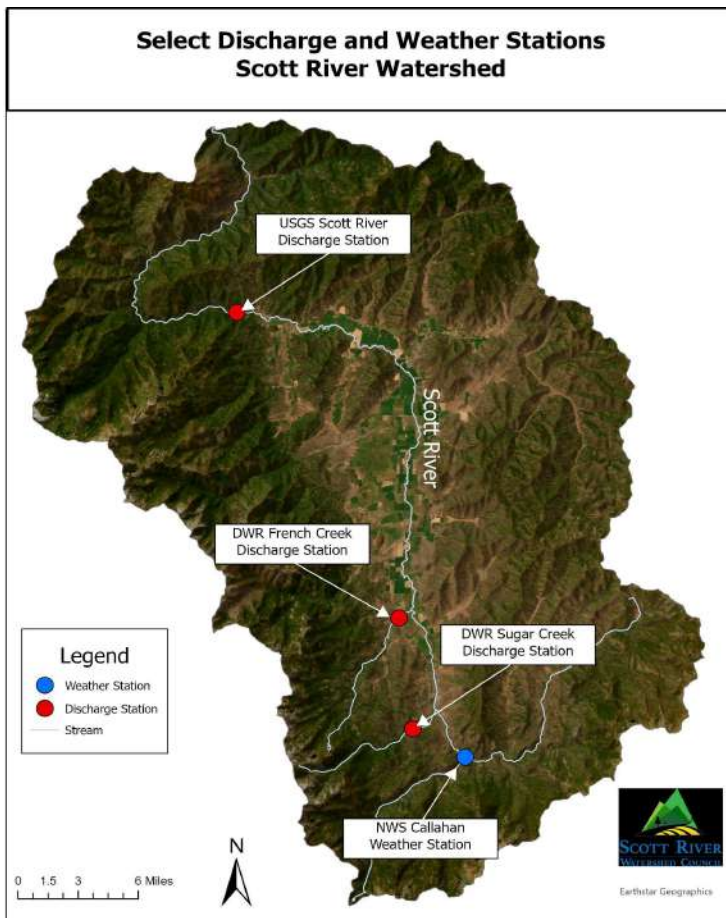
The purpose of the annual spawning ground surveys is to gather data on run parameters including the abundance, timing, duration, age composition, hatchery contribution and redd distribution of coho salmon

in the Scott River and its tributaries. This information also identifies potential locations where juvenile coho may rear, enabling informed management decisions during critical summer and fall months.

The specific objectives of the project involved conducting collaborative coho salmon spawning ground surveys in the Scott River and its tributaries throughout the 2023-2024 survey season. The aim was to comprehensively document the distribution of coho salmon spawning within their historical range. Additionally, the project sought to capture the upper extent of spawning in each tributary where coho are identified. Biological samples were collected from carcasses to enhance our understanding of the life history of the evolutionarily significant SONCC coho salmon.

### Water Year, Flow Conditions and Access for Returning Adult Coho Salmon

Stream discharge (flow) stations are operated on the mainstem Scott River by the United States Geological Survey (USGS) and on French Creek and Sugar Creek by the California Department of Water Resources (CDWR). The National Weather Service (NWS) operates a weather station in Callahan, CA, near the headwaters of the Scott River (Map 1). The Scott River discharge was retrieved from the USGS Water Data website, and the French Creek and Sugar Creek discharge data and the Callahan precipitation data was retrieved from the California Data Exchange Center website (USGS 2024 and CDWR 2024).



Map 1. Select discharge and weather stations in the Scott River watershed.



The Klamath National Forest’s April 1st, 2023 snow survey showed snow height and snow water equivalent (SWE) to be 178% and 163% of average, respectively (KNF 2023). Accordingly, Scott River discharge during the early fall of 2023 was significantly higher than in the previous drought year (Figure 1). In October 2023, daily average discharge steadily rose from 47.4 to 61.8 cubic feet per second (cfs) (USGS 2024).

The first coho salmon observation at the CDFW SRFCF occurred on November 3rd, 2023. This is in stark contrast to the fall of 2022, when daily average discharge did not exceed 10 cfs until November 20th, and the first coho salmon observation at the SRFCF did not occur until November 30th, 2022. In years with low fall discharge, like 2022, adult coho salmon can be observed staging in the lower sections of the Scott River, their migration route potentially blocked by flow-dependent passage barriers. The flow conditions in the fall of 2023 meant that coho salmon spawners returning to the Scott River watershed were able to pass through the canyon and reach the SRFCF almost a month earlier than during the prior spawning season (CDFW 2024).

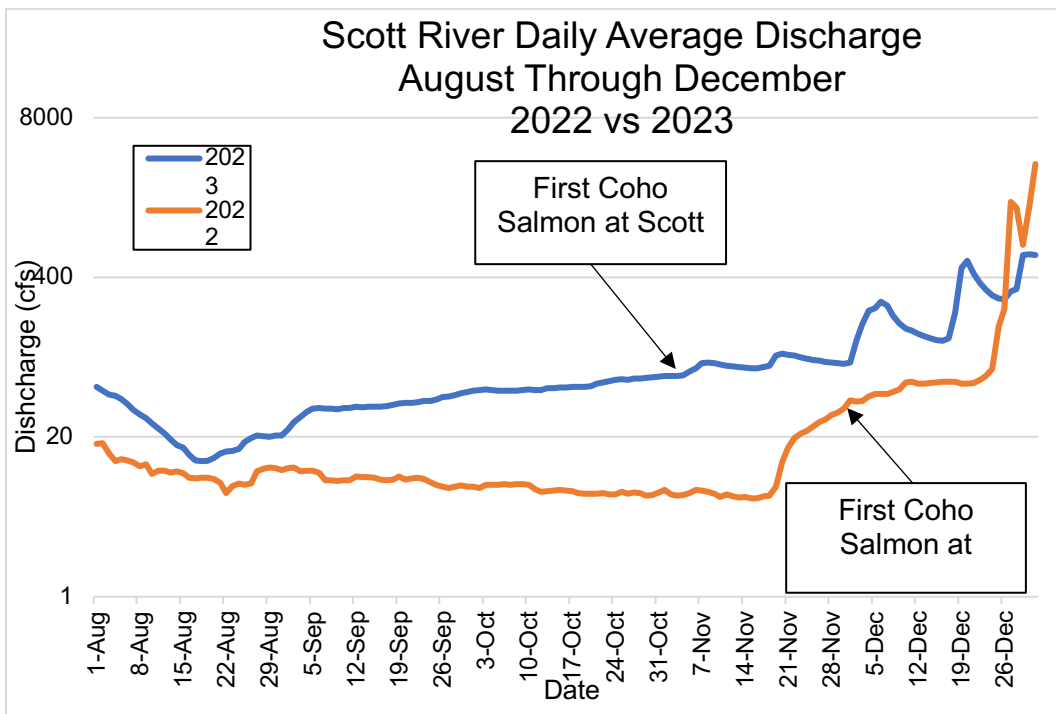


Figure 1. Daily average discharge from the Scott River (USGS gage 11519500) between August 1st and December 31st. Comparing 2022 to 2023. 2023 coho salmon return data is preliminary.

Monthly accumulated precipitation at the Callahan NWS station was lower than average in October and November during both Water Year (WY) 2023 and WY 2024. In December and January, accumulated precipitation in WY 2023 and WY 2024 exceeded the period of record average. The 8.47 inches of accumulated precipitation in January 2024 is the second highest value in the period of record, covering 1944 to 2024 (Figure 2) (CDWR 2024).

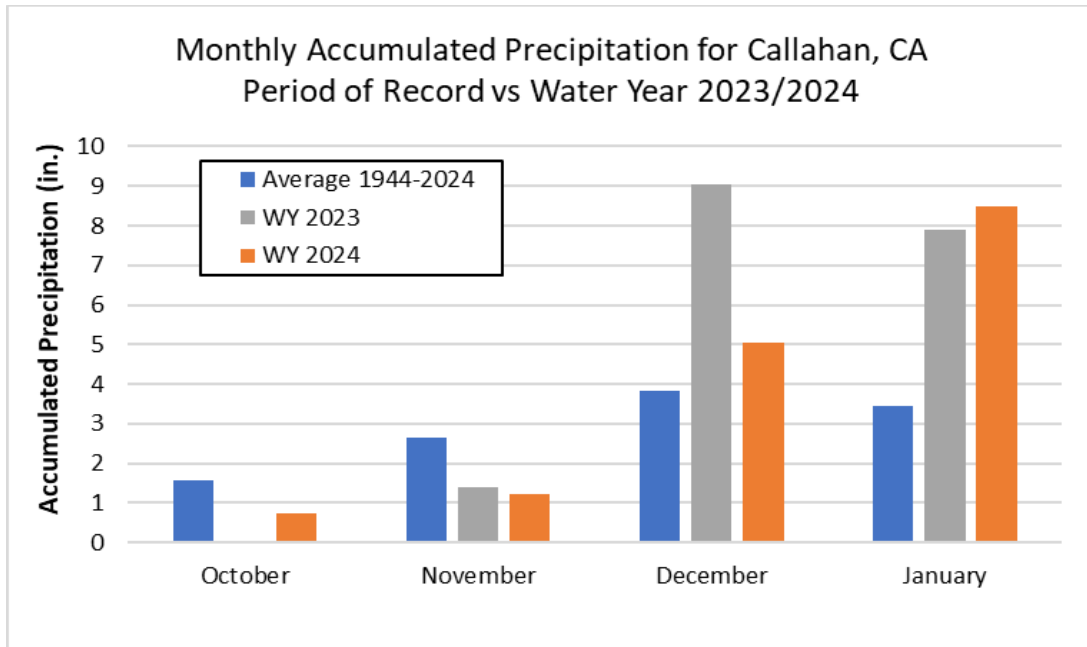


Figure 2. Monthly accumulated precipitation from Callahan NWS station. Period of record average vs water year 2023 and 2024.

Between November 2023 and January 2024, daily average discharge in the mainstem Scott River ranged from 62 to 3,400 cfs at the USGS gage. Minimum daily average discharge in French Creek was 6 cfs, and the maximum was not able to be calculated due to the discharge exceeding the rating table maximum (300 cfs) between January 13th and 14th. Daily average discharge in Sugar Creek ranged from 3 to 75 cfs (CDWR 2024). During this period, daily accumulated precipitation at the Callahan NWS station peaked on January 9th, 2024, at 1.14 inches (Figure 3).

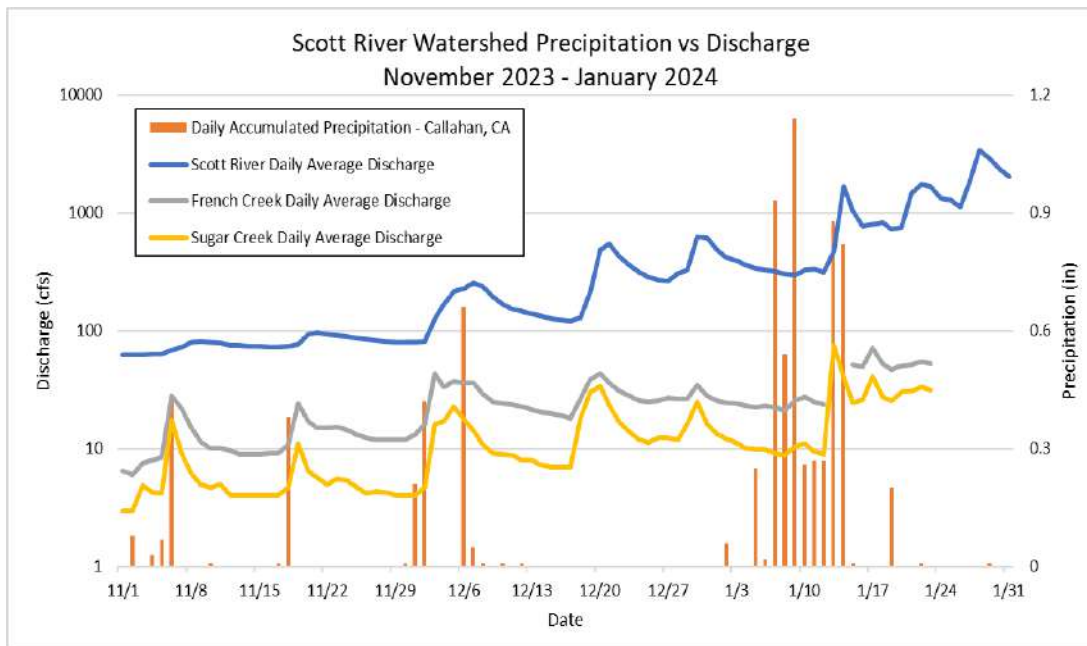


Figure 3. Daily average discharge from the Scott River (USGS gage 11519500), French Creek (CDWR gage FCC) and Sugar Creek (CDWR gage SGN) plotted against daily accumulated precipitation (NWS Callahan station). November 2023 through January 2024. Daily average discharge is not available for French Creek between January 13th and 14th, 2024 due to flows exceeding the rating table maximum.

### Coho Population Trends in the Scott River Watershed

It is well known that the Scott River supports a core, functionally independent population of SONCC coho salmon, one of the most productive natural stocks in the Klamath River basin. In 2014, NMFS identified the depensation threshold as 242 adult coho salmon, meaning that if the number of returning spawners does not exceed this value decreased reproductive success can result. This can be caused by factors such as difficulty in finding mates or other impacts based on less desirable spawning conditions. To attain viability, 6,500 spawners have been identified as the federal recovery target (NMFS 2014).

In 2007, CDFW began to monitor the returning adults using a video counting weir at RKM 29.2 in the mainstem Scott River. In the last 17 years, the count of coho spawners has not exceeded the depensation threshold on six occasions (Figures 4 - 7). However, in four of those six seasons the weir had to be removed prematurely due to high stream flows, so it is possible that a portion of the spawning cohort are not included in those totals. Since 2007, the average return (715 adults) is 11% of the viability target, and the maximum return was 42% (2,752 adults) of the target in 2013 (CDFW 2023).

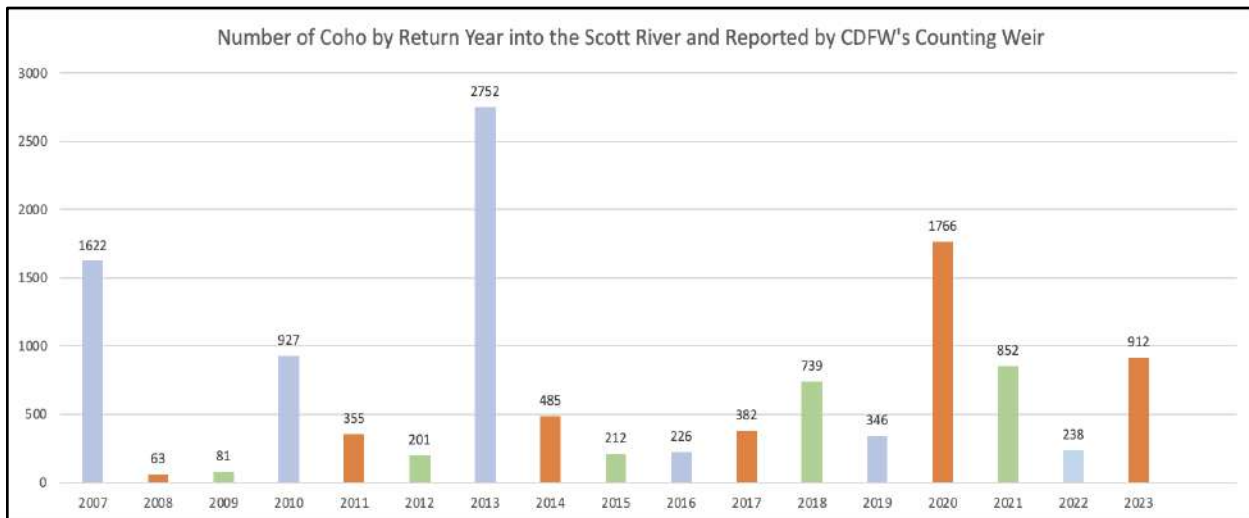


Figure 4. CDFW Scott River fish counting facility escapement by return year. 2007-2023. Early removal of the weir in 2012, 2014-2016 and 2022 may have impacted abundance estimates. 2023 data is preliminary.

Cohort 1	# of Fish	% of previous return	# of fish under/over depensation level (250)	# of fish under/over viable target (6,500)
2007	1622		1372	-4878
2010	927	57%	677	-5573
2013	2752	297%	2502	-3748
2016	226	8%	-24	-6274
2019	346	153%	96	-6154
2022	238	69%	-12	-6262

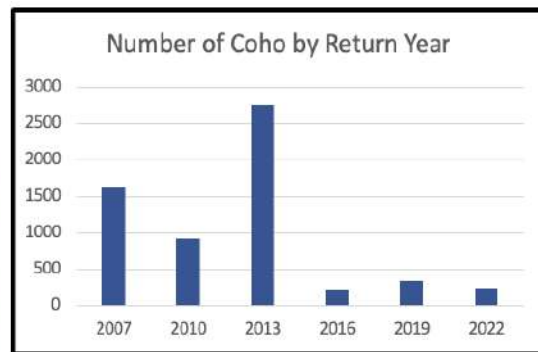


Figure 5. Scott River Coho Salmon cohort 1 escapement compared to depensation and viability values. The nomenclature of "Cohort 1" is merely for demonstration of information and not the official name for this cohort of coho salmon.

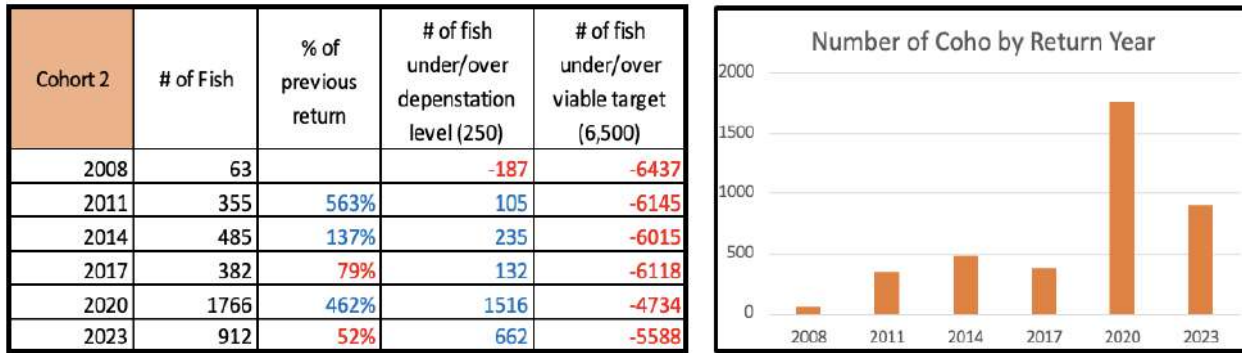


Figure 6. Scott River Coho Salmon cohort 2 escapement compared to depensation and viability values. 2023 data is preliminary. The nomenclature of “Cohort 2” is merely for demonstration of information and not the official name for this cohort of coho salmon.



Figure 7. Scott River Coho Salmon cohort 3 escapement compared to depensation and viability values. The nomenclature of “Cohort 3” is merely for demonstration of information and not the official name for this cohort of coho salmon.

### Current Run Abundance and Timing

During the salmon spawning season, the CDFW Klamath River Project distributes weekly preliminary abundance updates from the SRFCF. During 2023, the SRFCF was operated from September 20th to December 27th (Figure 8). The first coho salmon observation at this site occurred on November 3rd, 2023. In total, 912 coho were observed passing through the weir, the majority of which came through between November 28th and December 5th (CDFW 2024). Spawning ground survey crews observed adult coho at French Creek on December 5th, then on December 6th on Sugar Creek and at the East Fork Scott River on December 8<sup>th</sup>. Surveys continued until January 16th, 2024. At the time of the cessation of surveying, live coho salmon were still being observed in the Scott watershed.



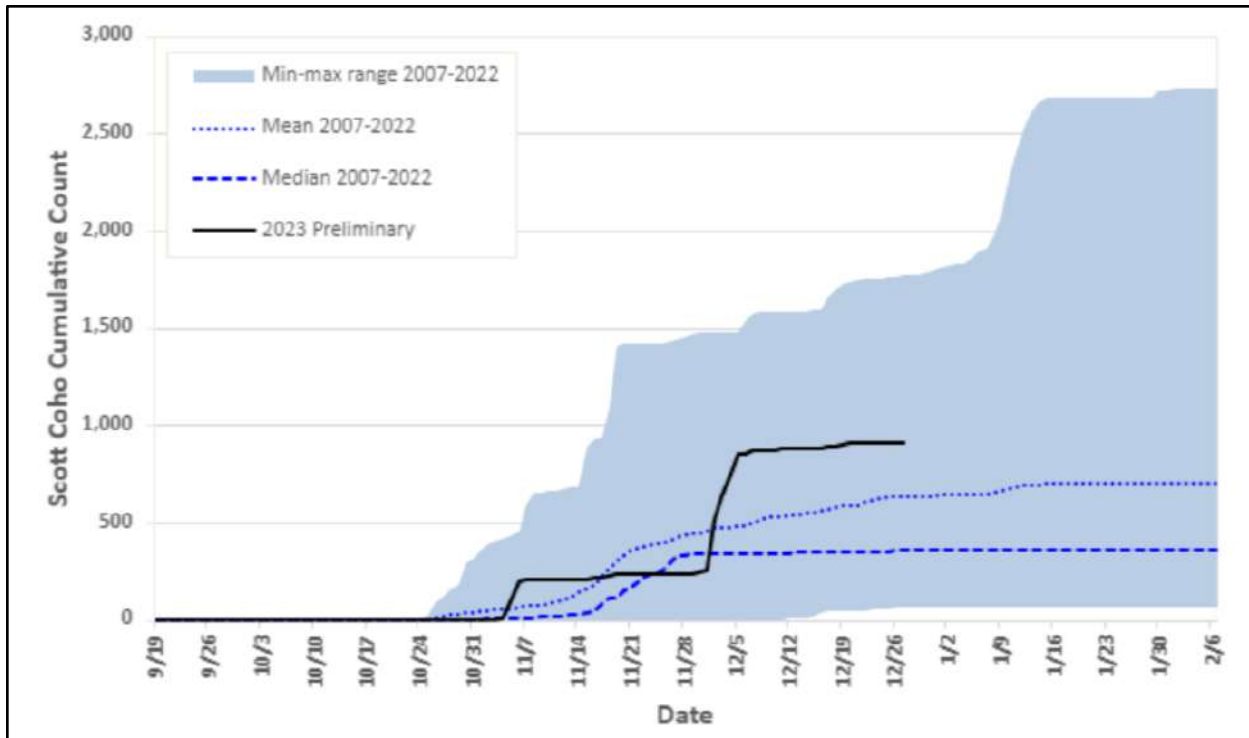
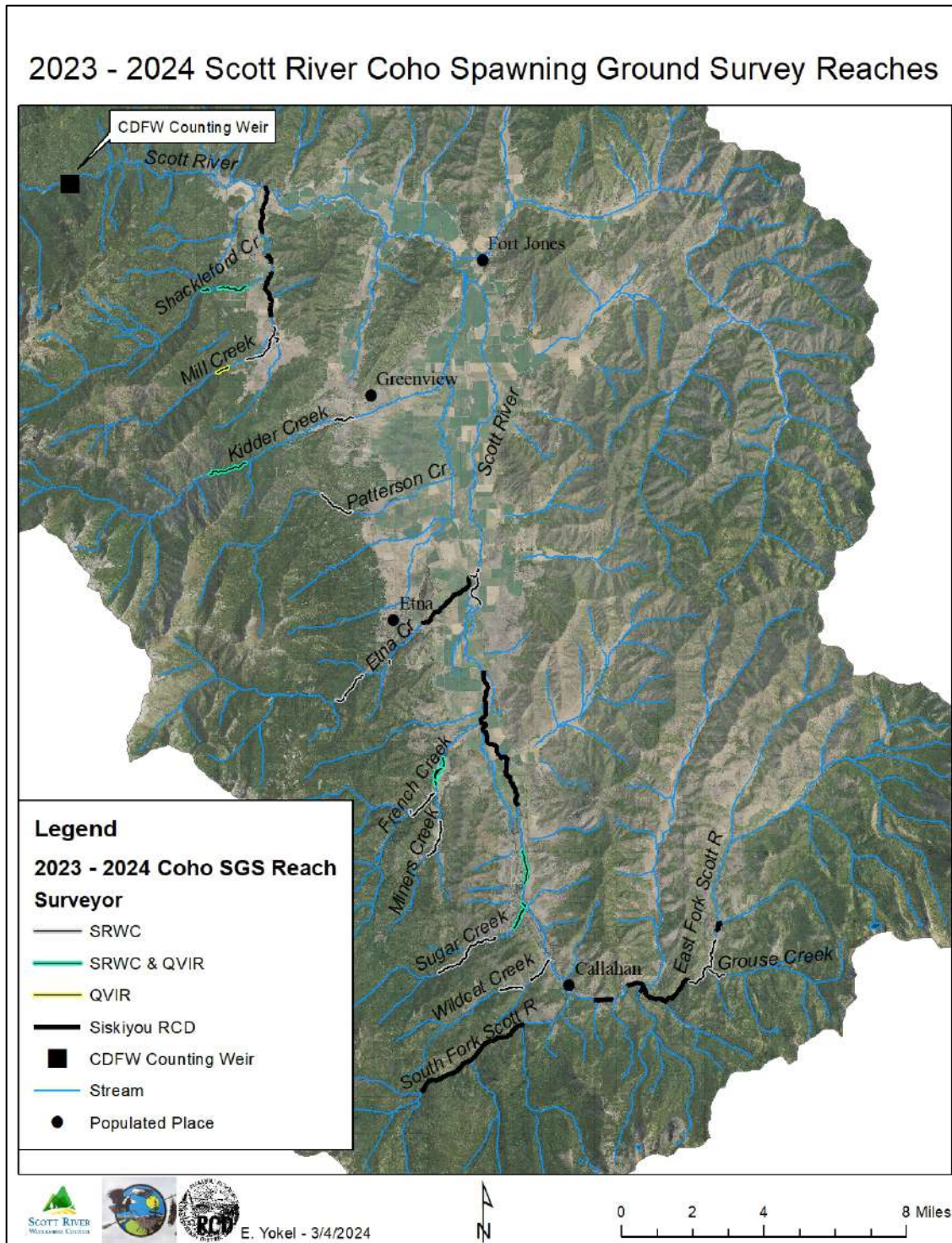


Figure 8. Preliminary coho salmon observations at the Scott River fish counting facility. Taken from Klamath River Project update on January 5th, 2023, California Department of Fish and Wildlife.

### Spawning Survey 2023 - 2024 Results

Spawning ground surveys were conducted on 61.6 km (38.3 mi) of 17 streams in the Scott River watershed during the 2023 - 2024 season (Map 2 and Table 1).



Map 2. Reaches surveyed during the 2023-2024 coho salmon spawning ground survey season.

Table 1. Length of reaches surveyed during the 2023-2024 coho salmon spawning ground survey season.

Stream	Reach	RKM From	RKM To	Length (miles)
Shackleford Creek	Lower	1.25	0	0.8
Shackleford Creek	Middle - Partial	5.2	1.25	1.2
Shackleford Creek	Upper	7.7	6.25	0.9
Shackleford Creek	Upper - Falls	8.5	8.1	0.2
Mill Creek	Lower	2.1	0	1.3
Mill Creek	Middle	5.05	2.6	1.5
Emigrant Creek	Lower	0.55	0	0.3
Mill Creek	Upper	6.6	5.9	0.4
Kidder Creek	Middle	12.05	11.15	0.5
Kidder Creek	Upper	19.3	17.3	1.3
Patterson Creek	Upper	7.25	5.4	1.1
Scott River	Reach 13 Partial	70.6	68.6	1.3
Etna Creek	Lower	3.7	0	2.3
Etna Creek	Middle	6.25	6.05	0.1
Etna Creek	Upper - Etna Diversion	9.5	7.7	1.1
Scott River	Reach 15 - French to Youngs Dam	77.6	75.1	1.5
French Creek	Middle	4.3	2.8	1.6
French Creek	Upper	6.3	4.7	1.0
Miners Creek	Middle	3.4	1.5	1.2
Scott River	Reach 15 - Fay Lane to French	80.8	77.6	2.1
Scott River	Reach 16 - Partial	82.5	80.8	1.0
Scott River	Reach 16 - Tailings	86.5	84.9	1.0
Scott River	Reach 16 - Sugar Confluence	87.7	87.4	0.1
Sugar Creek	Lower and Middle	1.2	0	0.7
Sugar Creek	Upper	5.8	2.2	2.2
Wildcat Creek	Lower	1.3	0	0.8
Wildcat Creek	Upper	3	1.9	0.7
South Fork Scott River	Upper and Middle	9.9	3.7	3.8
East Fork Scott River	Lower	2.65	1.8	0.5
East Fork Scott River	Middle - Big Mill Creek	7.6	3.75	2.6
Big Mill Creek	Lower	0.3	0	0.2
Mule Creek	Lower	0.05	0	0.02
East Fork Scott River	Middle - Grouse Creek	10.5	7.6	1.8
Grouse Creek	Lower	1	0	0.6
East Fork Scott River	Middle - Kangaroo Creek	11.35	10.9	0.3
Kangaroo Creek	Lower	0.2	0	0.1
			<b>Total</b>	<b>38.3</b>

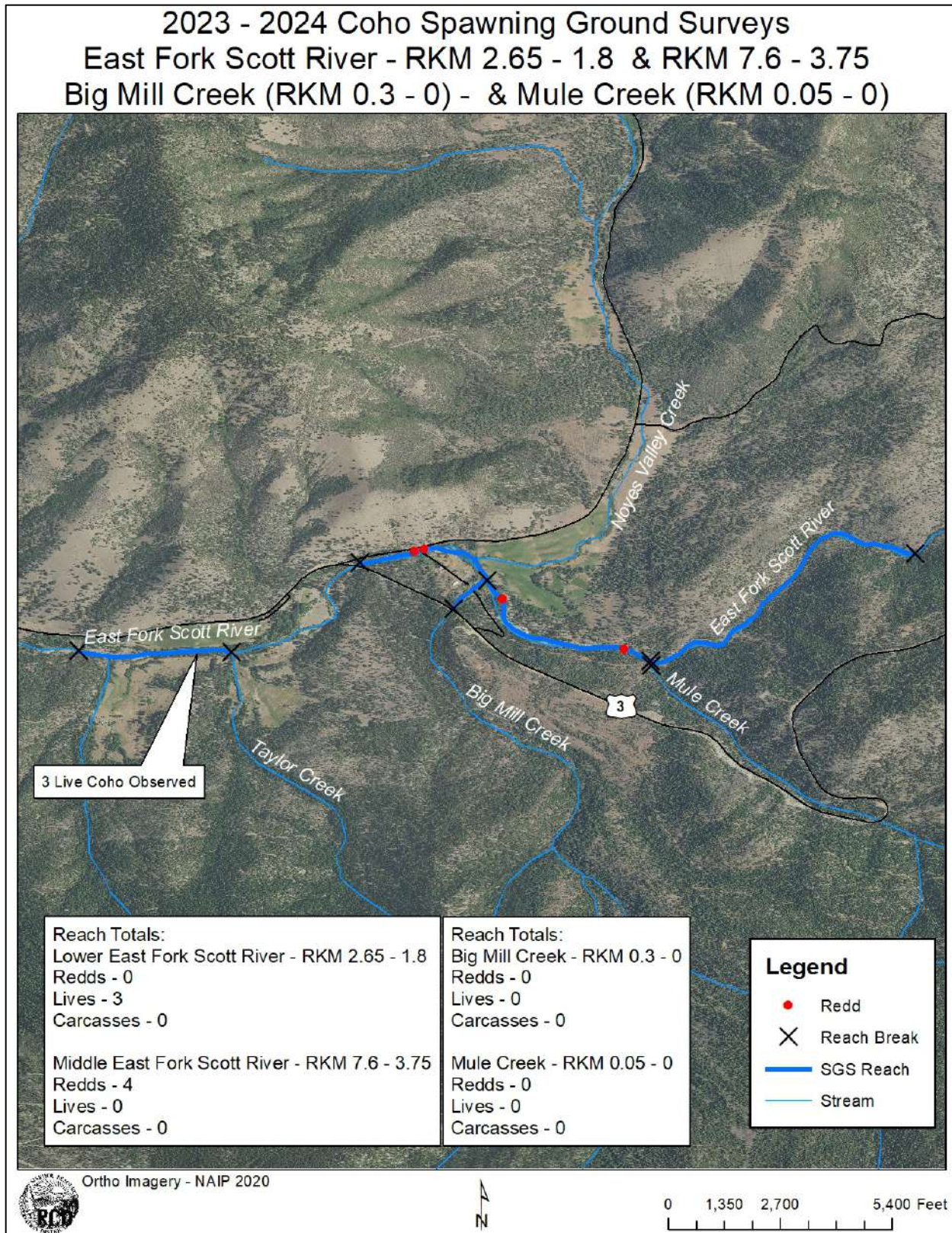
**Lower East Fork Scott River (RKM 2.65 - 1.8) & Middle East Fork Scott River (RKM 7.6 - 3.75), Big Mill Creek (RKM 0.3 - 0) and Mule Creek (RKM 0.05 - 0)**

A 0.5-mile reach was surveyed in Lower East Fork Scott River from downstream of Taylor Creek to the end of survey reach. Zero redds, three live fish and zero carcasses were observed in the East Fork Scott River - RKM 1.8 - 2.65 reach. A 2.6-mile reach of the Middle East Fork Scott River was surveyed from upstream of Mule Creek to the Highway 3 Bridge. Four redds, zero live fish and zero carcasses were observed in the East Fork Scott River - RKM 3.75 - 7.6 reach. A 0.2-mile reach of Big Mill Creek was surveyed from the Highway 3 culvert to the confluence with the East Fork Scott River. Approximately 100 ft of Mule Creek upstream of the confluence with the East Fork Scott River was surveyed. No redds, live fish or carcasses were observed in Big Mill Creek or Mule Creek (Map 3 and Table 2).

Table 2. Coho salmon observations from the East Fork Scott River, Big Mill Creek and Mule Creek. 2023-2024.

Reach	Coho Redds Observed	Live Coho Observed	Coho Carcasses Observed
East Fork RKM 2.65 -1.8	0	3	0
East Fork RKM 7.6 - 3.75	4	0	0
Big Mill Creek RKM 0.3 - 0	0	0	0
Mule Creek RKM 0.05 - 0	0	0	0
<b>Total</b>	<b>4</b>	<b>3</b>	<b>0</b>





Map 3. Lower East Fork Scott River and Middle East Fork Scott River observations.

**Middle East Fork Scott River (RKM 10.5 - 7.6) & Lower Grouse Creek (RKM 1.0 - 0)**

On December 22nd, January 5th and January 11th, a 1.8-mile reach of the East Fork Scott River from upstream the Masterson Road Bridge to downstream Grouse Creek (RKM 10.5 to 7.6) was surveyed (Map 4). On December 15th, part of this reach was surveyed, from RKM 10.5 to RKM 9.1. Across these four surveys, 24 redds, five live fish and three carcasses were observed (Table 3). In this reach, the amount of suitable spawning habitat is significantly higher upstream of the Grouse Creek confluence at RKM 9.1. Only 6 of the 24 redds were observed downstream of this point.

On December 15th, January 5th and January 11th, a 0.6-mile reach of Grouse Creek from the mouth to RKM 1.0 was surveyed. No redds, live fish or carcasses were observed on any of these surveys (Table 4).

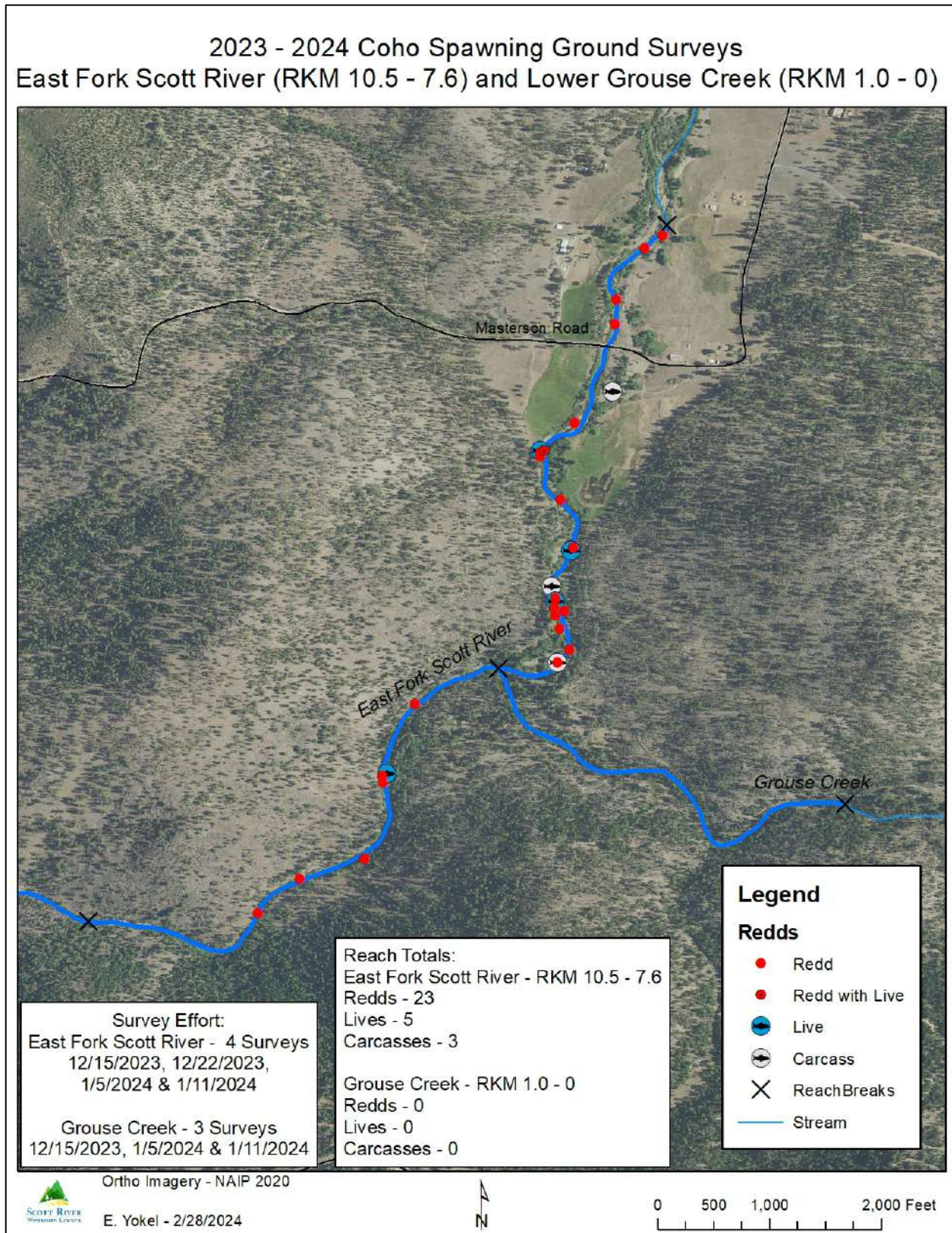
Table 3. Coho salmon observations from the East Fork Scott River RKM 10.5 - 7.6. 2023-2024.

<b>East Fork Scott River RKM 10.5 - 7.6</b>				
Date	Coho Redds Observed	Live Coho Observed	Coho Carcasses Observed	Partial Survey Yes/No
12/15/2023	8	1	0	Y
12/22/2023	6	3	1	N
1/5/2024	5	1	1	N
1/11/2024	4	0	1	N
<b>Total</b>	<b>23</b>	<b>5</b>	<b>3</b>	

Table 4. Coho salmon observations from Lower Grouse Creek. 2023-2024.

<b>Grouse Creek RKM 1.0 - 0</b>			
Date	Coho Redds Observed	Live Coho Observed	Coho Carcasses Observed
12/15/2023	0	0	0
1/5/2023	0	0	0
1/11/2024	0	0	0
<b>Total</b>	<b>0</b>	<b>0</b>	<b>0</b>





Map 4. East Fork Scott River and Lower Grouse Creek observations. 2023-2024.

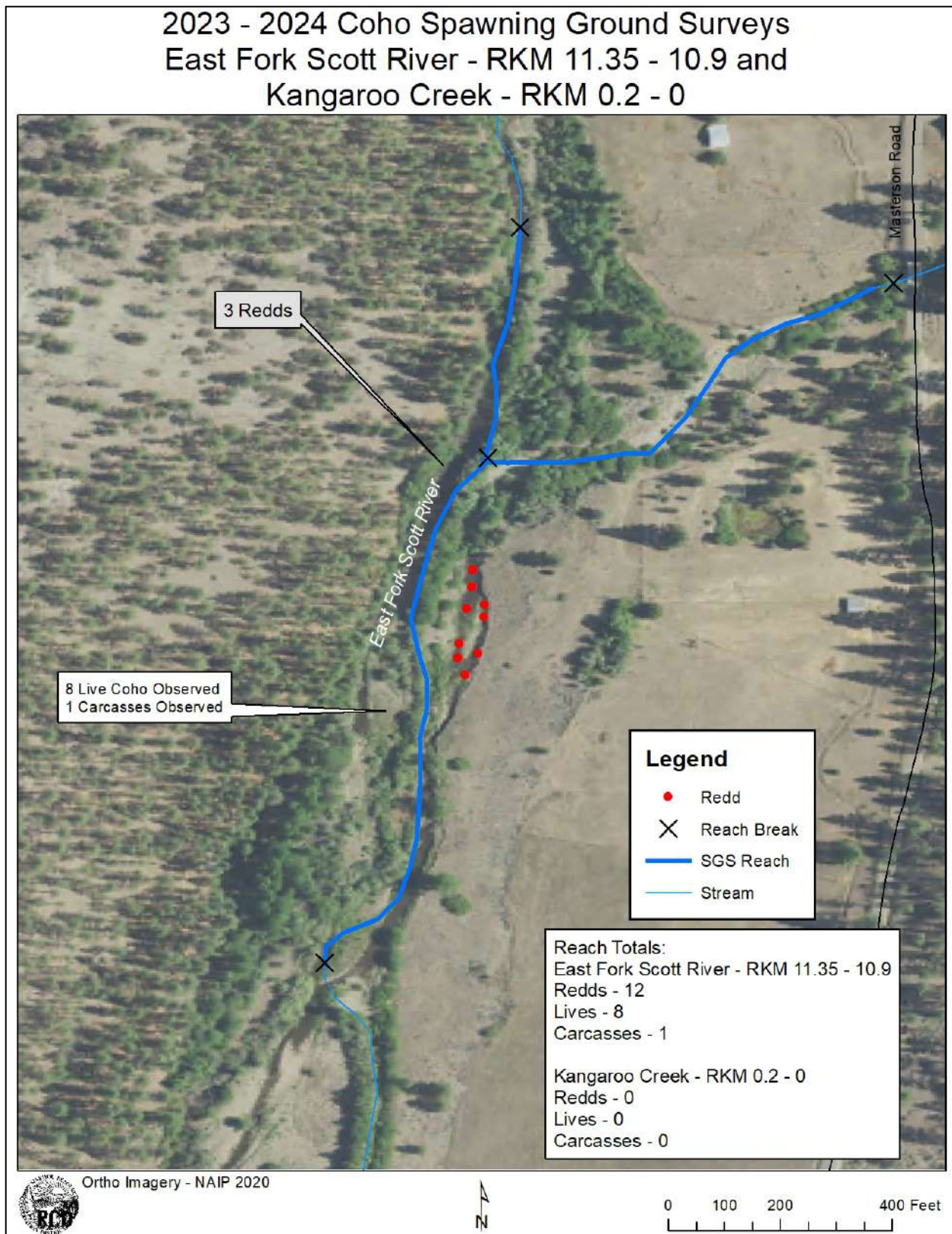
**Middle East Fork Scott River (RKM 11.35 - 10.9) & Lower Kangaroo Creek (RKM 0 - 0.2)**

A 0.3-mile reach of the Middle East Fork Scott River upstream and downstream of Kangaroo Creek was surveyed. Twelve redds, eight live fish and one carcass were observed in the East Fork Scott River RKM 11.35 - 10.9 reach. A 0.1-mile reach of Kangaroo Creek from the Masterson Road Bridge to the confluence with the East Fork Scott River was surveyed. No redds, live fish or carcasses were observed in Kangaroo Creek (Map 5 and Table 5). Locations of three redds are not identified on the map per landowner request.

Table 5. Coho salmon observations from the East Fork Scott River RKM 11.35 - 10.9 and Lower Kangaroo Creek. 2023-2024.

Reach	Coho Redds Observed	Live Coho Observed	Coho Carcasses Observed
East Fork RKM 11.35 -10.9	12	8	1
Kangaroo Creek RKM 0.2 - 0	0	0	0
<b>Total</b>	<b>12</b>	<b>8</b>	<b>1</b>

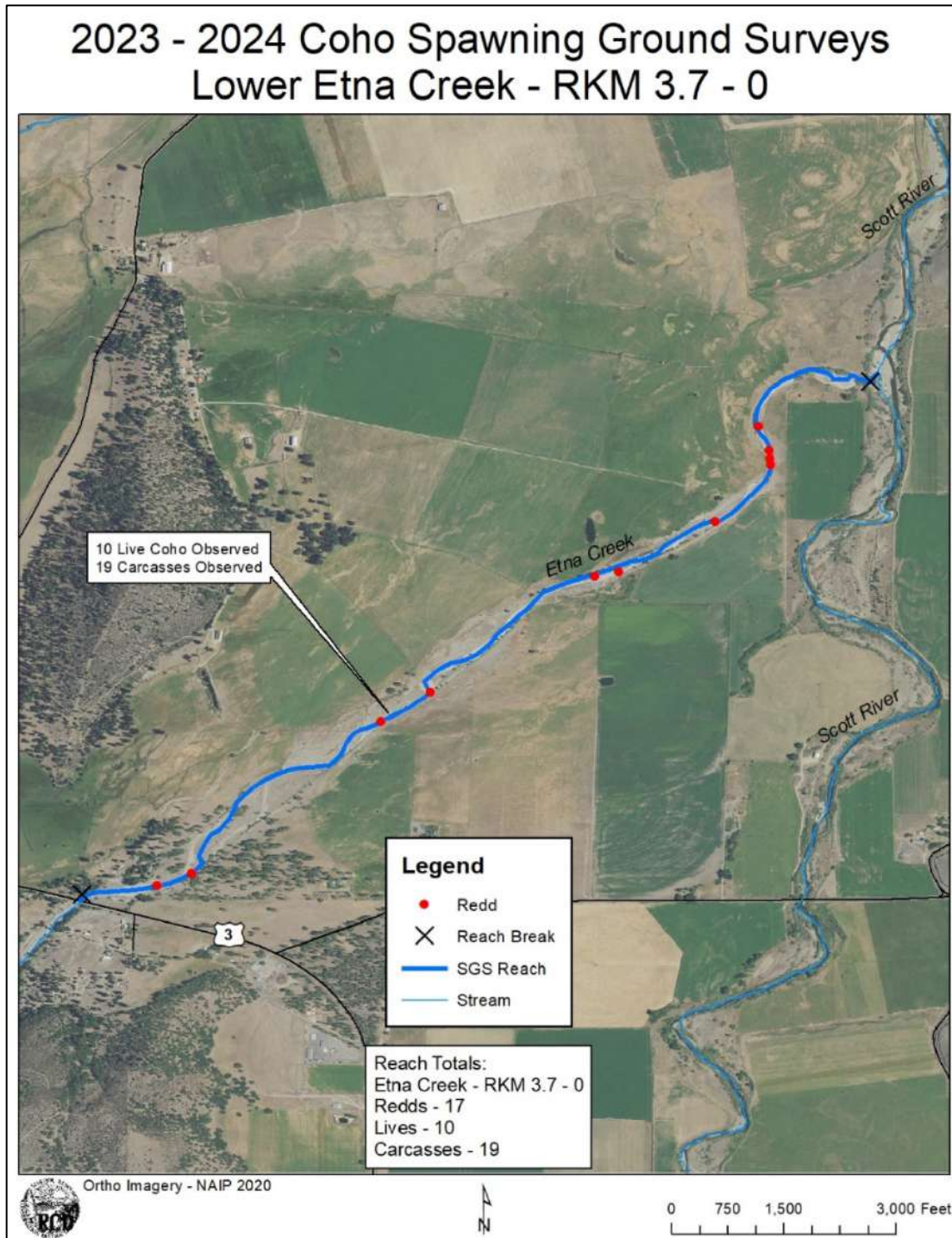




Map 5. Middle East Fork Scott River and Lower Kangaroo Creek observations.

**Lower Etna Creek (RKM 3.7 - 0)**

A 2.3-mile reach of Lower Etna Creek from the Highway 3 Bridge to the confluence with the Scott River was surveyed. Nineteen carcasses, ten live fish and 17 redds were observed in this reach (Map 6).



Map 6. Lower Etna Creek observations.



**Middle Etna Creek (RKM 6.25 - 6.05)**

On December 11th, a 0.1-mile reach of Etna Creek from RKM 6.25 to RKM 6.05 was surveyed. No live coho salmon, redds or carcasses were observed during this survey (Table 6).

Table 6. Coho salmon observations from Etna Creek RKM 6.05 - 6.25. 2023-2024.

<b>Etna Creek RKM 6.25 - 6.05</b>			
Date	Coho Redds Observed	Live Coho Observed	Coho Carcasses Observed
12/11/2023	0	0	0
<b>Total</b>	<b>0</b>	<b>0</b>	<b>0</b>

**Etna Creek (RKM 9.5 - 7.7)**

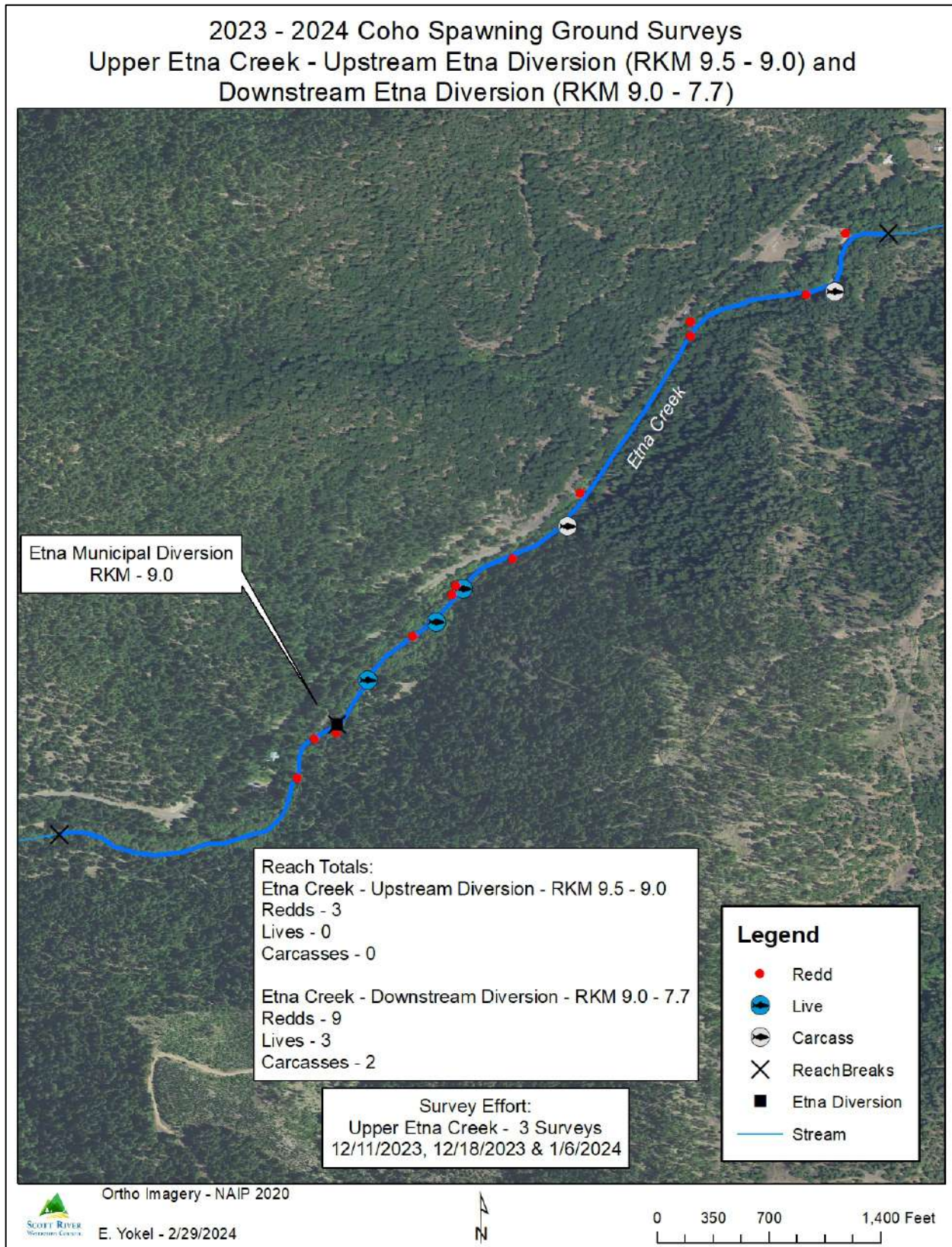
On December 11th and January 6th, a 1.1-mile reach of Upper Etna Creek from RKM 9.5 to RKM 7.7 was surveyed (Photo 1). This reach was also surveyed over two days on December 18th and 19th (Map 7). Across these three surveys, 12 redds, three live fish and two carcasses were observed (Table 7). This reach includes the City of Etna diversion dam and fish ladder at RKM 9.0. Of the 12 total redds, three were identified above the dam.

Table 7. Coho salmon observations from Etna Creek RKM 9.5 - 7.7. 2023-2024.

<b>Etna Creek RKM 9.5 - 7.7</b>				
Date	Coho Redds Observed	Live Coho Observed	Coho Carcasses Observed	Partial Survey Yes/No
12/11/2023	1	1	0	N
12/18/2023	0	0	0	Y
12/19/2023	0	0	0	Y
1/6/2024	11	2	2	N
<b>Total</b>	<b>12</b>	<b>3</b>	<b>2</b>	



Photo 1. Upper Etna Creek survey reach. December 11, 2023.



Map 7. Upper Etna Creek observations. 2023-2024.



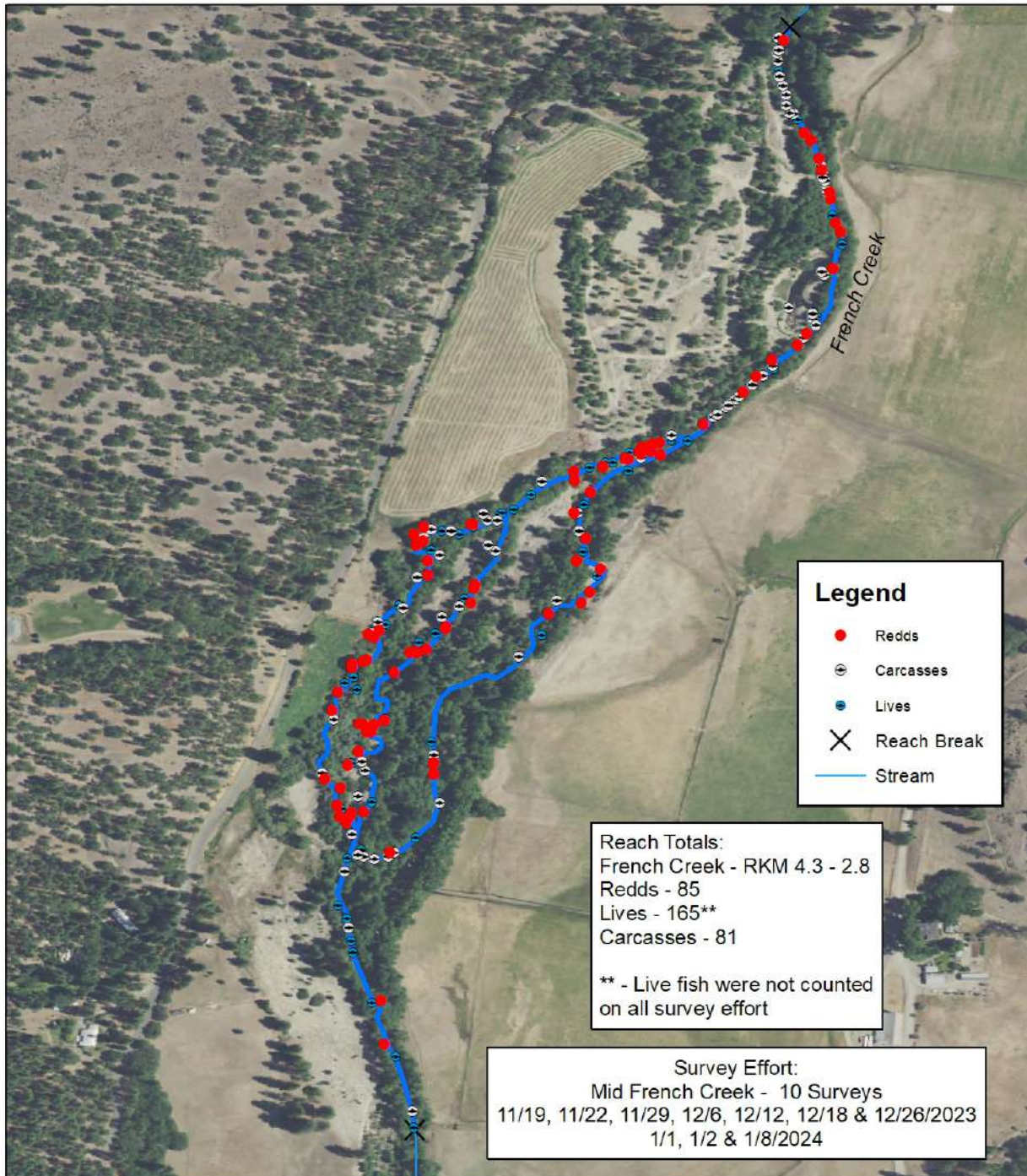
**Middle French Creek (RKM 4.3 - 2.8)**

A 1.6-mile reach of Middle French Creek from RKM 4.3 to RKM 2.8 was surveyed on ten occasions between November 2023 and January 2024 (Map 8). The Middle French Creek reach consists of 0.9 miles of mainstem habitat and 0.7 miles of side channel habitat. In addition to the ten surveys of the entire reach, two spot carcass collection efforts were carried out on December 21st and 22nd. Over the course of these surveys, 87 redds, 166 live fish and 85 carcasses were observed (Table 8). Due to the density of live fish, live fish observations were not recorded during surveys on December 21st, December 22nd, December 26th and January 3rd.

Table 8. Coho salmon observations from French Creek RKM 4.3 - 2.8. 2023-2024.

<b>French Creek RKM 2.8 - 4.3</b>				
Date	Coho Redds Observed	Live Coho Observed	Coho Carcasses Observed	Partial Survey Yes/No
11/19/2023	0	0	0	N
11/22/2023	0	0	0	N
11/29/2023	0	0	0	N
12/6/2023	6	56	0	N
12/12/2023	17	49	1	N
12/18/2023	11	24	1	N
12/21/2023	ND	ND	2	Y
12/22/2023	ND	ND	2	Y
12/26/2023	15	ND	11	N
1/1/2024	9	20	12	Y
1/2/2024	15	12	11	Y
1/3/2024	7	ND	16	Y
1/4/2024	3	0	10	Y
1/8/2024	4	5	19	N
<b>Total</b>	<b>87</b>	<b>166</b>	<b>85</b>	

### 2023 - 2024 Coho Spawning Ground Surveys Middle French Creek (RKM 4.3 - 2.8)



Map 8. Mid French Creek observations.

**Upper French Creek (RKM 6.3 - 4.7) & Lower North Fork French Creek (RKM 0.1 - 0)**

On January 11th, a 0.1-mile reach of North Fork French Creek from the French Creek Road Bridge to the confluence with French Creek and 1.0-mile reach of Upper French Creek RKM 6.3 - 4.7 were surveyed (Map 9). One redd was observed on the North Fork, but no live fish or carcasses. Two redds and five carcasses were observed on mainstem French Creek (Table 9 and Table 10).

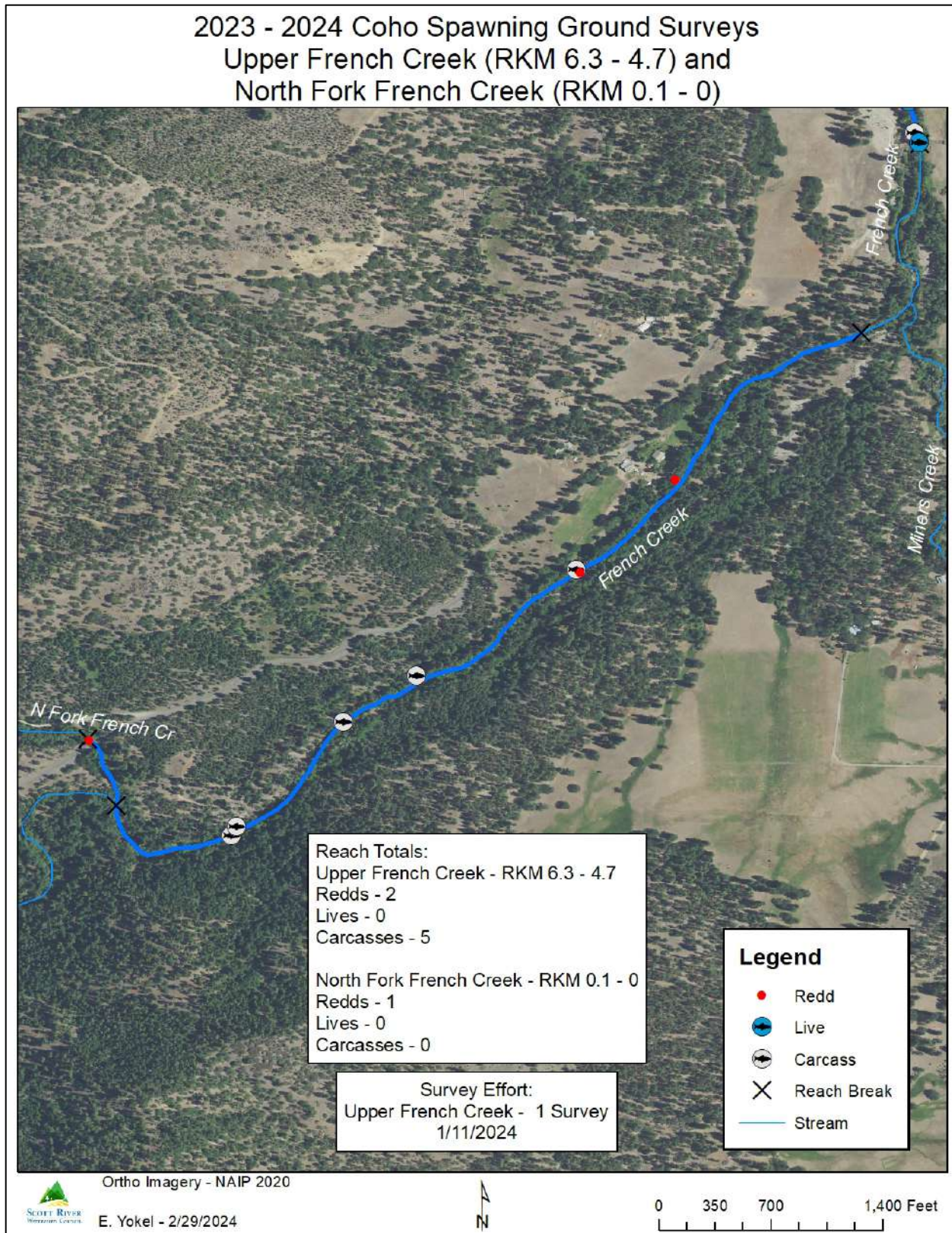
Table 9. Coho salmon observations from Upper French Creek RKM 4.7 - 6.3. 2023-2024.

<b>French Creek RKM 6.3 - 4.7</b>			
Date	Coho Redds Observed	Live Coho Observed	Coho Carcasses Observed
1/11/2024	2	0	5
<b>Total</b>	<b>2</b>	<b>0</b>	<b>5</b>

Table 10. Coho salmon observations from Lower North Fork French Creek RKM 0.1 - 0. 2023-2024.

<b>North Fork French Creek RKM 0.1 - 0</b>			
Date	Coho Redds Observed	Live Coho Observed	Coho Carcasses Observed
1/11/2024	1	0	0
<b>Total</b>	<b>1</b>	<b>0</b>	<b>0</b>





Map 9. Upper French Creek observations.

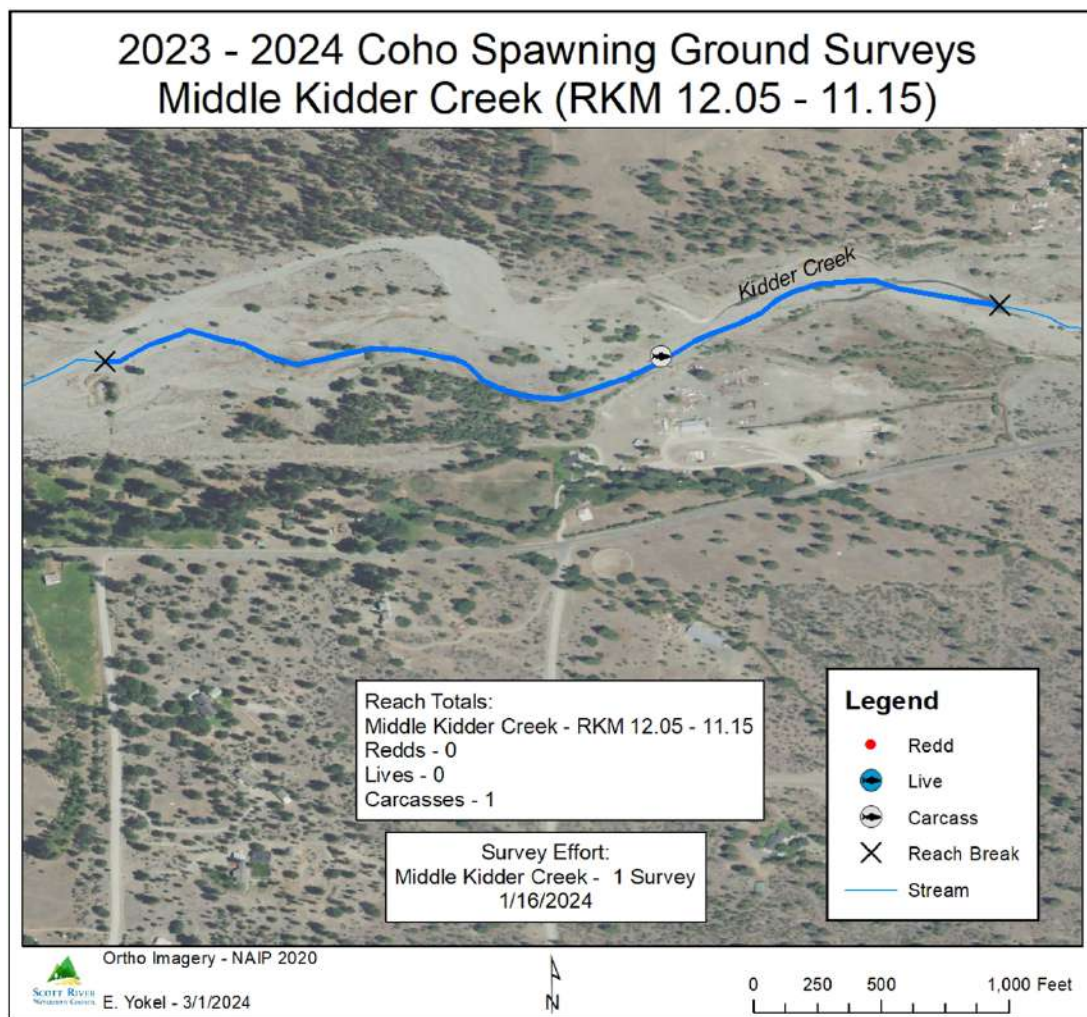


**Middle Kidder Creek (RKM 12.05 - 11.15)**

On January 16th, a 0.5-mile reach of Middle Kidder Creek upstream of the Highway 3 Bridge from RKM 12.05 to RKM 11.15 was surveyed (Map 10). No live coho salmon or redds were observed during this survey. The survey team discovered a remnant of a salmonid carcass but were unable to conclusively identify the species (Table 11). The week prior to this survey, a report from the landowner on this reach had observed several adult salmonids instream. From the time of this observation to the survey period, there was a significant increase in flows within the Scott watershed. While it is plausible that spawning took place in this area, the elevated flows posed challenges in accurately documenting the presence of actual redds.

Table 11. Coho salmon observations from Middle Kidder Creek RKM 12.05 - 11.15. 2023-2024.

Kidder Creek RKM 12.05 - 11.15			
Date	Coho Redds Observed	Live Coho Observed	Coho Carcasses Observed
1/16/2024	0	0	1*
<b>Total</b>	<b>0</b>	<b>0</b>	<b>1*</b>



Map 10. Middle Kidder Creek observations.



**Kidder Creek (RKM 19.3 - 17.3)**

On December 11th and 12th, December 18th, January 3rd/4th and January 10th, a 1.3-mile reach of Upper Kidder Creek from RKM 19.3 to RKM 17.3 was surveyed (Photo 2 and Map 11). In addition to the four complete reach surveys, a live coho observation was made on December 14th by an SRWC staff member taking a discharge measurement in this reach. In total, five redds and one live fish were observed during these surveys (Table 12). No carcasses were recovered.

Table 12. Coho salmon observations from Kidder Creek RKM 19.3 - 17.3. 2023-2024.

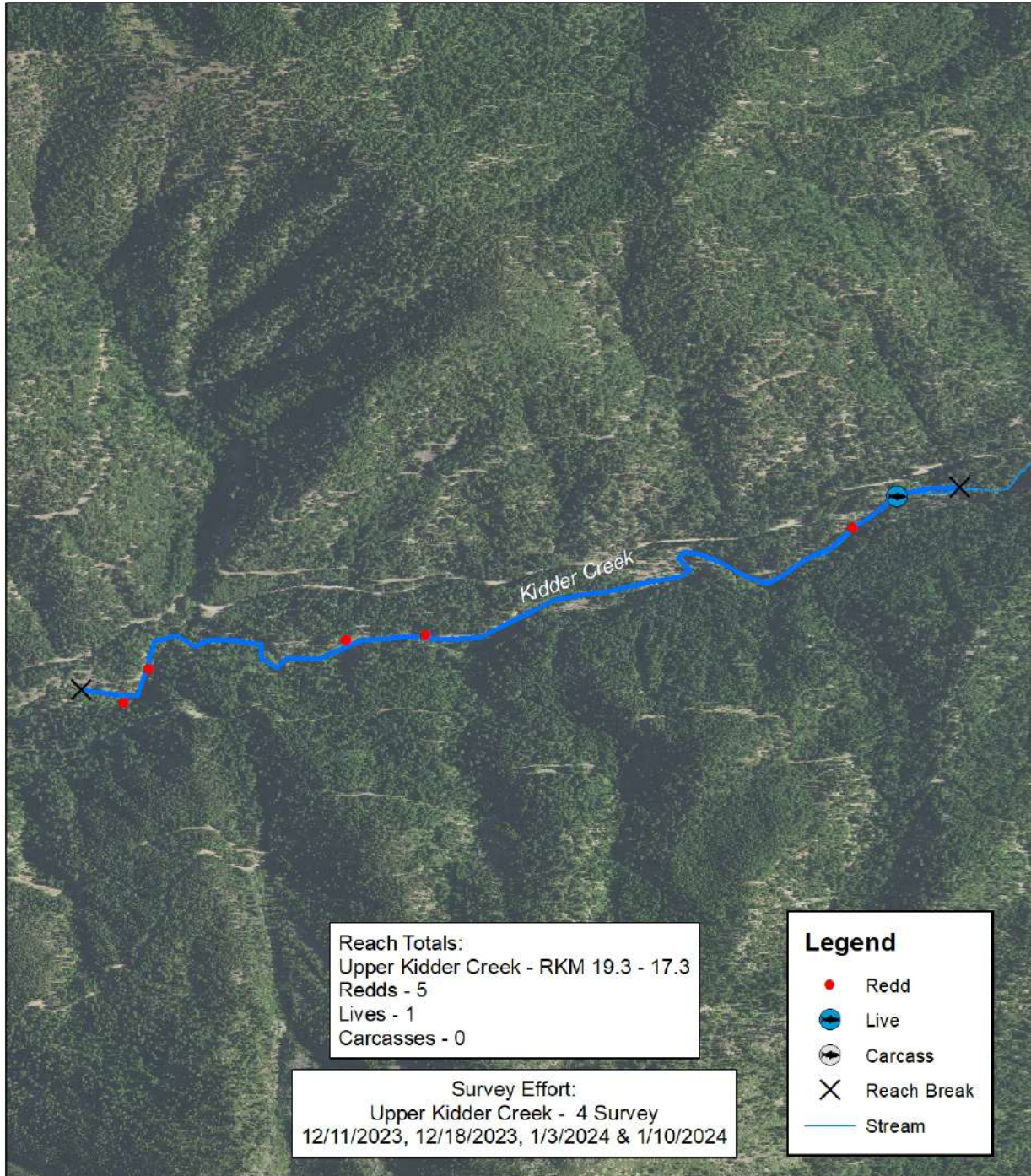
<b>Kidder Creek RKM 19.3 - 17.3</b>				
Date	Coho Redds Observed	Live Coho Observed	Coho Carcasses Observed	Partial Survey Yes/No
12/11/2023	0	0	0	Y
12/12/2023	0	0	0	Y
12/13/2023	0	1	0	Y
12/18/2023	0	0	0	N
1/3/2024	0	0	0	Y
1/4/2024	0	0	0	Y
1/10/2024	5	0	0	N
<b>Total</b>	<b>5</b>	<b>1</b>	<b>0</b>	



Photo 2. Upper Kidder Creek survey reach. December 11, 2023.



## 2023 - 2024 Coho Spawning Ground Surveys Upper Kidder Creek (RKM 19.3 - 17.3)



Ortho Imagery - NAIP 2020

E. Yokel - 3/1/2024



0 500 1,000 2,000 Feet

Map 11. Upper Kidder Creek observations.

**Middle Mill Creek (RKM 5.05 - 2.6) & Lower Emigrant Creek (RKM 0.55 - 0)**

On January 16th, a 1.5 mile reach of Middle Mill Creek from RKM 5.05 to RKM 2.6 and a 0.3 mile reach of Lower Emigrant Creek from the mouth to RKM 0.55 were surveyed (Map 12). One redd was observed in Mill Creek, but no live fish or carcasses (Table 13). No redds, live fish or carcasses were observed in Emigrant Creek (Table 14).

Table 13. Coho salmon observations from Middle Mill Creek RKM 5.05 - 2.6. 2023-2024.

<b>Mill Creek RKM 5.05 - 2.6</b>			
Date	Coho Redds Observed	Live Coho Observed	Coho Carcasses Observed
1/16/2024	1	0	0
<b>Total</b>	<b>1</b>	<b>0</b>	<b>0</b>

Table 14. Coho salmon observations from Lower Emigrant Creek RKM 0.55 - 0. 2023-2024.

<b>Emigrant Creek RKM 0.55 - 0</b>			
Date	Coho Redds Observed	Live Coho Observed	Coho Carcasses Observed
1/16/2024	0	0	0
<b>Total</b>	<b>0</b>	<b>0</b>	<b>0</b>

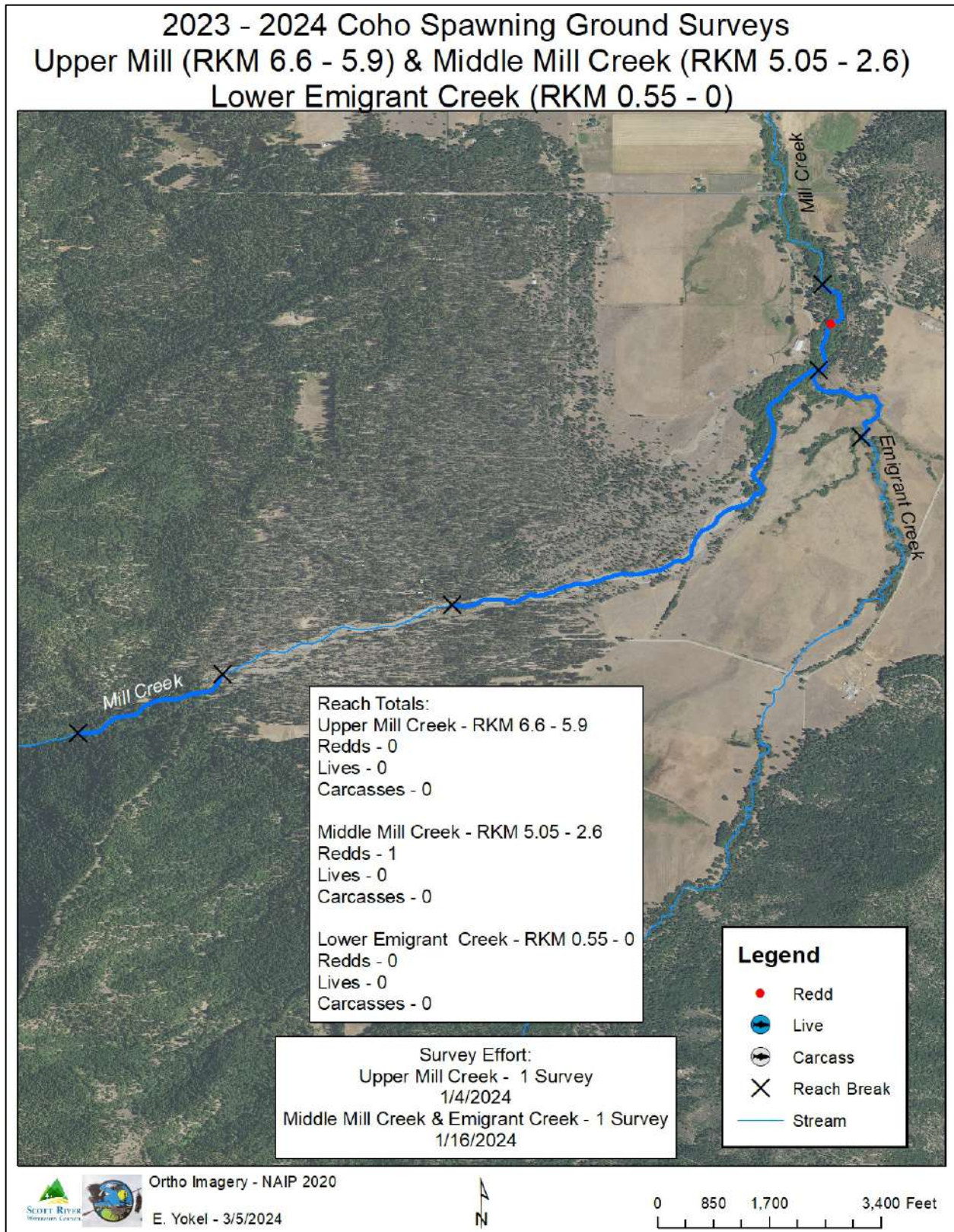
**Upper Mill Creek (RKM 6.6 - 5.9)**

On January 4th, a 0.4-mile reach of Upper Mill Creek from RKM 6.6 to RKM 5.9 was surveyed (Map 12). No redds, live fish or carcasses were observed during this survey (Table 15).

Table 15. Coho salmon observations from Upper Mill Creek RKM 6.6 - 5.9. 2023-2024.

<b>Mill Creek RKM 6.6 - 5.9</b>			
Date	Coho Redds Observed	Live Coho Observed	Coho Carcasses Observed
1/4/2024	0	0	0
<b>Total</b>	<b>0</b>	<b>0</b>	<b>0</b>





Map 12. Upper and middle Mill Creek and lower Emigrant Creek observations.



**Middle Miners Creek (RKM 3.4 - 1.5)**

On December 18th, a 1.2-mile reach of Middle Miners Creek from RKM 3.4 to RKM 1.5 was surveyed (Photo 3). One redd was observed during this survey, but no live fish or carcasses (Table 16 and Map 13).

Table 16. Coho salmon observations from Middle Miners Creek RKM 3.4 - 1.5. 2023-2024.

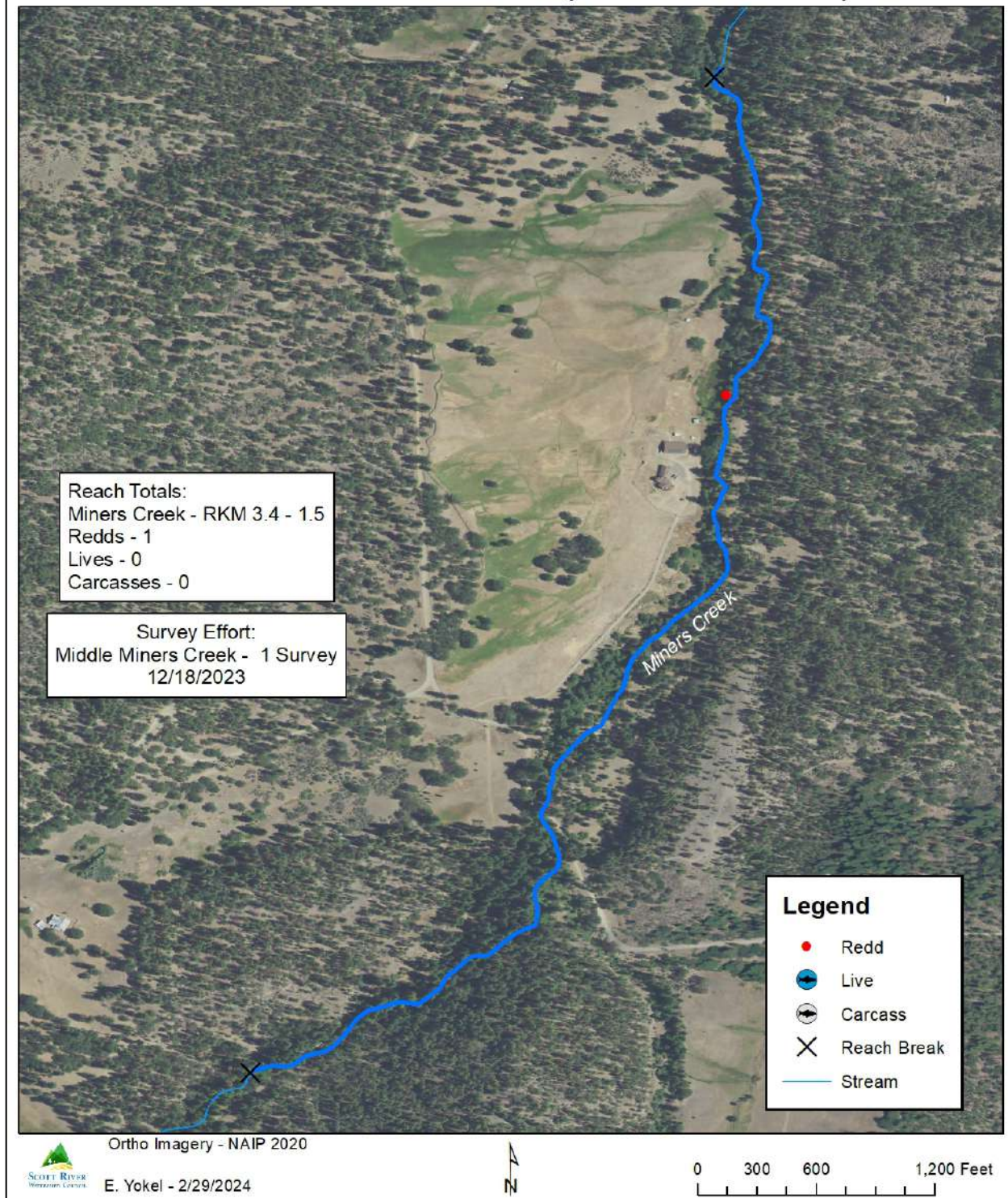
<b>Miners Creek RKM 3.4 - 1.5</b>			
Date	Coho Redds Observed	Live Coho Observed	Coho Carcasses Observed
12/18/2023	1	0	0
<b>Total</b>	<b>1</b>	<b>0</b>	<b>0</b>



Photo 3. Middle Miners Creek survey reach. December 18, 2023.



## 2023 - 2024 Coho Spawning Ground Surveys Middle Miners Creek (RKM 3.4 - 1.5)



Map 13. Middle Miners Creek observations.

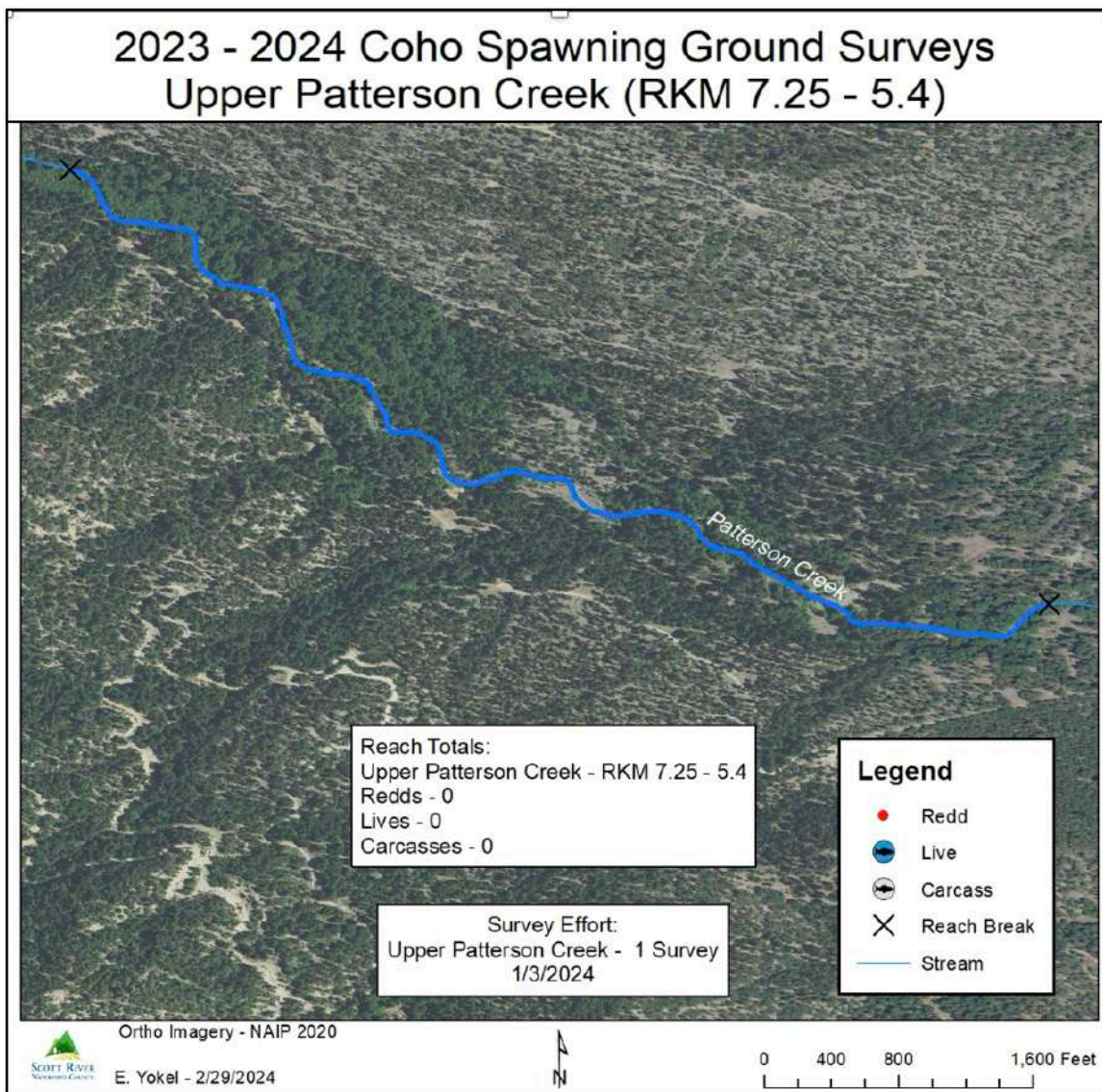


**Upper Patterson Creek (RKM 7.25 - 5.4)**

On January 3rd, a 1.1-mile reach of Upper Patterson Creek from RKM 7.25 to RKM 5.4 was surveyed. No redds, live fish or carcasses were observed (Table 17 and Map 14).

Table 17. Coho salmon observations from Upper Patterson Creek RKM 7.25 - 5.4. 2023-2024.

Patterson Creek RKM 7.25 - 5.4			
Date	Coho Redds Observed	Live Coho Observed	Coho Carcasses Observed
1/3/2024	0	0	0
<b>Total</b>	<b>0</b>	<b>0</b>	<b>0</b>



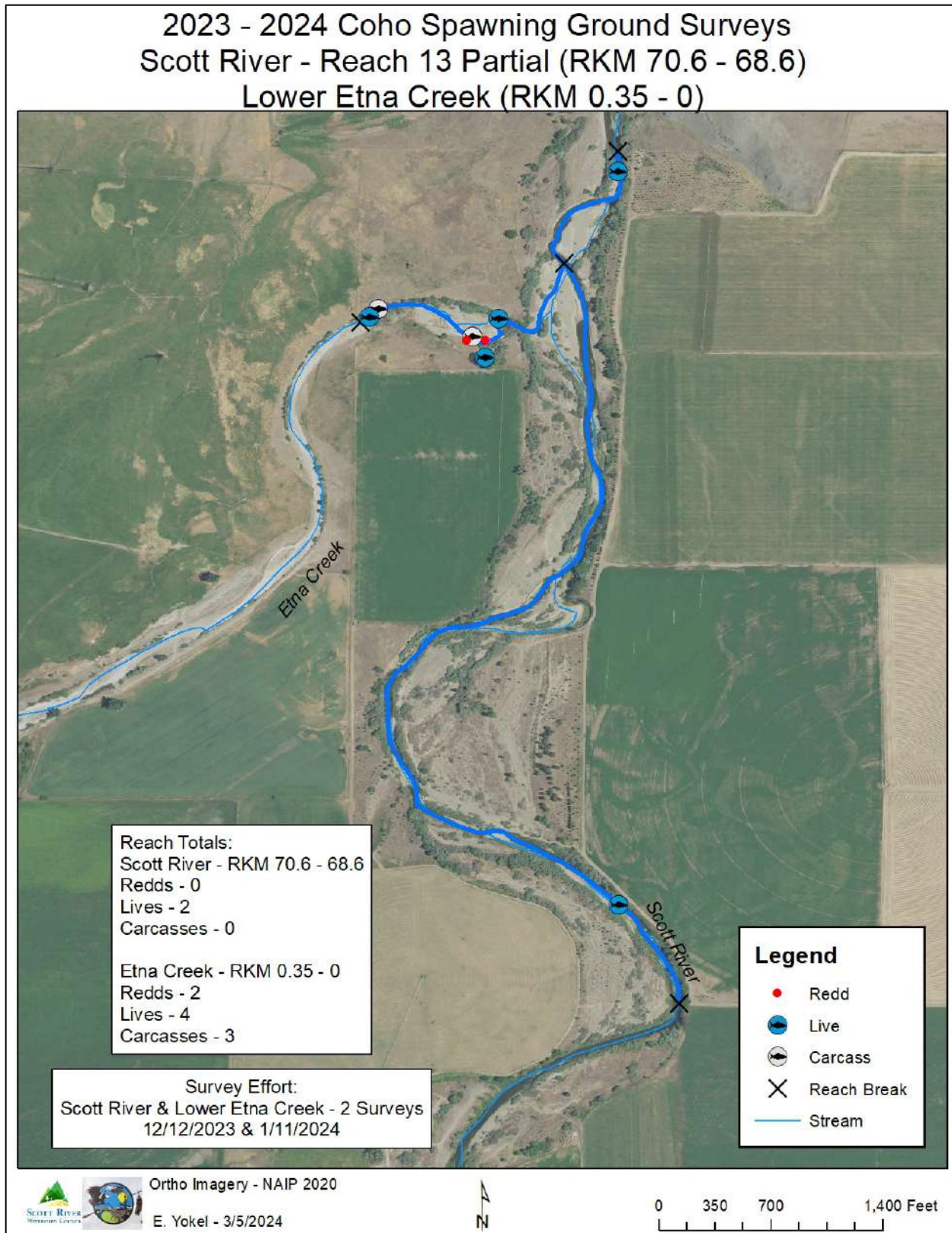
Map 14. Upper Patterson Creek observations.

**Scott River Reach 13 Partial (RKM 70.6 - 68.6)**

On December 12th and January 11th, a 1.3-mile reach of the mainstem Scott River from RKM 70.6 to RKM 68.6 was surveyed (Map 15). No redds or carcasses were observed in this reach, two live fish were observed across both surveys (Table 18).

Table 18. Coho salmon observations from Scott River RKM 70.6 - 68.6. 2023-2024.

<b>Scott River RKM 70.6 - 68.6</b>			
Date	Coho Redds Observed	Live Coho Observed	Coho Carcasses Observed
12/12/2023	0	2	0
1/11/2024	0	0	0
<b>Total</b>	<b>0</b>	<b>2</b>	<b>0</b>



Map 15. Scott River, partial Reach 13 and lower Etna Creek observations.



**Scott River Reach 15 – French Creek to Youngs Dam (RKM 77.6 - 75.1)**

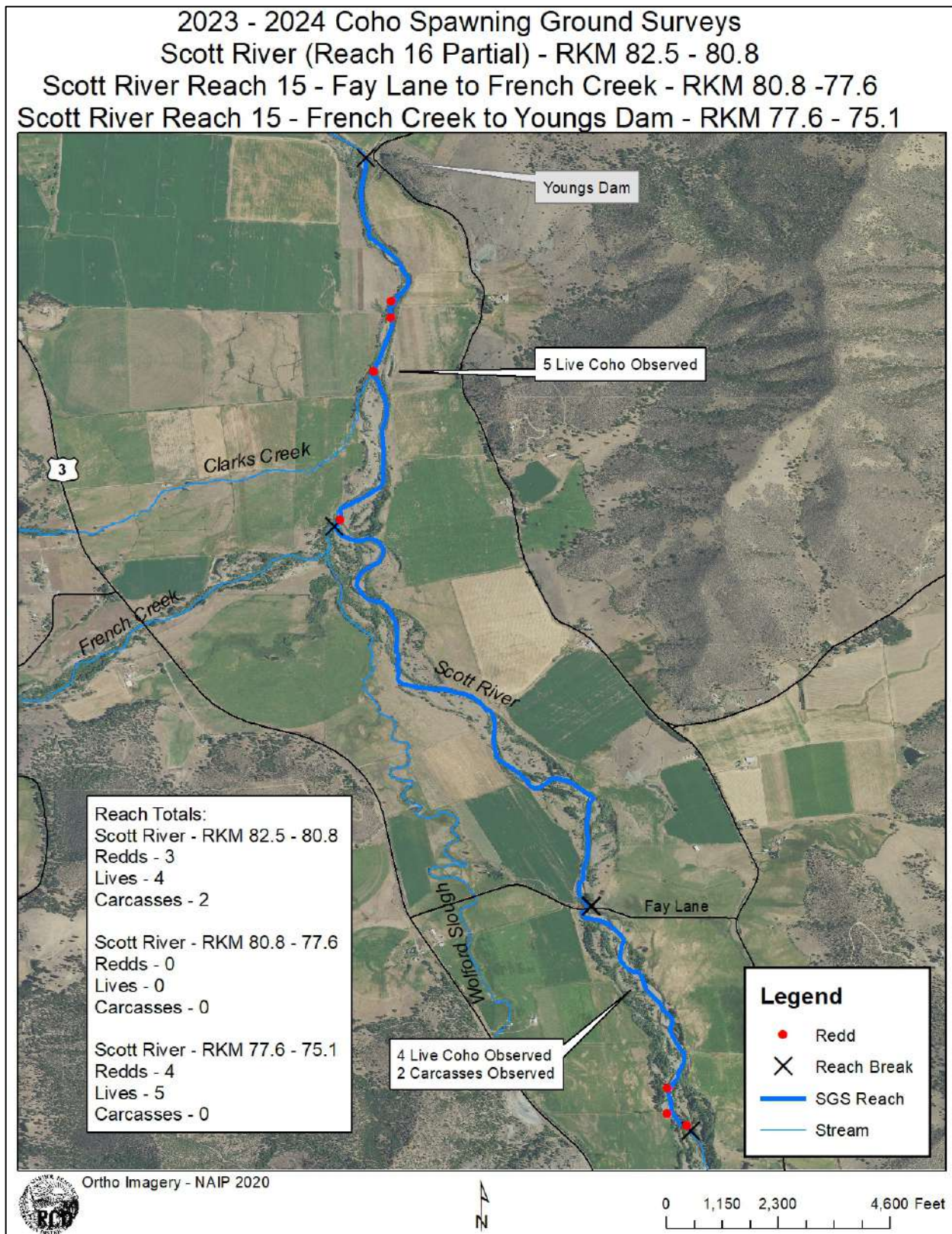
A 1.5-mile reach of the Scott River from French Creek to Youngs Dam (RKM 77.6 to 75.1) was surveyed. Four redds, five live fish and zero carcasses were observed in the mainstem Scott River between French Creek and Youngs Dam (Map 16).

**Scott River Reach 15 – Fay Lane to French Creek (RKM 80.8 - 77.6)**

A 2.1-mile reach of the Scott River from Fay Lane to French Creek (RKM 80.8 to 77.6) was surveyed. No redds, live fish or carcasses were observed in the mainstem Scott River between Fay Lane and French Creek (Map 16).

**Scott River Reach 16 – Partial to Fay Lane (RKM 82.5 - 80.8)**

A 1.0-mile reach of the Scott River from the property boundary to Fay Lane (RKM 82.5 to 80.8) was surveyed. Three redds, four live fish and two carcasses were observed in the mainstem Scott River on the partial Reach 16 effort (Map 16).



Map 16. Scott River sections of Reach 15 and partial section of Reach 16 observations.

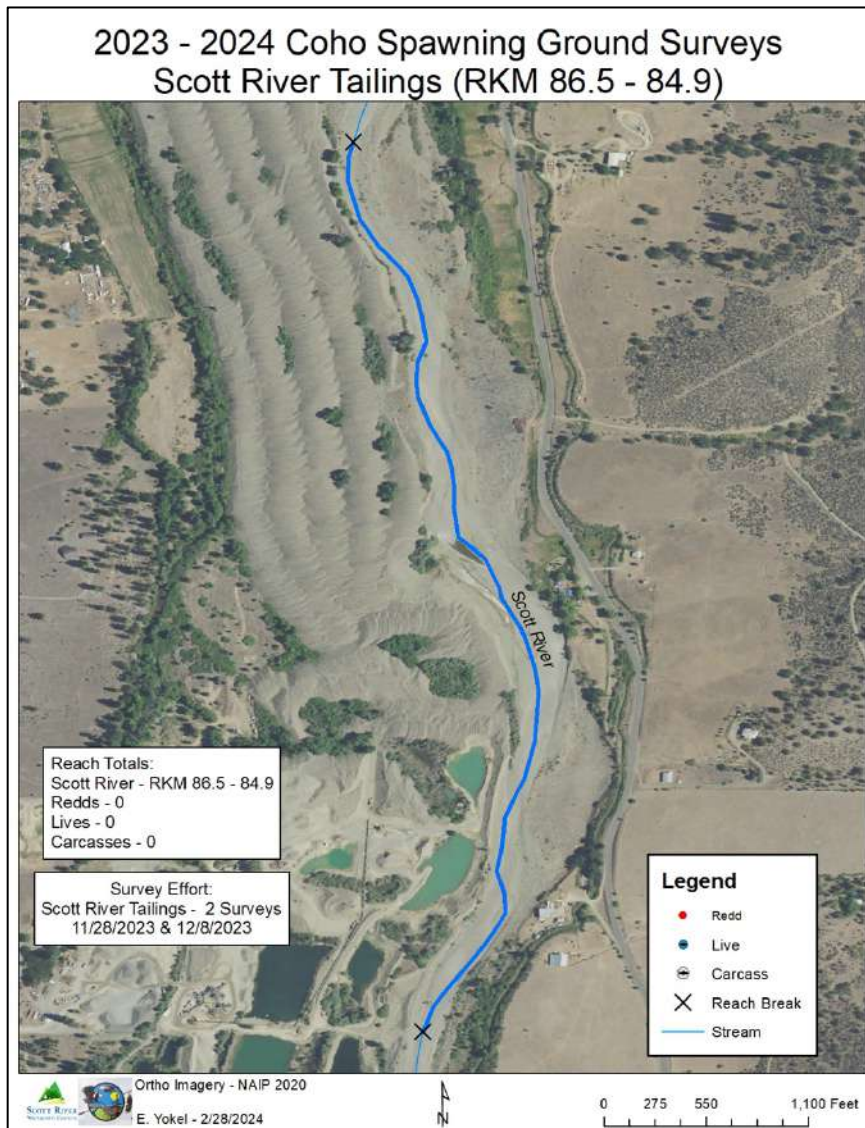


**Scott River Tailings (RKM 86.5 - 84.9)**

On November 28th and December 8th, a 1.0 mile of the mainstem Scott River Tailings from RKM 86.5 to RKM 84.9 was surveyed (Map 17). No redds, live fish or carcasses were observed during either of these surveys (Table 19).

Table 19. Coho salmon observations from Scott River Tailings RKM 86.5 - 84.9. 2023-2024.

<b>Scott River Tailings RKM 86.5 - 84.9</b>			
Date	Coho Redds Observed	Live Coho Observed	Coho Carcasses Observed
11/28/2023	0	0	0
12/8/2023	0	0	0
<b>Total</b>	<b>0</b>	<b>0</b>	<b>0</b>



Map 17. Scott River tailings reach from RMK 84.9-86.5 observations.



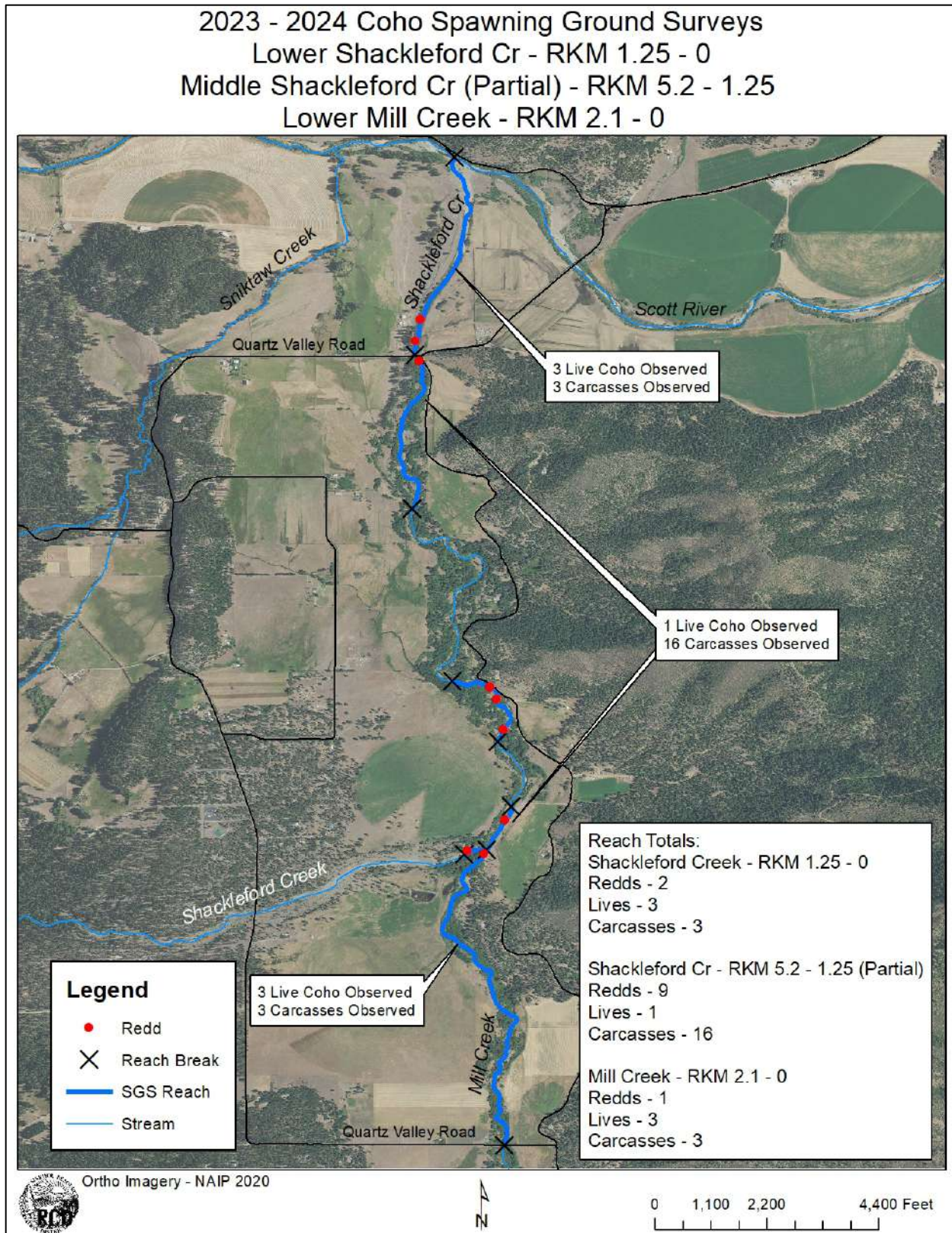
**Lower Shackleford Creek (RKM 1.25 - 0) & Middle Shackleford Creek (Partial) (RKM 5.2 - 1.25)**

A 0.8-mile reach in Lower Shackleford Creek from the Quartz Valley Road bridge to the confluence with the Scott River (RKM 1.25 to RKM 0) was surveyed. Two redds, three live fish and three carcasses were observed in the Lower Shackleford Creek reach between RKM 1.25 and the Scott River confluence (Map 18).

The Middle Shackleford Creek reach is 1.2 miles upstream of the confluence with Mill Creek to the Quartz Valley Road bridge and was surveyed in three partial noncontiguous reaches due to access restrictions. Nine redds, one live fish and sixteen carcasses were observed in the surveyed Middle Shackleford Creek reaches between the confluence with Mill Creek and the Quartz Valley Road Bridge (Map 18).

**Lower Mill Creek (RKM 2.1 - 0)**

A 1.3-mile reach in Lower Mill Creek from the Quartz Valley Road bridge to the confluence with Shackleford Creek was surveyed. One redd, three live fish and three carcasses were observed in the Lower Mill Creek reach (Map 18).



Map 18. Lower and Middle Shackleford Creek and lower Mill Creek observations.

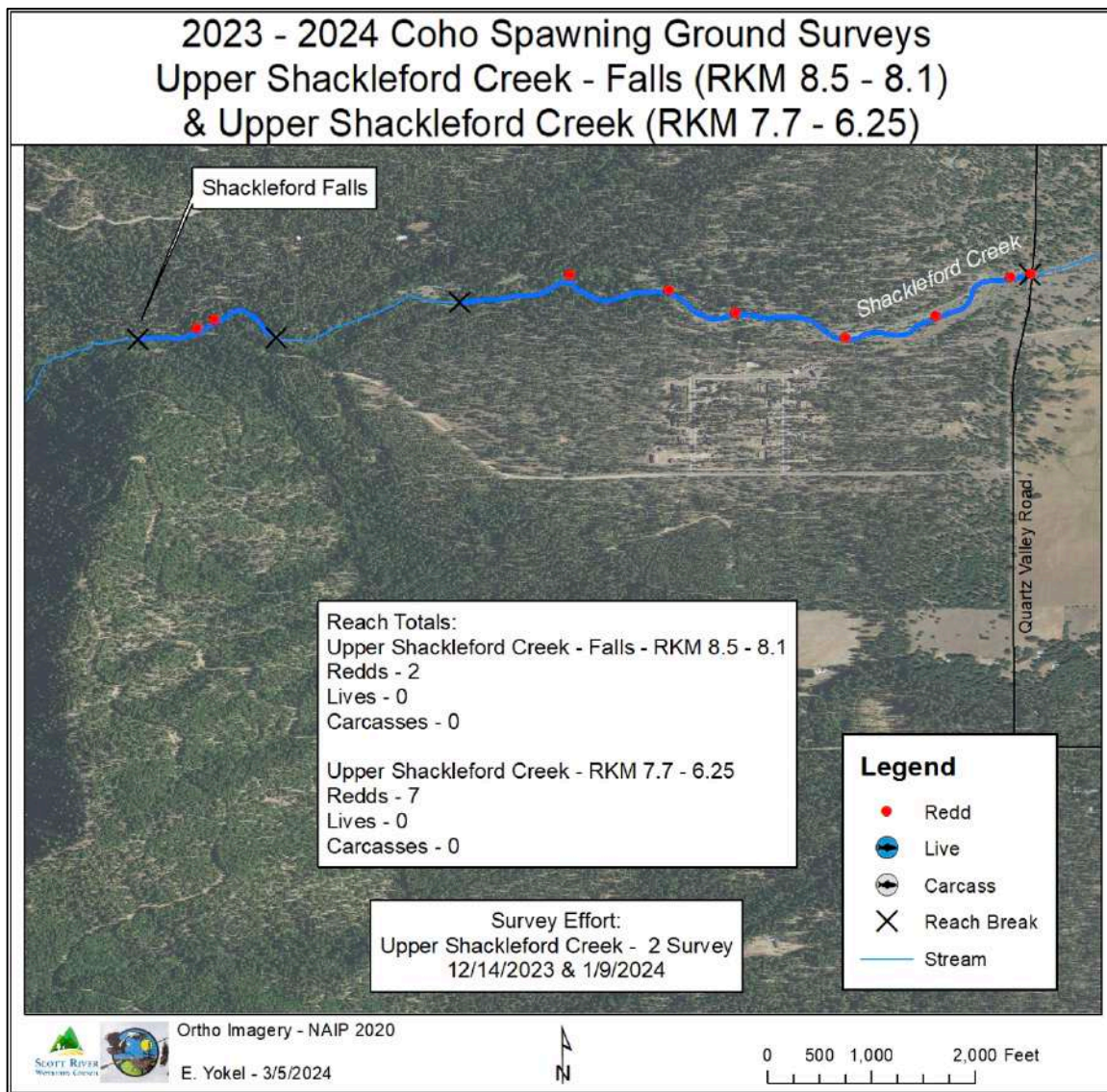


**Upper Shackleford Creek (RKM 8.5 - 8.1 & RKM 7.7 - 6.25)**

On December 14th and January 9th, 1.1 miles of Upper Shackleford Creek was surveyed in two reaches (RKM 8.5 to RKM 8.1 and RKM 7.7 to RKM 6.25) due to access restrictions from Shackleford Falls to the Quartz Valley Road bridge (Map 19). Nine redds, zero live fish and zero carcasses were observed during the survey effort (Table 20).

Table 20. Coho salmon observations from Shackleford Creek RKM 6.25 - 7.7. 2023-2024.

<b>Shackleford Creek RKM 6.25 - 7.7 &amp; RKM 8.1 - 8.5</b>			
Date	Coho Redds Observed	Live Coho Observed	Coho Carcasses Observed
12/14/2023	1	0	0
1/9/2024	8	0	0
<b>Total</b>	<b>9</b>	<b>0</b>	<b>0</b>

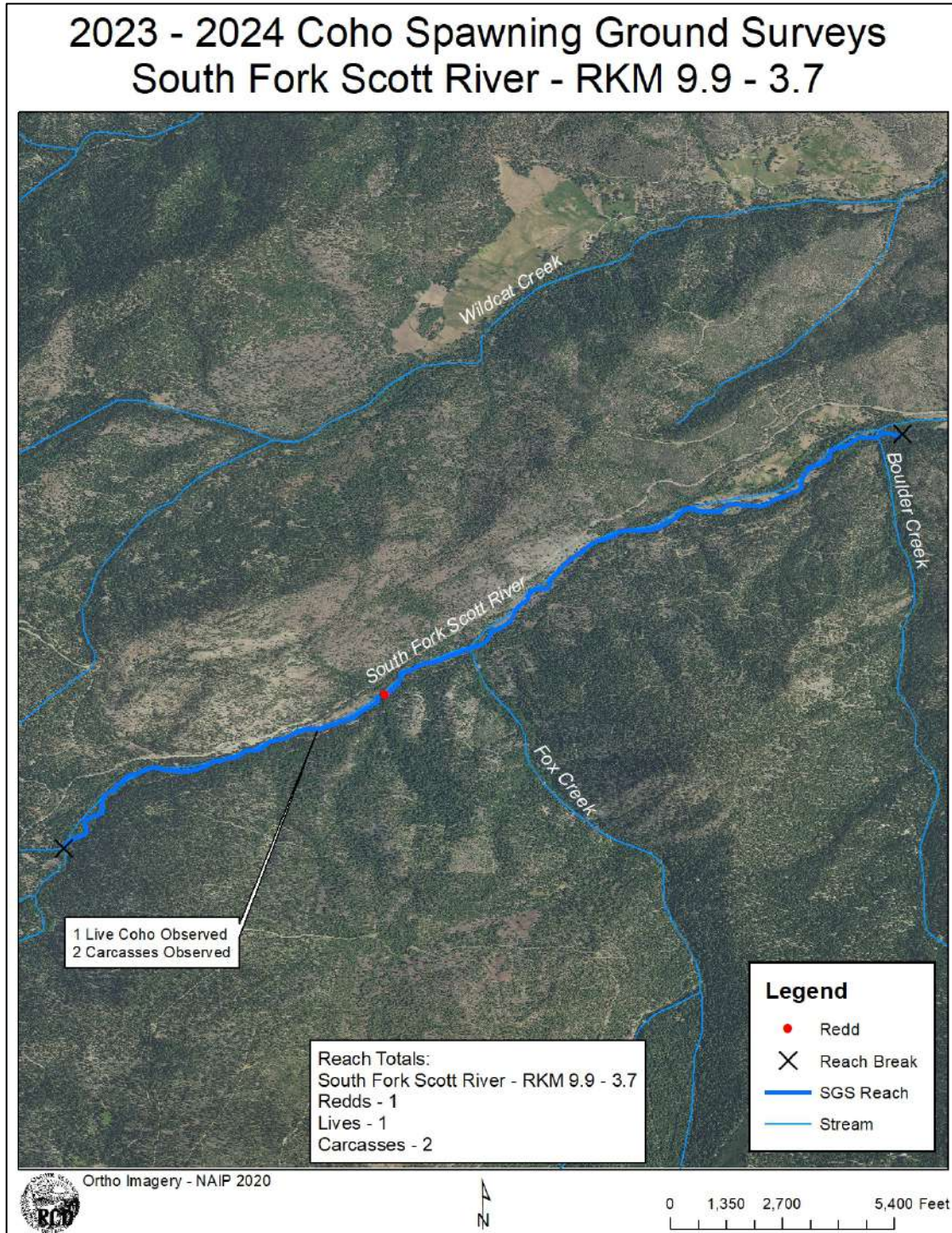


Map 19. Upper Shackleford Creek observations.



**South Fork Scott River (RKM 9.9 - 3.7)**

A 3.8-mile reach of the South Fork Scott River from upstream of Fox Creek to downstream of Boulder Creek was surveyed. One redd, one live fish and two carcasses were observed in the South Fork Scott River between RKM 3.7 and 9.9 (Map 20).



Map 20. South Fork of the Scott River observations.

**Lower and Middle Sugar Creek (RKM 1.2 - 0) & Scott River (RKM 87.4 - 87.7)**

A 0.7-mile reach of Sugar Creek from RKM 1.2 to the confluence with the Scott River was surveyed on eight occasions and a 0.1-mile reach of the mainstem Scott River from RKM 87.4 to 87.7 (the area immediately up and downstream of the mouth of Sugar Creek) was surveyed on seven occasions (Map 21). In the Lower and Middle Sugar Creek reach 35 redds, 89 live fish and 24 carcasses were observed. In the mainstem Scott River reach, 15 redds, 12 live fish and zero carcasses were observed (Table 21 and Table 22).

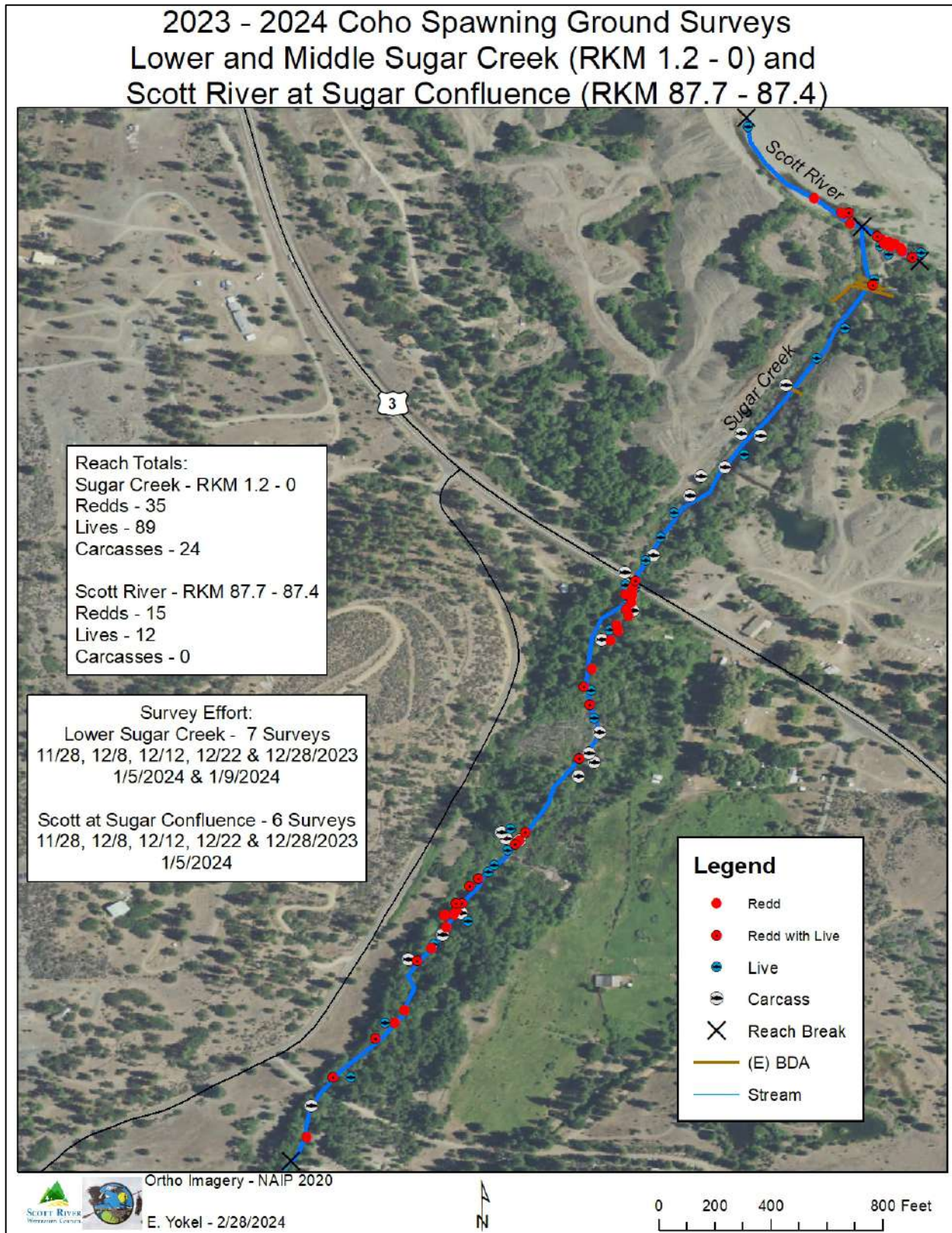
Table 21. Coho salmon observations from Sugar Creek RKM 1.2 - 0. 2023-2024.

<b>Sugar Creek RKM 1.2 - 0</b>			
Date	Coho Redds Observed	Live Coho Observed	Coho Carcasses Observed
11/28/2023	0	0	0
12/8/2023	9	13	0
12/12/2023	6	4	0
12/22/2023	6	26	0
12/28/2023	5	23	5
1/5/2024	9	20	14
1/9/2024	0	3	5
<b>Total</b>	<b>35</b>	<b>89</b>	<b>24</b>

Table 22. Coho salmon observations from Scott River RKM 87.7 - 87.4. 2023-2024

<b>Scott River RKM 87.7 - 87.4</b>			
Date	Coho Redds Observed	Live Coho Observed	Coho Carcasses Observed
11/28/2023	2	0	0
12/8/2023	6	2	0
12/12/2023	2	2	0
12/22/2023	0	0	0
12/28/2023	2	0	0
1/5/2024	3	2	0
<b>Total</b>	<b>15</b>	<b>12</b>	<b>0</b>





Map 21. Lower Sugar Creek and the Scott River confluence observations.



**Upper Sugar Creek (RKM 5.8 - 2.2)**

On December 12th, December 22nd, December 28th, January 4th and January 10th, a 2.2-mile reach of Upper Sugar Creek from RKM 5.8 to RKM 2.2 was surveyed (Photo 4 and Map 22). In total, eight redds, three live fish and one carcass were observed during these surveys (Table 23).

Table 23. Coho salmon observations from Sugar Creek RKM 5.8 - 2.2. 2023-2024

<b>Sugar Creek RKM 5.8 - 2.2</b>			
Date	Coho Redds Observed	Live Coho Observed	Coho Carcasses Observed
12/11/2023	0	0	0
12/22/2023	0	1	0
12/28/2023	1	1	0
1/4/2024	7	1	1
1/10/2024	0	0	0
<b>Total</b>	<b>8</b>	<b>3</b>	<b>1</b>

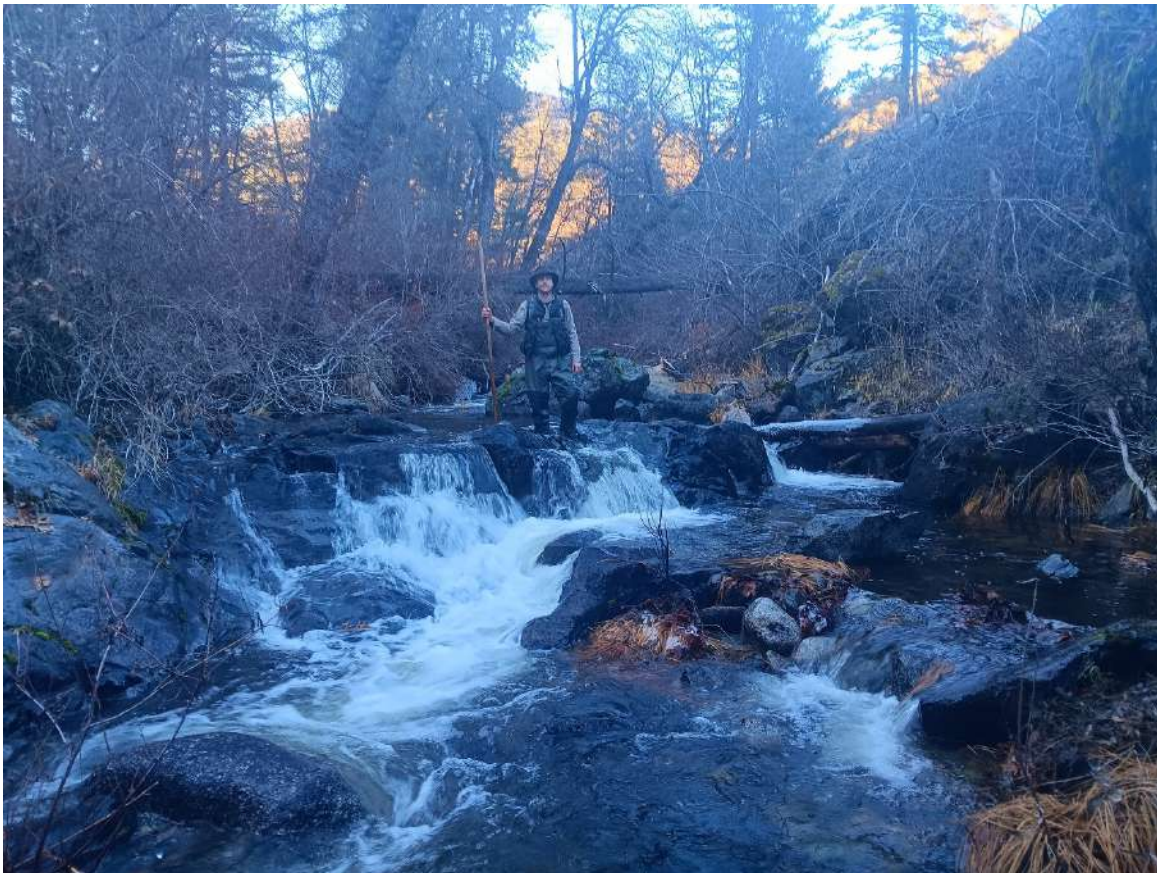
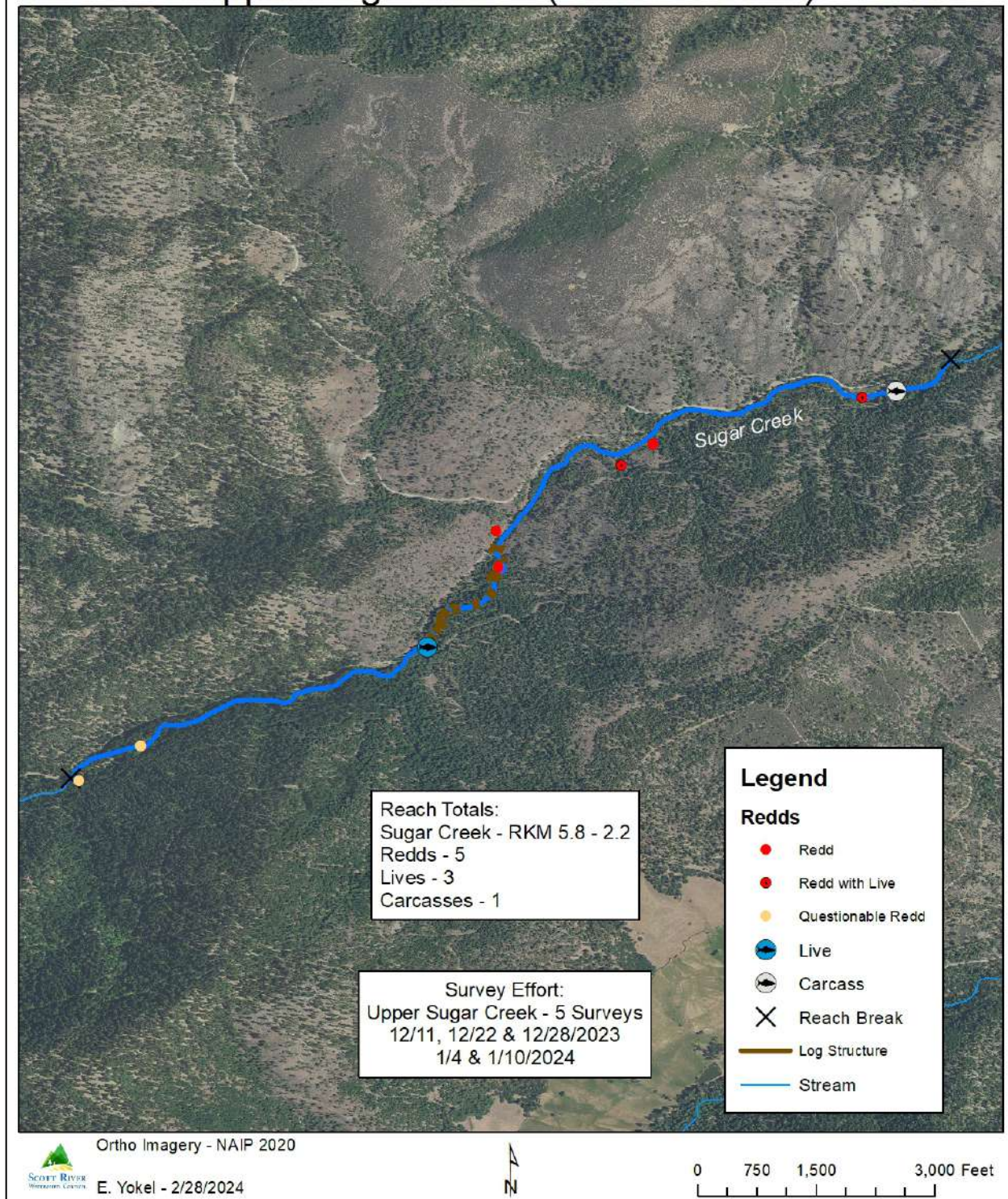


Photo 4. Upper Sugar Creek survey reach. December 2023.



## 2023 - 2024 Coho Spawning Ground Surveys Upper Sugar Creek (RKM 5.8 - 2.2)



Map 22. Upper Sugar Creek observations.

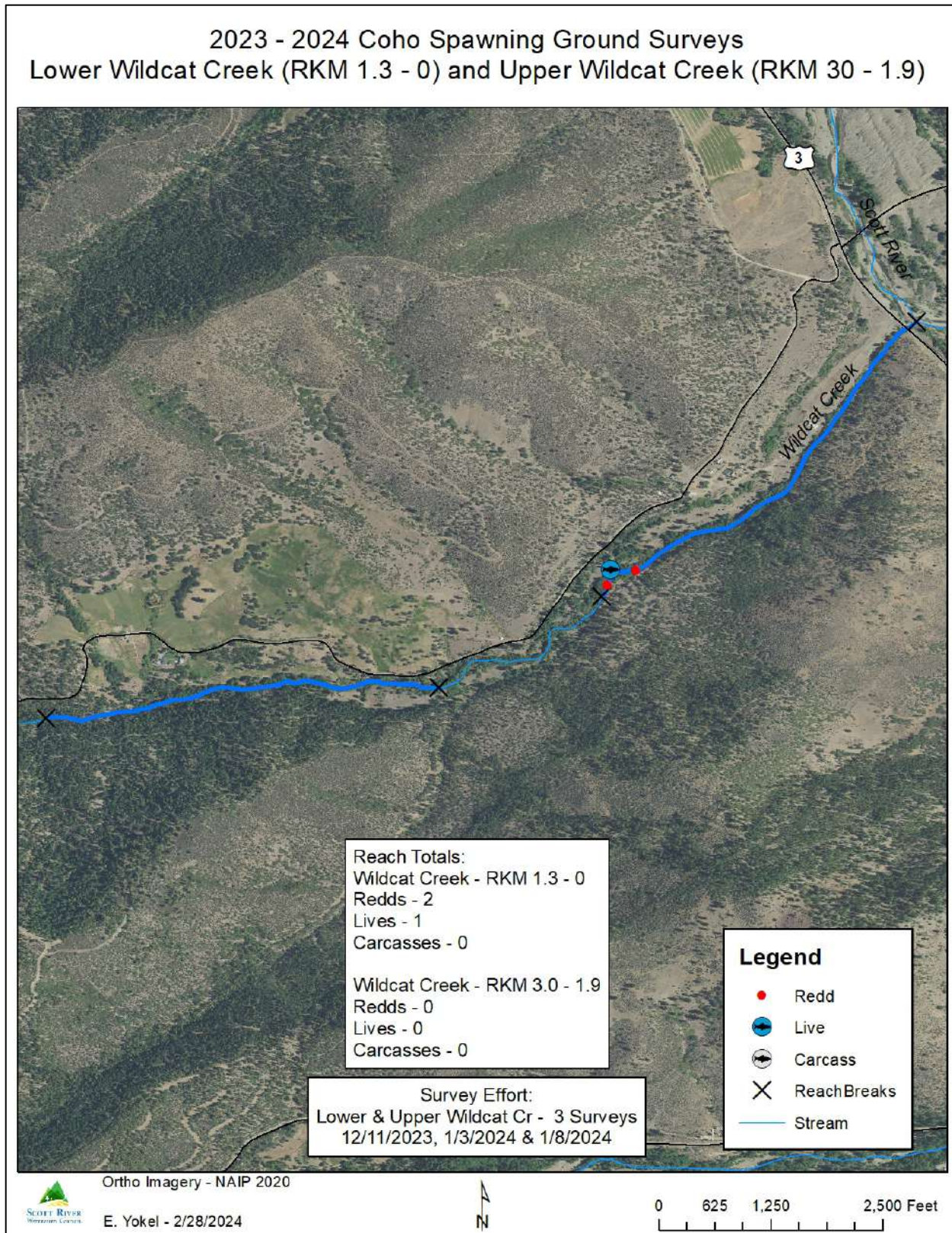
**Lower Wildcat Creek (RKM 1.3 - 0) & Upper Wildcat Creek (RKM 3.0 - 1.9)**

On December 11th, January 3rd and January 8th, a 0.8-mile reach of Lower Wildcat Creek from the RKM 1.3 to the confluence with the Scott River and a 0.7 mile reach of Upper Wildcat Creek from RKM 3.0 to RKM 1.9 was surveyed (Map 23). Two redds, two live fish and zero carcasses were observed in the Lower Wildcat Creek reach and no redds, lives or carcasses were observed in the Upper Wildcat Creek reach during these surveys (Table 24).

Table 24. Coho salmon observations from Wildcat Creek RKM 0 - 1.3 and 1.9 - 3.0. 2023-2024.

<b>Wildcat Creek RKM 1.3 - 0 &amp; RKM 3.0 - 1.9</b>			
Date	Coho Redds Observed	Live Coho Observed	Coho Carcasses Observed
12/11/2023	0	2	0
1/3/2024	2	0	0
1/8/2024	0	0	0
<b>Total</b>	<b>2</b>	<b>2</b>	<b>0</b>





Map 23. Lower and Upper Wildcat Creek observations.

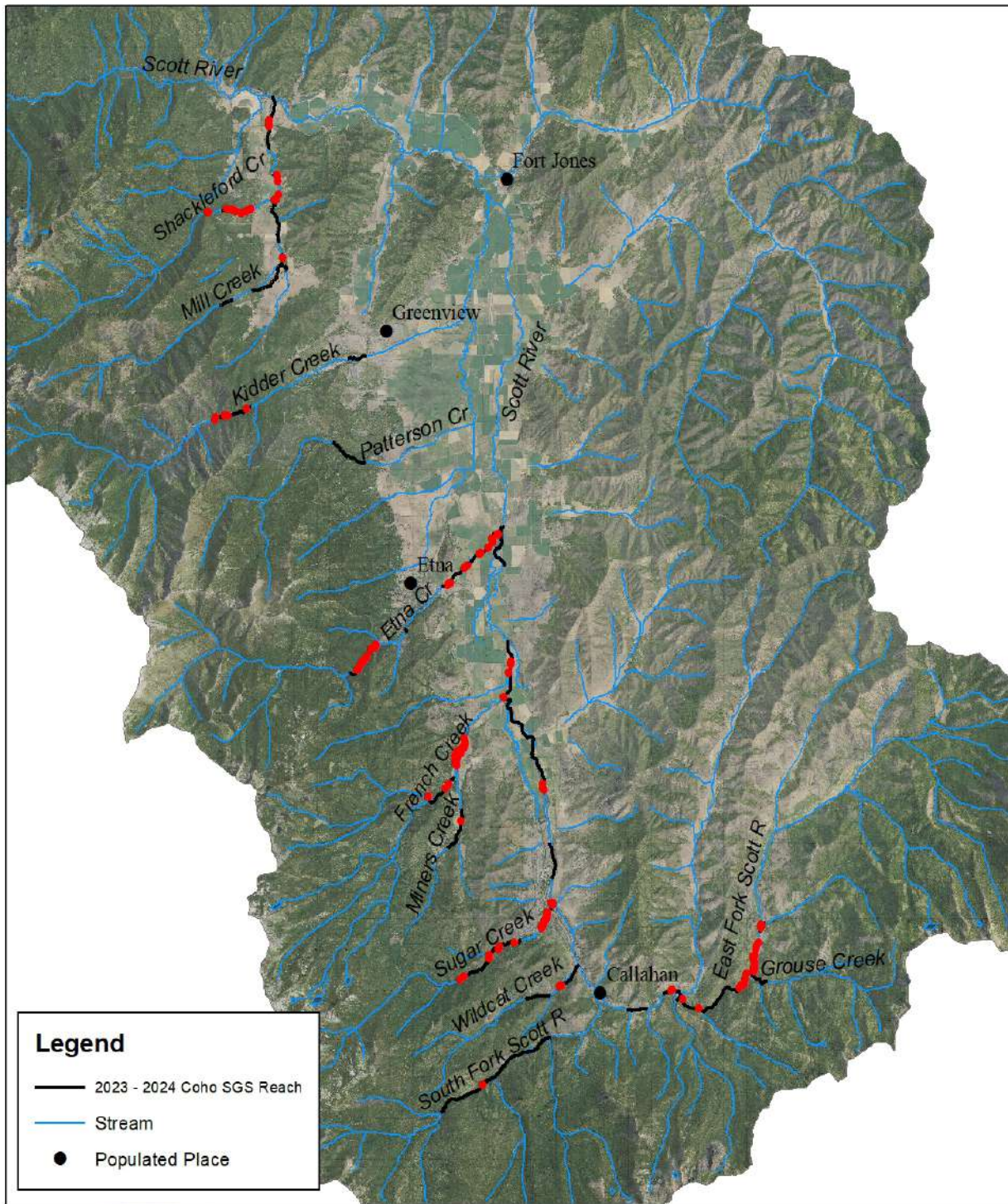
## Discussion

Increased funding, collaboration and staff availability allowed for an expansion of spawning ground survey efforts on both a spatial and temporal scale in the 2023-2024 season compared to recent years. This survey effort and streamflow conditions that allowed volitional access of adult coho salmon to most of the locations in the Scott River Watershed with documented historic distribution, resulted in an extended period of coho salmon spawning and many observations of redds, live fish and carcasses.

Coho salmon redds were observed in all surveyed tributaries except for Patterson Creek (Map 24). The density of observed redds per mile of surveyed reach was calculated for each survey reach (Table 25 and Map 26). The highest density of redds per mile of surveyed reach was observed in the side channel of the mainstem Scott River in the short reach upstream and downstream of the Sugar Creek confluence - 110 redds per survey mile. This high density is an artifact of the short survey length (0.1 miles) and the localized high density of spawning (15 redds) in the side channel of the Scott River.



### 2023 - 2024 Scott River Coho Spawning Ground Surveys Observed Coho Salmon Redds

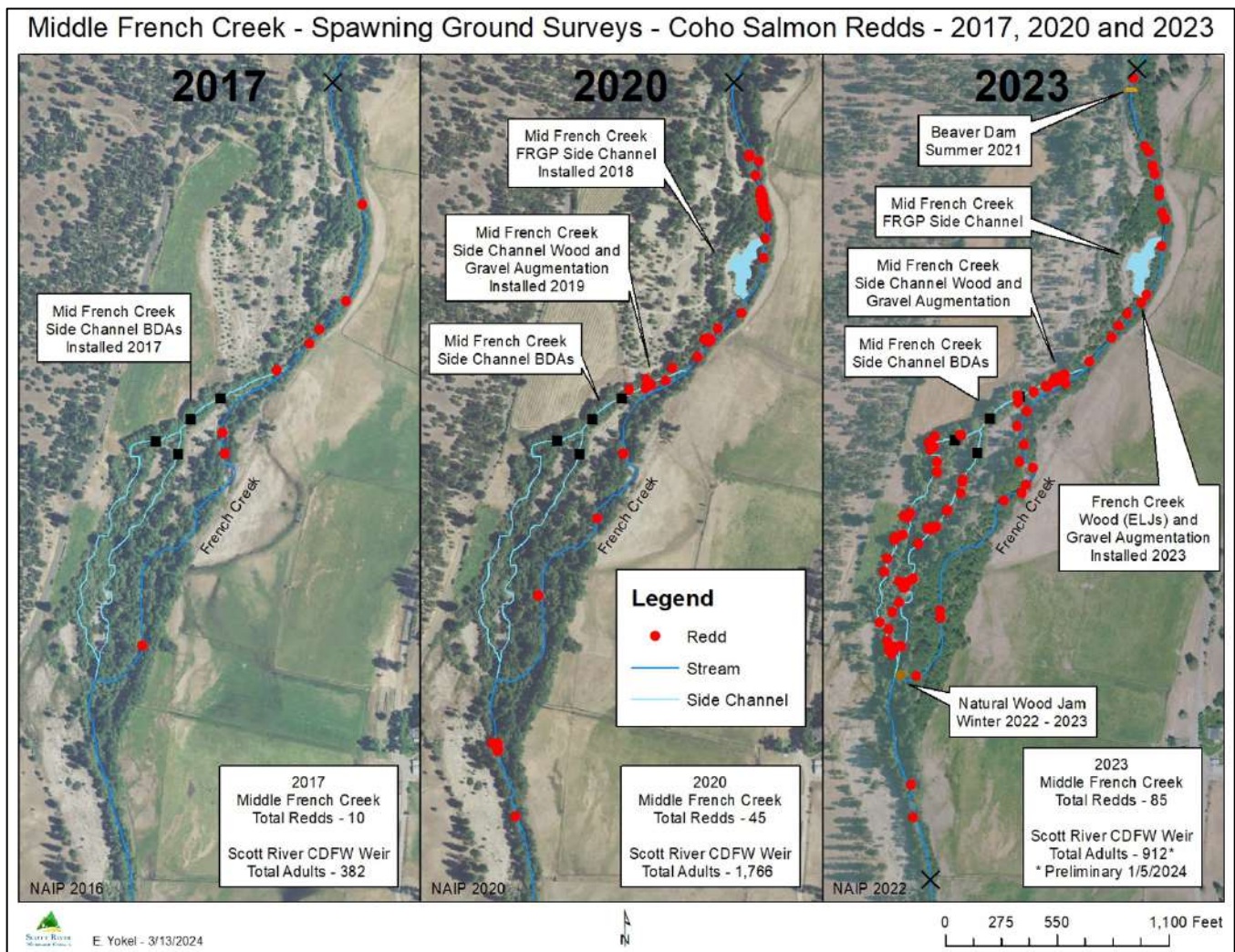


Map 24. Scott River coho salmon spawning ground survey observed redds in surveyed reach.



The highest density of redds per survey mile in the longer reaches were observed in the Middle French Creek and the Lower and Middle Sugar Creek reaches. In the Middle French Creek reach 85 redds were observed in 1.6 miles of mainstem and side channel habitat for a density of 53.3 redds per survey mile. In the Lower and Middle Sugar Creek reach 35 redds were observed in a 0.7-mile reach for a density of 48.4 redds per survey mile. It should be noted that significant restoration efforts have been performed and are ongoing in both the Middle French Creek and Lower and Middle Sugar Creek reaches.

To underscore the potential positive impact of restoration efforts on coho salmon populations, French Creek may offer valuable insights. Since 2017, various restoration measures have been initiated to support coho salmon. These include the installation of beaver dam analogs, the creation of a slow-water side channel, the placement of numerous large wood structures and the addition of suitably sized spawning gravel (Map 25). The increased utilization of this reach by returning coho salmon can serve as a metric for assessing project effectiveness and identifying actions that may contribute to coho recovery.



Map 25. French Creek spawning ground survey coho salmon redds change over time of the same cohort and various restoration actions taken by private landowners.

In the winter of 2023, the formation of a natural wood jam activated a relic side channel. In an attempt to preserve this feature measures were implemented to strengthen the integrity of the wood formation by inserting vertical posts into the mainstem woody debris structures (Photo 5). Consequently, the wood jam endured higher flows, substantially increasing spawning opportunities. The increase in both the quantity and distribution of redds emphasizes the significance of restoration efforts aimed at support for all life stages for both summer and winter juvenile coho salmon.



*Photo 5. Log Jam looking upstream from mid channel with vertical logs placed to add support. December 21, 2023.*

The fourth highest density of redds per survey mile occurred in the Middle East Fork Scott River reach at the confluence of Kangaroo Creek. This relatively short reach (0.3 miles) with a high density of redds (12 redds) had a density of 45.5 redds per survey mile.

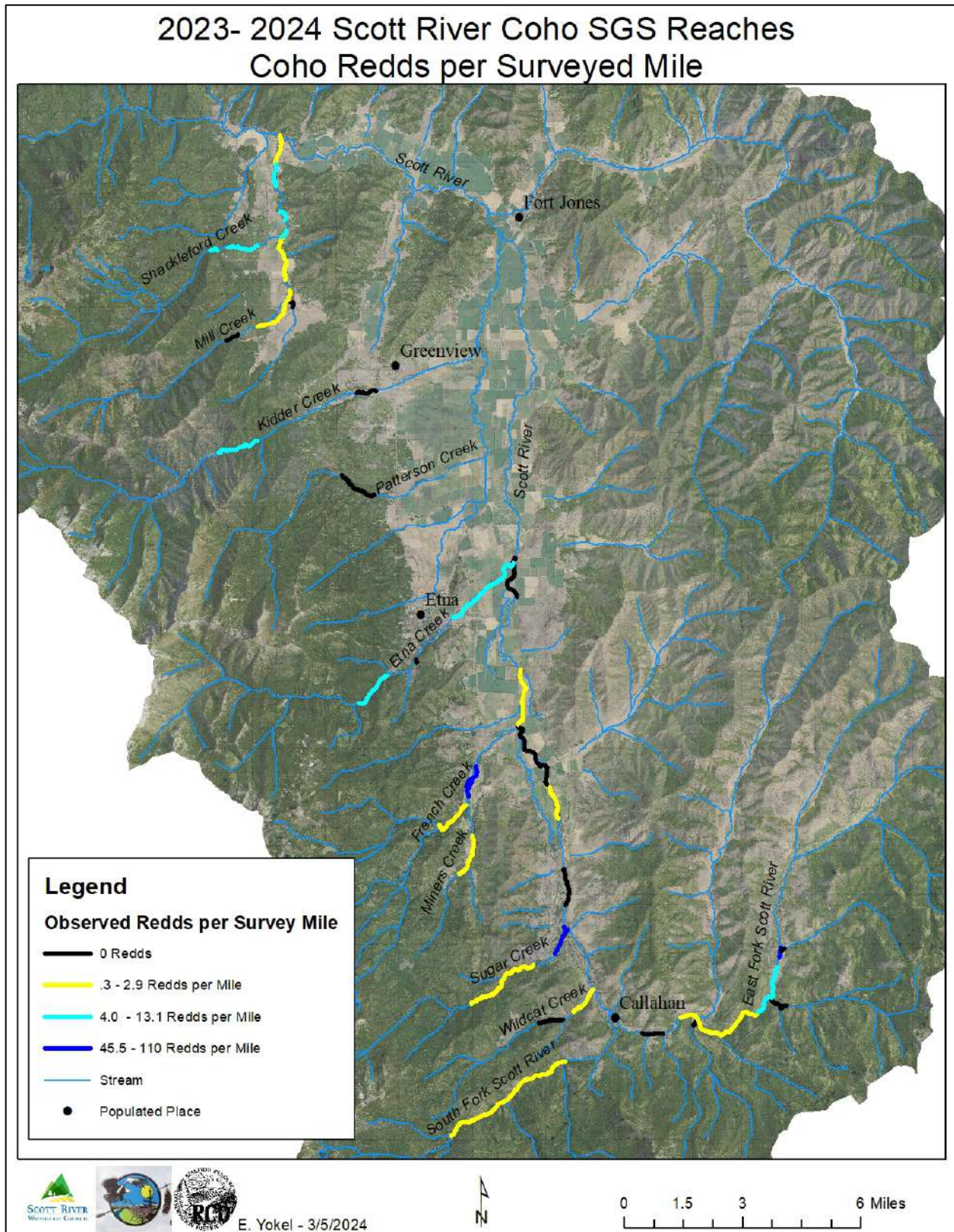
Seven survey reaches had densities of redds per survey mile between 4.0 and 13.1 redds per mile. These reaches include the Middle East Fork Scott River at the confluence of Grouse Creek reach (13.1 redds per mile), the Upper Etna Creek reach (10.9 redds per mile), the Lower Etna Creek reach (9.1 redds per mile), the Upper Shackleford Creek reaches (8.7 and 7.9 redds per mile), the Middle Shackleford Creek reach (7.3 redds per mile) and the Upper Kidder Creek reach (4.0 redds per mile).

Spawning ground surveys performed during the strong brood year returns of 2004, 2007, 2010 and 2016 identified Lower Mill Creek, Shackleford Creek, Mid French Creek, Lower Miners Creek and Lower Sugar Creek as the reaches that consistently supported high density spawning (SRWC 2018). The high-density spawning reaches during the 2023-2024 survey season coincide with the previous observations except for the Lower Mill Creek reach that had low density of spawning in the 2023-2024 season (Lower Miners Creek was not surveyed in 2023-2024 due to access restrictions).



Table 25. Totals for all survey reaches and data collected. 2023-2024.

Stream	Reach	Length (miles)	Redds (Number)	Lives (Number)	Carcasses (Number)	Redds per Survey Mile
Shackleford Creek	Lower	0.8	2	3	3	2.5
Shackleford Creek	Middle - Partial	1.2	9	1	16	7.3
Shackleford Creek	Upper	0.9	7	0	0	7.9
Shackleford Creek	Upper - Falls	0.2	2	0	0	8.7
Mill Creek	Lower	1.3	1	3	3	0.8
Mill Creek	Middle	1.5	1	0	0	0.7
Emigrant Creek	Lower	0.3	0	0	0	0
Mill Creek	Upper	0.4	0	0	0	0
Kidder Creek	Middle	0.5	0	0	1	0
Kidder Creek	Upper	1.3	5	1	0	4.0
Patterson Creek	Upper	1.1	0	0	0	0
Scott River	Reach 13 - Partial	1.3	0	2	0	0
Etna Creek	Lower	2.3	16	17	21	9.1
Etna Creek	Middle	0.1	0	0	0	0
Etna Creek	Upper - Etna Diversion	1.1	12	3	2	10.9
Scott River	Reach 15 - French to Youngs Dam	1.5	4	5	0	2.6
French Creek	Middle	1.6	85	165**	84	53.3
French Creek	Upper	1.0	3	0	5	3.0
Miners Creek	Middle	1.2	1	0	0	0.8
Scott River	Reach 15 - Fay Lane to French	2.1	0	0	0	0
Scott River	Reach 16 - Partial	1.0	3	4	2	2.9
Scott River	Reach 16 - Tailings	1.0	0	0	0	0
Scott River	Reach 16 - Sugar Confluence	0.1	15	12	0	110.0
Sugar Creek	Lower and Middle	0.7	35	89	24	48.4
Sugar Creek	Upper	2.2	8	3	1	3.2
Wildcat Creek	Lower	0.8	2	1	0	2.5
Wildcat Creek	Upper	0.7	0	0	0	0
South Fork Scott River	Upper and Middle	3.8	1	1	2	0.3
East Fork Scott River	Lower	0.5	0	0	0	0
East Fork Scott River	Middle - Big Mill Creek	2.6	4	3	0	1.6
Big Mill Creek	Lower	0.2	0	0	0	0
Mule Creek	Lower	0.02	0	0	0	0
East Fork Scott River	Middle - Grouse Creek	1.8	23	5	3	13.1
Grouse Creek	Lower	0.6	0	0	0	0
East Fork Scott River	Middle - Kangaroo Creek	0.3	12	12	1	45.5
Kangaroo Creek	Lower	0.1	0	0	0	0
<b>Totals</b>		<b>38.3</b>	<b>251</b>	<b>329**</b>	<b>168</b>	



Map 26. Scott River coho salmon spawning ground surveys reaches and observed redds per survey mile.



The average redd size observed during the 2023-2024 coho spawning season was 1.9 m long and 1.0 m wide. The largest spawning sites were seen in Shackleford Creek and the mainstem Scott River, where five redd complexes greater than 4 m in length were observed (Figure 9). It is likely that these sites are multiple redds superimposed on one another.

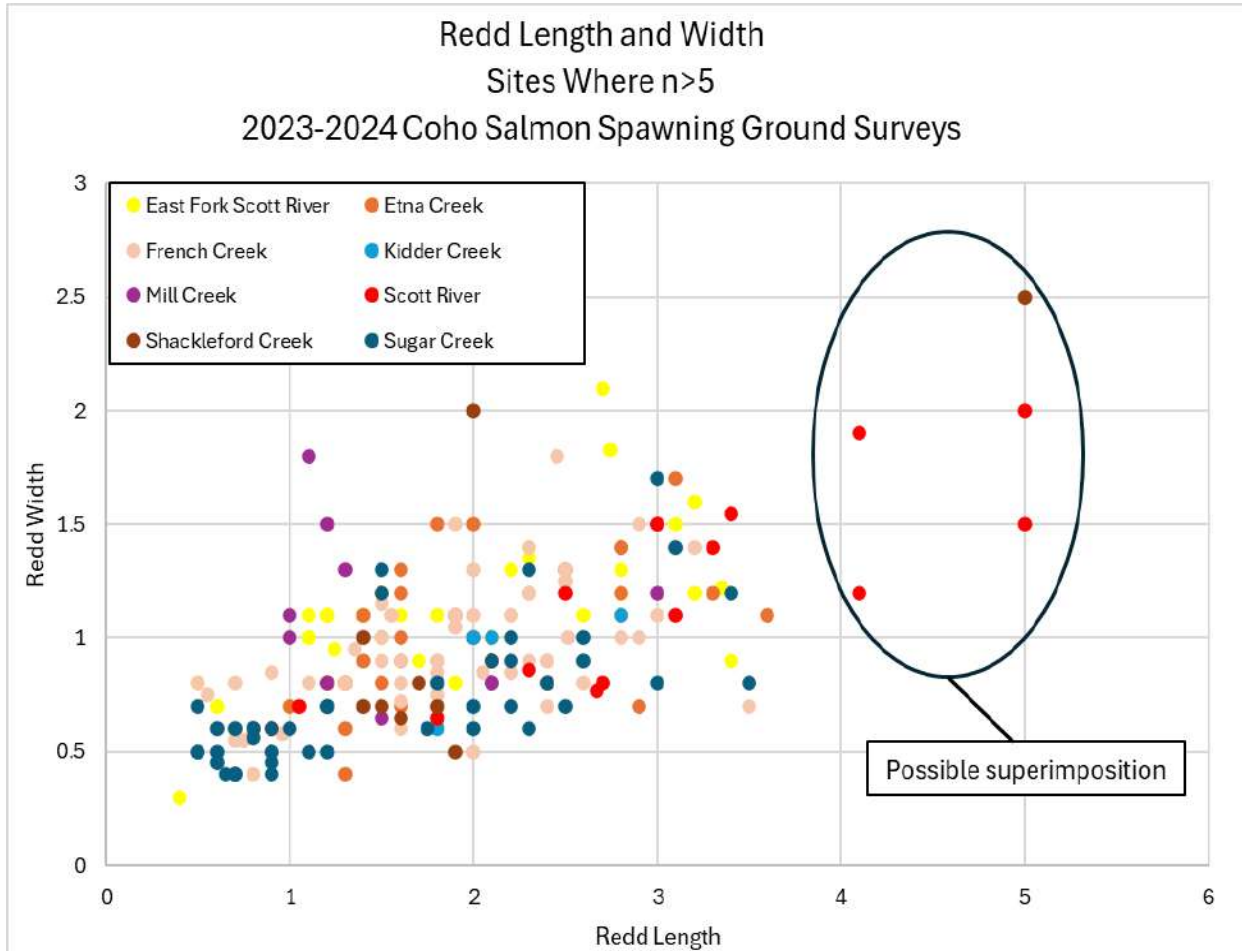


Figure 9. Scatter plot of redd length and width from all streams where more than five redds were observed.

Of the 168 carcasses observed during the spawning ground survey season, forklength measurements were performed on 136 carcasses. The mean and median of these measurements were 64.8 cm and 65 cm, respectively. The mode was 63 cm, and the range was 30 cm to 77 cm (Figure 10). The 30 cm carcass appears to be a coho salmon “jack” – a two year old precocious male returning to spawn after spending only one summer in the marine environment.

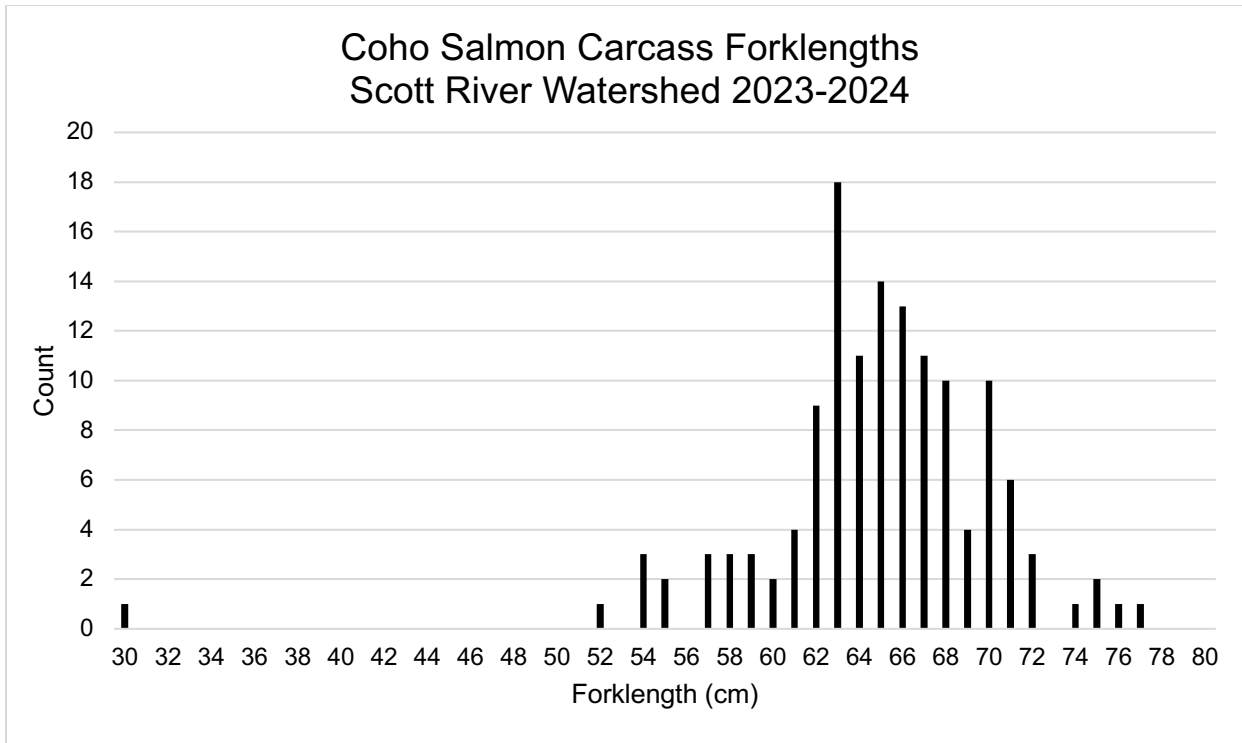


Figure 10. Histogram of coho salmon carcass forklengths observed during the 2023-2024 season.

The 912 coho salmon that returned to spawn in the Scott River in the 2023-2024 season were the progeny of the 1,766 spawners from the 2020-2021 season. During the 2020-2021 season, flows in the mainstem Scott River were extremely low during the period of adult migration. Daily average discharge at USGS Scott River discharge station did not exceed 35 cfs until December 17th and did not exceed 200 cfs until January 5th. During the 2023-2024 season, daily average discharge did not drop below 50 cfs after October 15th and exceeded 200 cfs on December 4th (Figure 11).



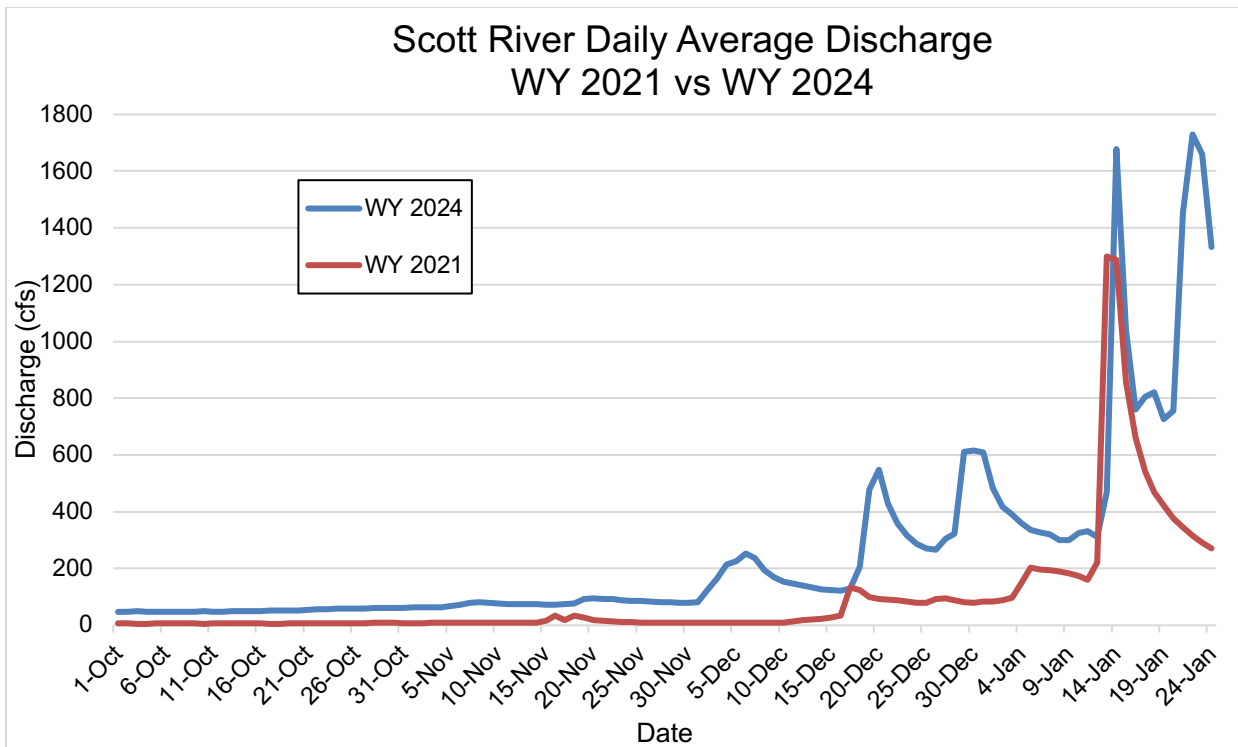


Figure 11. Comparison of daily average discharge at the Scott River (USGS gage 11519500) from October 1<sup>st</sup> to January 24<sup>th</sup> for Water Year 2021 and Water Year 2024.

The abnormally low flows during Water Year 2021 in conjunction with the severe drought of WY2020 led to a severe delay in the connectivity in the mainstem Scott River and tributaries in the late fall of 2020, likely influencing the areas in which spawning occurred (SRCO 2021). In the 2020-2021 season, 26% of the observed redds were seen in the mainstem Scott River and 74% were seen in tributary streams. Based on survey data, during the 2020-2021 season, spawning was largely concentrated in the Shackleford Creek watershed (44% of total), the first major tributary returning coho salmon encounter upon entering Scott Valley. A significant percent of the documented spawning (26% of total) was observed in the mainstem Scott River in the 2020-2021 season. In the 2020-2021 season, no redds were observed upstream of the Scott River tailings, which begin at Scott River RKM 83.9. In contrast, during the 2023-2024 season 8.8% of redds were observed in the mainstem Scott River and 91.2% were observed in tributaries. Additionally, 33.9% of redds were observed upstream of the Scott River tailings during this spawning season (Table 26).

Table 26. Comparison by reach of this cohort of coho salmon from 2020-2021 season to 2023-2024 season (SRCD 2021).  
 \*\*Coho salmon abundance data from the CDFW SRFCF in 2023-2024 is preliminary.

Stream	2020-2021 Redds (1,766 Spawners)		2023-2024 Redds (912 Spawners**)	
	Number	Percentage	Number	Percentage
<b>Scott River Mainstem</b>				
Reach 16 Partial (RKM 87.4-87.7)	ND	NA	15	6.0%
Reach 16 Partial (RKM 80.8-82.5)	30	10.6%	3	1.2%
Reach 15 (RKM 75.1-80.8)	33	11.7%	4	1.6%
Reach 13 Partial (RKM 68.6-70.6)	1	0.4%	0	0.0%
Reach 9	8	1.7%	ND	NA
<b>Scott River Mainstem Total</b>	<b>72</b>	<b>26.0%</b>	<b>22</b>	<b>8.8%</b>
<b>Tributaries (North to South)</b>				
Mill Creek	55	20.0%	2	0.8%
Shackleford Creek	67	24.0%	20	8.0%
Kidder Creek	ND	NA	5	2.0%
Etna Creek	0	0.0%	28	11.2%
Miners Creek (not identical survey reaches)	30	10.0%	1	0.4%
French Creek	56	20.0%	88	35.1%
Sugar Creek	0	0.0%	43	17.1%
Wildcat Creek	ND	NA	2	0.8%
East Fork	ND	NA	39	15.5%
South Fork	0	0.0%	1	0.4%
<b>Tributary Total</b>	<b>208</b>	<b>74.0%</b>	<b>229</b>	<b>91.2%</b>
<b>Total Redd Count for 21/22 &amp; 23/24 Surveys</b>	<b>280</b>	<b>100%</b>	<b>251</b>	<b>100%</b>

**Recommendations**

To enhance forthcoming surveys, the participating organizations are committed to nurturing positive relationships with landowners and extending access to additional survey locations. Potential areas of focus may encompass middle Kidder Creek, middle Patterson Creek, lower Etna Creek, a portion of Sugar Creek and additional areas in both the East and South Fork.



## Acknowledgements

This report has been produced through the joint endeavors of the QVIR, SRWC and SRCD. Special recognition and gratitude are extended to the Scott Valley landowners who generously permitted the surveys on their private properties. The successful completion of this work would not have been possible without their valuable cooperation.

The organizations would like to acknowledge and thank the agencies who provided the financial resources to support these important efforts:

Quartz Valley Indian Reservation, *California Department of Fish and Wildlife, Watershed Restoration Grant, Q2296027*; Scott River Watershed Council, *California Department of Fish and Wildlife, Watershed Restoration Grant, Q2296027*; Siskiyou Resource Conservation District, *California Department of Fish and Wildlife, Ichthyology Program, F20AP11407*

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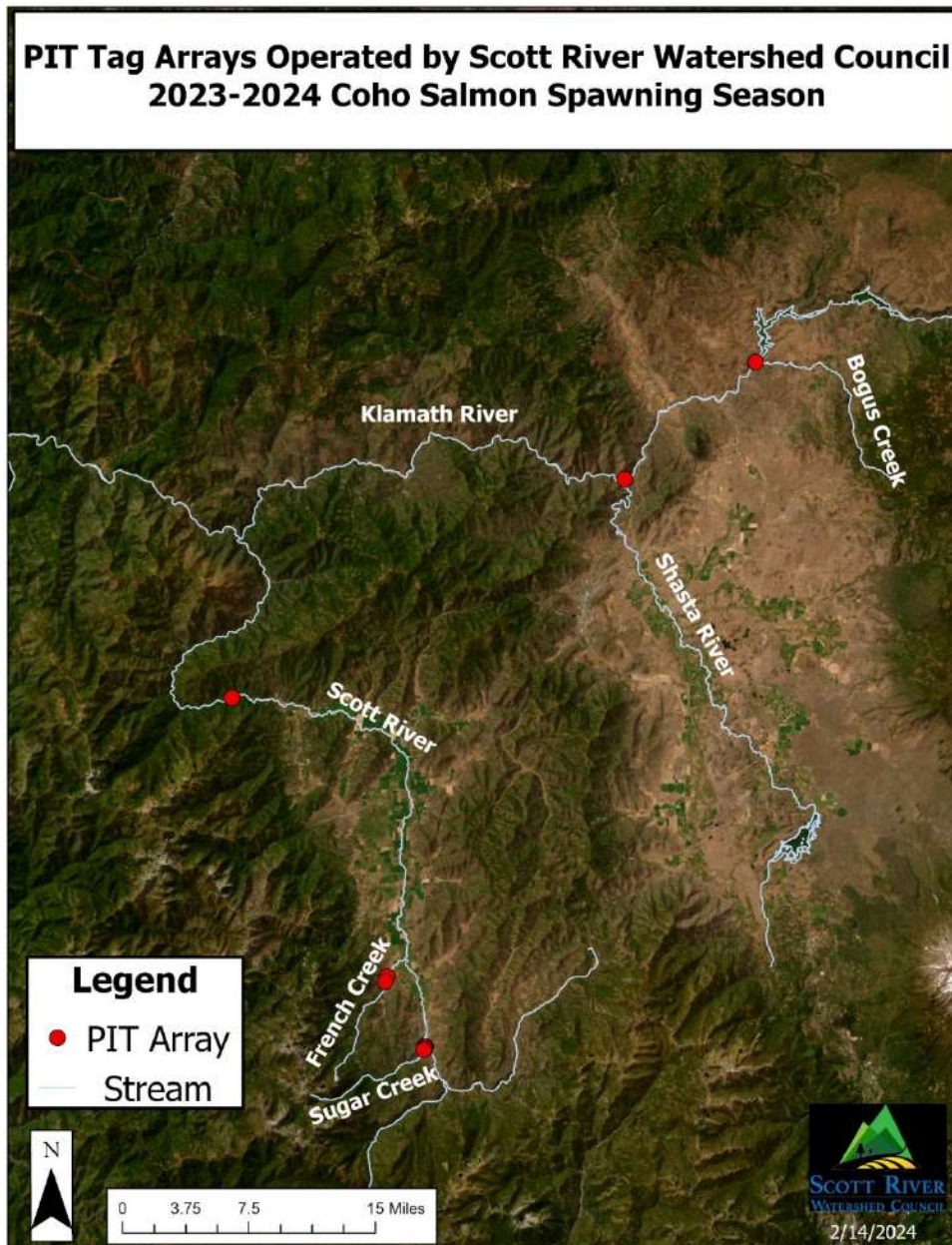


Scott River Watershed Council's  
Passive Integrated Transponder (PIT) Program  
2023/2024



## Introduction

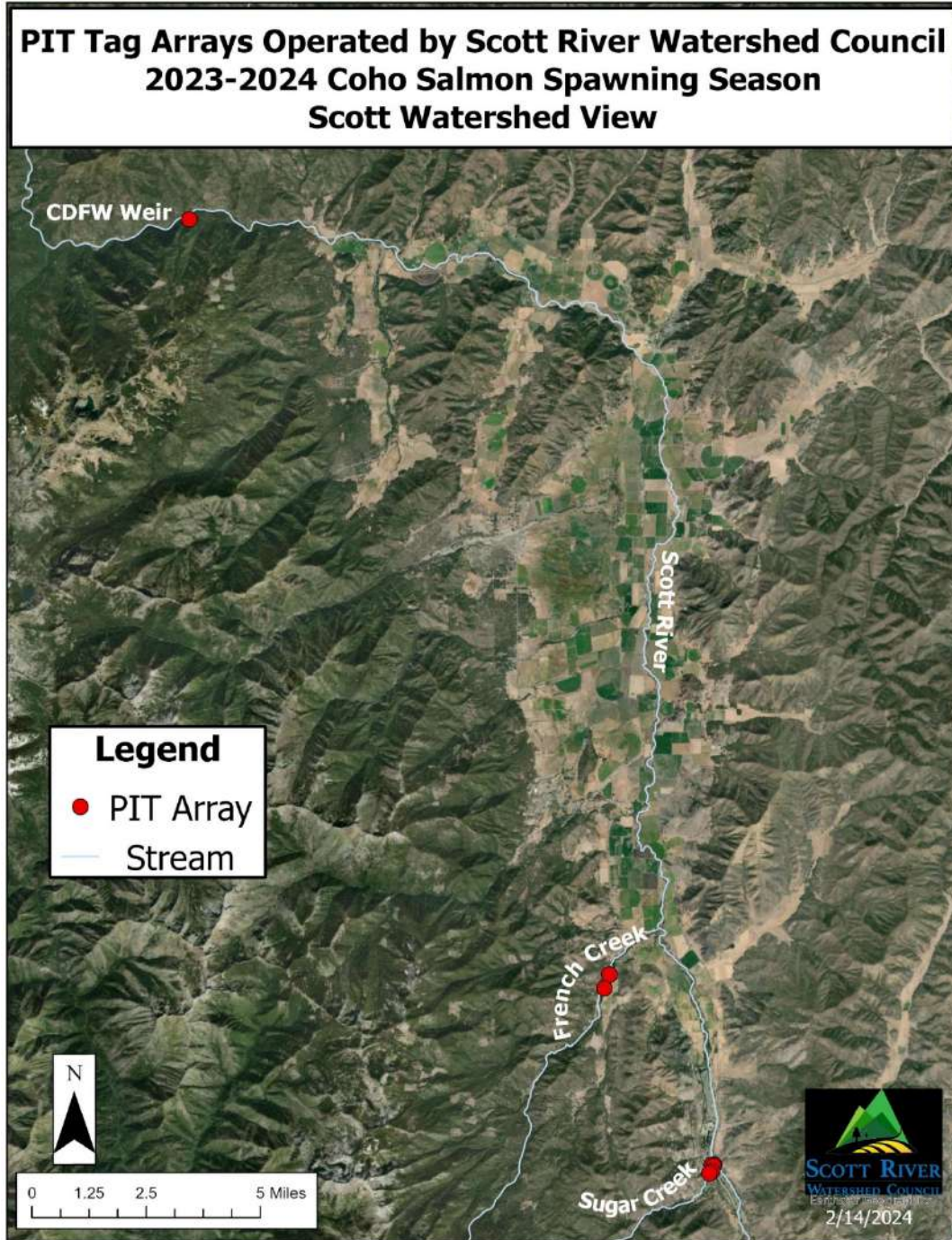
During the 2023/2024 Coho Salmon (*Oncorhynchus kisutch*) spawning season, the Scott River Watershed Council (SRWC) operated eleven passive integrated transponder (PIT) tag arrays in the Klamath River watershed. These arrays, consisting of an instream antenna, a data logger and a power station, record detection data as previously PIT-tagged fish pass over or through the antenna. On the mainstem Scott River and the Shasta River, SRWC operated antennas at the California Department of Fish and Wildlife (CDFW) adult salmonid counting facilities. In addition to these weir antennas, SRWC operated nine arrays: two at French Creek, five at Sugar Creek and two at Bogus Creek (Map 1).



Map 1. Locations of all PIT arrays operated by the Scott River Watershed Council between October 2023 and January 2024.

### Scott River, French Creek and Sugar Creek

The CDFW weir on the Scott River and its associated PIT antenna are operated at river kilometer (RKM) 29.2. The furthest downstream array on French Creek is located at RKM 2.85, while the furthest downstream array on Sugar Creek is located at RKM 0.05 (Map 2).



Map 2. PIT arrays operated in the Scott River watershed between October 2023 and January 2024.



The Scott River weir array operated from October 25<sup>th</sup> to December 27<sup>th</sup>, 2023. This array consists of an HDPE antenna that is oriented around the weir opening, meaning that all adult Coho Salmon migrating past this point must pass through this antenna. The antenna connects to an IS1001 reader in an enclosure on the weir and then to a power station and data logger on the bank (Picture 1-4).



Picture 1. Scott River CDFW weir.



Picture 2. HDPE antenna operated at Scott River weir.





Picture 3. Fishway enclosure housing IS1001 reader and capacitance board.



Picture 4. Data logger and power station at Scott River weir array.



The French and Sugar Creek PIT Arrays are operated continuously throughout the year. The downstream array at French Creek consists of two 20-foot flexible cord antennas lying flat on the streambed. These antennas connect to “J-boxes” (connection point between antennas and readers) and then on to IS1001 readers housed in a Pelican box on the bank. The power for this system comes from a battery bank being charged by solar panels (Picture 5-9).



Picture 5. French Creek downstream array. J-boxes in foreground attached to t-post and tree.



Picture 6. Flexible antenna lying flat on streambed at French Creek downstream array.





Picture 7. IS001 readers at French Creek downstream array.



Picture 8. Example of solar panel setup at array site.





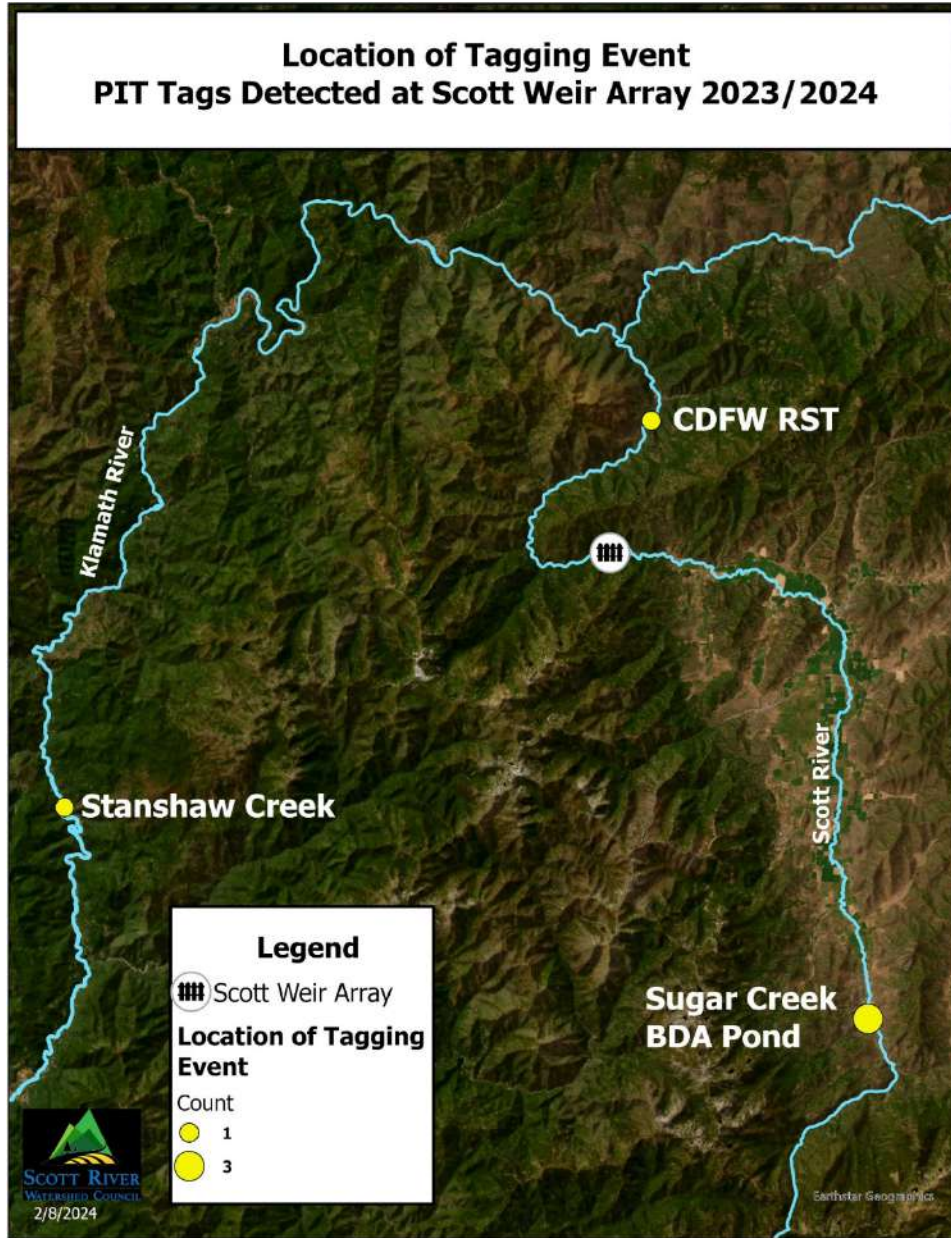
Picture 9. Example of battery bank setup at array site.

The Sugar Creek downstream array site is very similar to its counterpart at French Creek, the main difference being the use of two HDPE antennas standing up in the channel (Picture 10).



Picture 10. Paired antennas at the Sugar Creek downstream array site.

During the 2023/2024 season, five PIT-tagged Coho Salmon were detected passing through the weir antenna at RKM 29.2. Three of these fish had been tagged by SRWC in Sugar Creek beaver dam analog (BDA) habitats, one by the Karuk Tribe at a Stanshaw Creek restoration site and one by CDFW at the Scott River rotary screw trap (RST) at RKM 7.8 (Map 3).



Map 3. Location of tagging event for all PIT-tagged adult Coho Salmon detected in the Scott River watershed between October 2023 and January 2024.

Tag #989001044294998 was detected passing through the weir antenna and then was detected one month later in French Creek. Interestingly, this fish had been tagged as a juvenile in Sugar Creek, and it appears to have exhibited a two-year life cycle, rather than the more common three-year cycle. Tag #989001044294998 was the only tag detected higher up in the watershed after being detected at the weir antenna.

Tag #989001028144543 was implanted by the Karuk Tribe in Stanshaw Creek near its confluence with the Klamath River on July 1<sup>st</sup>, 2021 (Table 1). The detection of this tag 29 months later at the Scott weir antenna indicates that this fish originated in the Scott River and took refuge in a restored Stanshaw Creek habitat after making an early outmigration from the Scott watershed.



<b>Tag #989001041193497</b>					
<b>Date</b>	<b>Stream</b>	<b>Location</b>	<b>Gear</b>	<b>Fork Length (mm)</b>	<b>Weight (g)</b>
1/19/2022	Sugar Creek	BDA Pond 1 (RKM 0.1)	Minnow Traps	100	11.4
3/10/2022	Sugar Creek	BDA Pond 1 (RKM 0.1)	Minnow Traps	105	12.6
4/24/2022	Sugar Creek	Array 1A/1B (RKM 0.05)	PIT Antenna		
11/6/2023	Scott River	Scott Weir Array 93 (RKM 29.2)	PIT Antenna		
<b>Tag #989001003466505</b>					
<b>Date</b>	<b>Stream</b>	<b>Location</b>	<b>Gear</b>	<b>Fork Length (mm)</b>	<b>Weight (g)</b>
5/19/2022	Scott River	Scott River Rotary Screw Trap (RKM 6.9)	RST	136	
11/5/2023	Scott River	Scott Weir Array 93 (RKM 29.2)	PIT Antenna		
<b>Tag #989001044294998</b>					
<b>Date</b>	<b>Stream</b>	<b>Location</b>	<b>Gear</b>	<b>Fork Length (mm)</b>	<b>Weight (g)</b>
10/27/2022	Sugar Creek	BDA Pond 1 (RKM 0.1)	Seine	80	6.0
12/29/2022	Sugar Creek	Array 2D (RKM 0.18)	PIT Antenna		
5/8/2023	Sugar Creek	Array 2D (RKM 0.18)	PIT Antenna		
5/14/2023	Sugar Creek	Array 2A (RKM 0.1)	PIT Antenna		
5/14/2023	Sugar Creek	Array 1A/1B (RKM 0.05)	PIT Antenna		
11/3/2023	Scott River	Scott Weir Array 93 (RKM 29.2)	PIT Antenna		
12/3/2023	French Creek	Array F1/F2 (RKM 2.85)	PIT Antenna		
<b>Tag #989001028144543</b>					
<b>Date</b>	<b>Stream</b>	<b>Location</b>	<b>Gear</b>	<b>Fork Length (mm)</b>	<b>Weight (g)</b>
7/1/2021	Stanshaw Creek	Stanshaw Pool (Karuk Tribe Sampling)	Seine	69	4.1
9/9/2021	Stanshaw Creek	Stanshaw Pool (Karuk Tribe Sampling)	Seine	77	5.6
1/21/2022	Stanshaw Creek	Stanshaw Pool (Karuk Tribe Sampling)	Seine	95	9.9
12/2/2023	Scott River	Scott Weir Array 93 (RKM 29.2)	PIT Antenna		

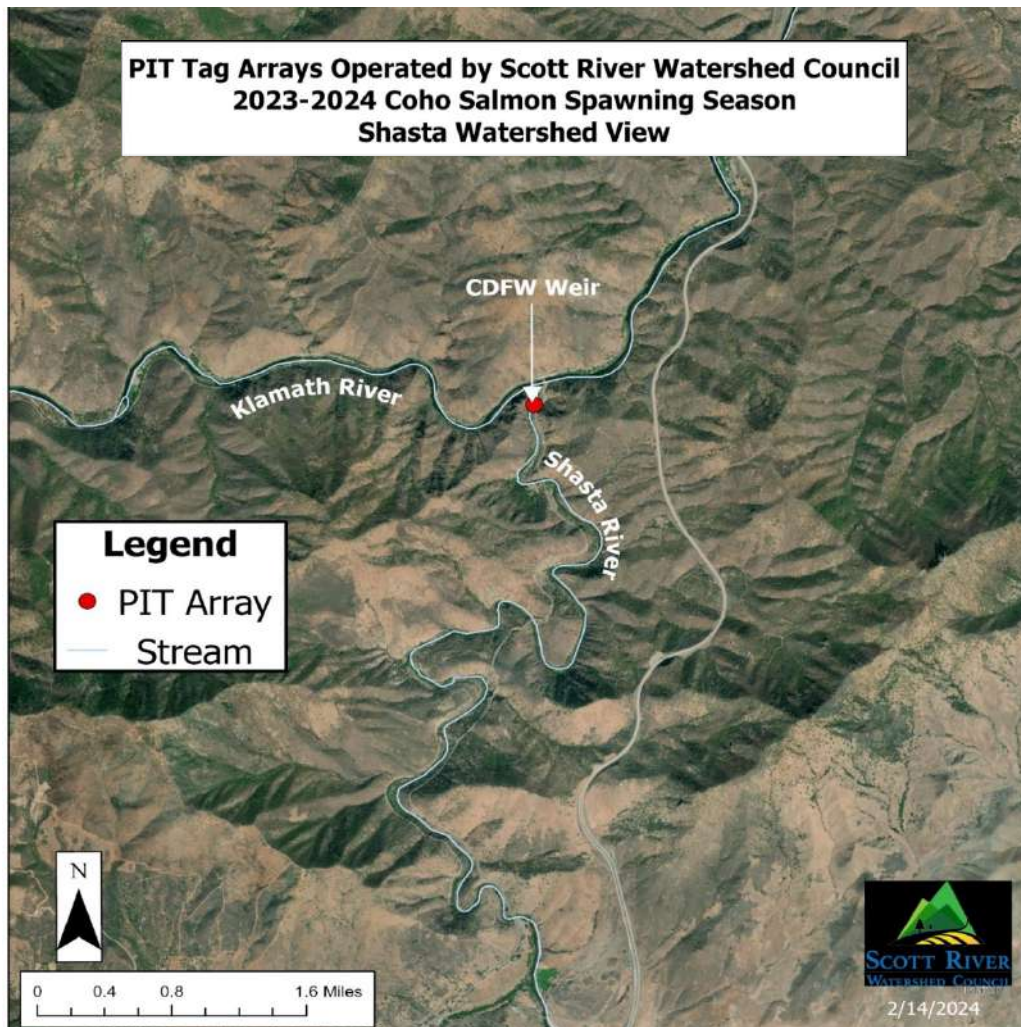
Table 1. Detection histories of all adult PIT-tagged Coho Salmon detected in the Scott River watershed in the 2023-2024 season.

Tag #989001039966194					
Date	Stream	Location	Gear	Fork Length (mm)	Weight (g)
7/21/2021	Sugar Creek	BDA Pond 1 (RKM 0.1)	Minnow Traps	76	4.8
1/12/2022	Sugar Creek	Array 2C (RKM 0.18)	PIT Antenna		
1/14/2022	Sugar Creek	Array 2C (RKM 0.18)	PIT Antenna		
5/31/2022	Sugar Creek	Array 1A/1B (RKM 0.05)	PIT Antenna		
12/2/2023	Scott River	Scott Weir Array 93 (RKM 29.2)	PIT Antenna		

Table 2 (continued). Detection histories of all adult PIT-tagged Coho Salmon detected in the Scott River watershed in the 2023-2024 season.

### Shasta River

The PIT array operated on the CDFW Shasta River weir is located at RKM 0.2 (Map 3). This array was operated from September 15<sup>th</sup> to December 28<sup>th</sup>, 2023.



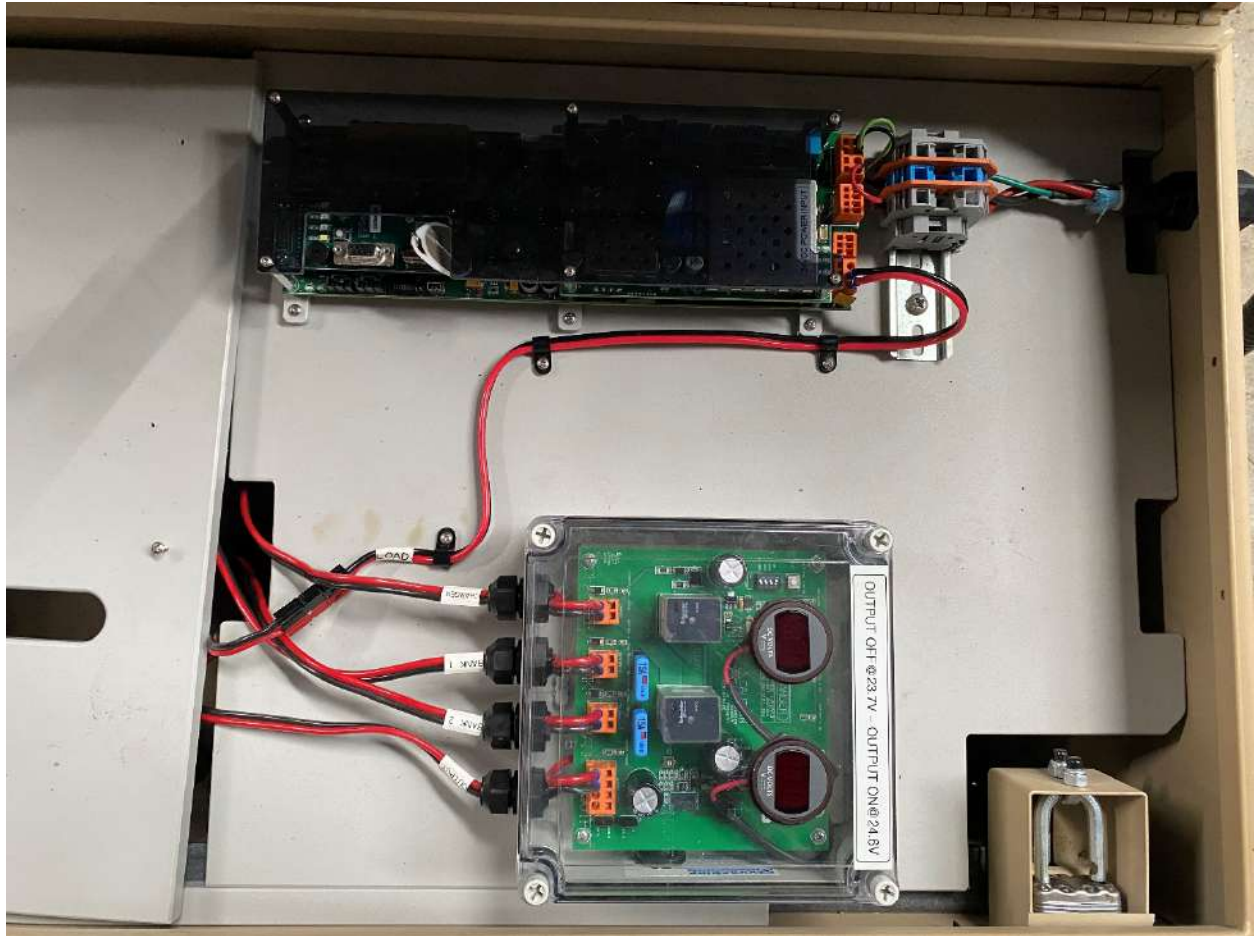
Map 4. PIT arrays operated in the Shasta River watershed between October 2023 and January 2024.



Like the Scott weir array, Shasta weir array consists of an HDPE antenna designed to encompass the weir opening where the migrating adult Coho must pass through. The distance from the antenna to the bank is much less than at the Scott River, so the IS1001 reader is able to be housed in the same enclosure as the data logger and battery bank. This array also differs from the Scott weir system in that it is adjacent to an AC power source, allowing for batteries to be continuously charged (Picture 11-12).



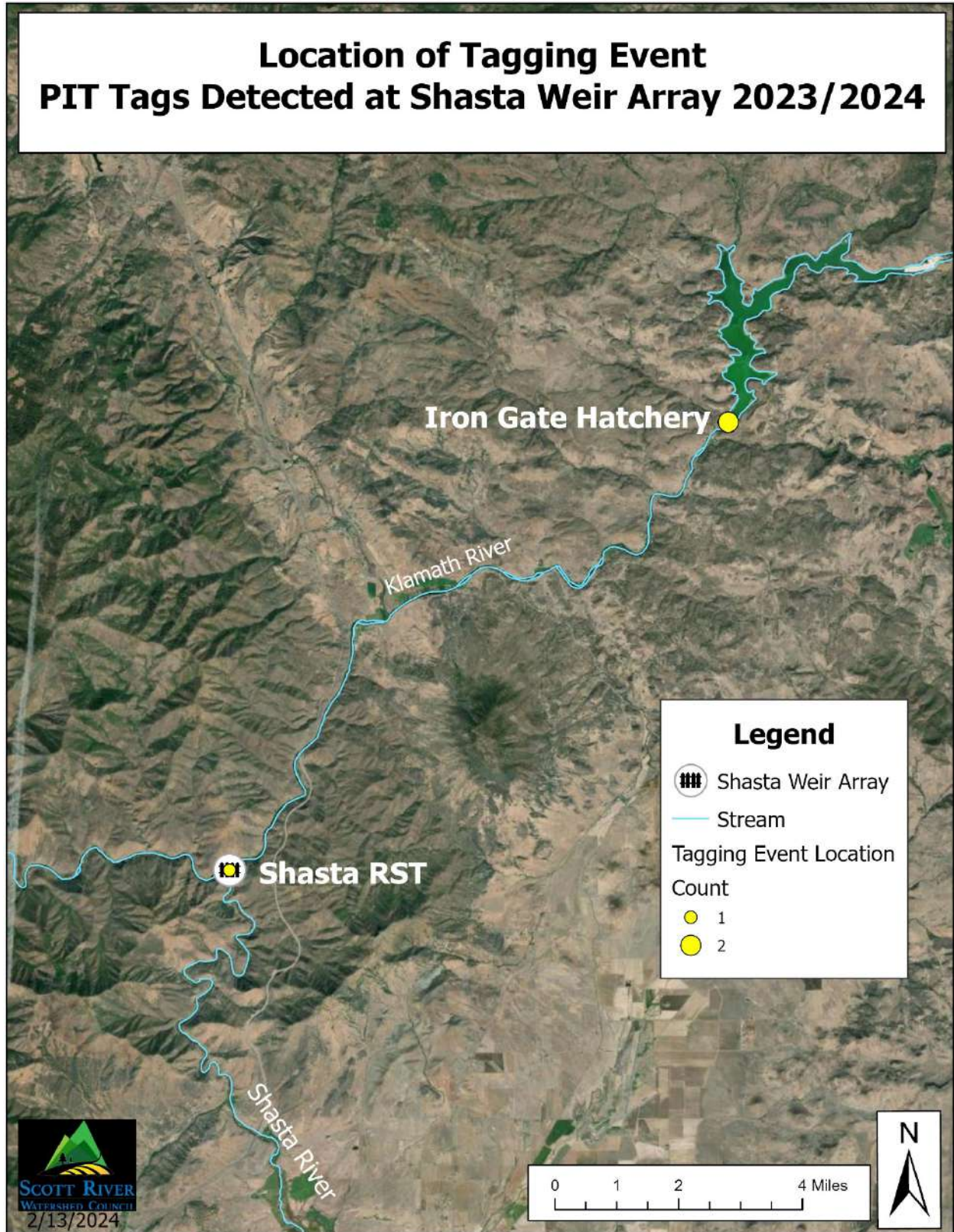
Picture 11. Shasta River weir and PIT array.



Picture 12. Shasta weir array IS001 reader, data logger and battery bank switcher.

Three PIT tags were detected on this antenna during the 2023-2024 season. Two of the three fish received their tags as returning adults at Iron Gate Hatchery (IGH), where CDFW staff implant tags into a sample of Coho Salmon that are not used for broodstock. These fish are then released back into the Klamath River and are able to voluntarily travel to spawning grounds downstream of Iron Gate Dam. The mouth of the Shasta River is approximately 21.6 RKM downstream from IGH. The third was tagged as a juvenile by CDFW at the Shasta River rotary screw trap (Map 5). At the tagging event in spring of 2022, it was determined that this fish originated at IGH after a left maxillary clip was observed. This fish and one of the fish tagged as an adult at IGH were detected on a Bogus Creek antenna before being detected at the Shasta River antenna (Table 2).





Map 5. Location of tagging event for all PIT-tagged adult Coho Salmon detected in the Shasta River watershed between October 2023 and January 2024.

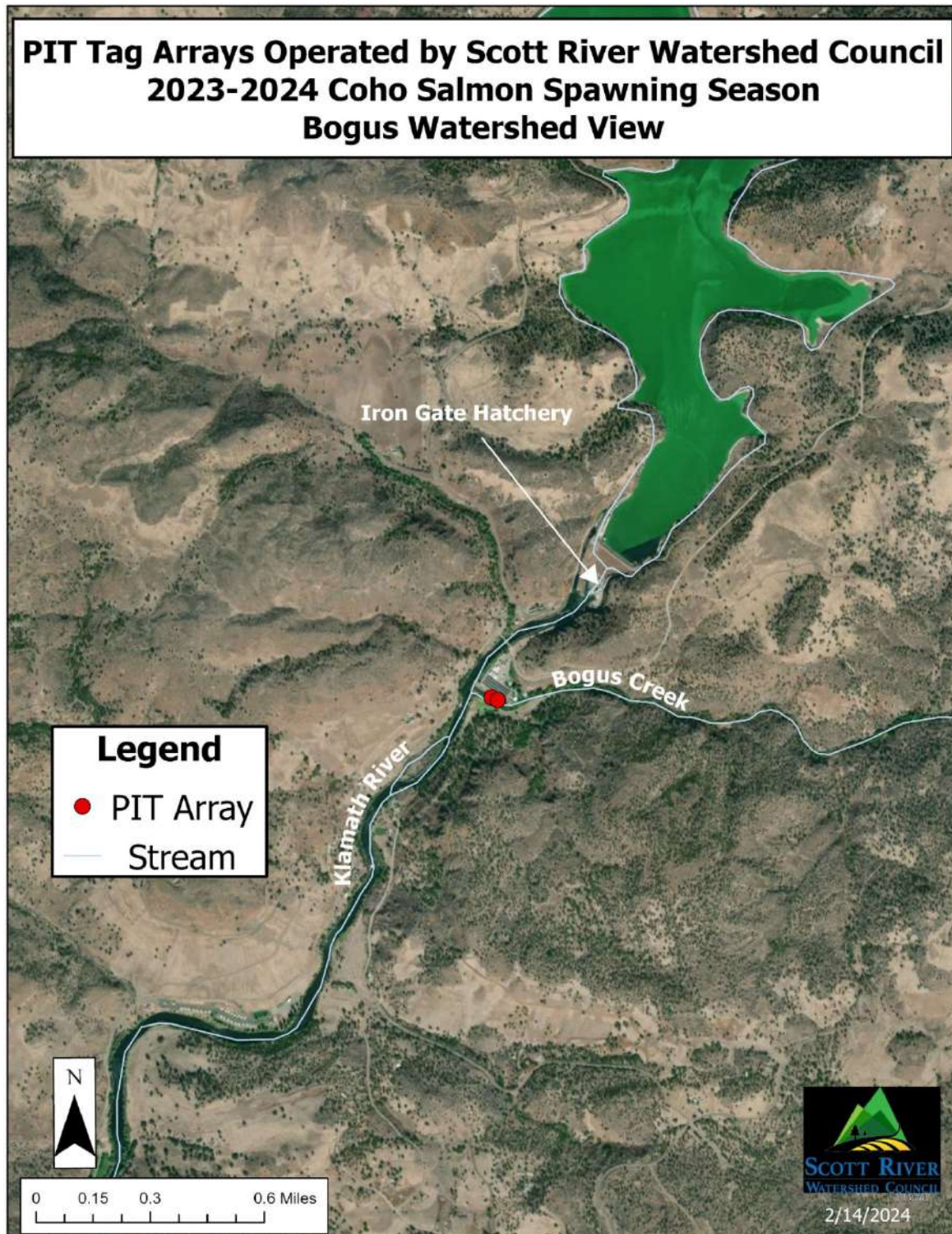
<b>Tag #989001003466285 (IGH Origin)</b>					
<b>Date</b>	<b>Stream</b>	<b>Location</b>	<b>Gear</b>	<b>Fork Length (mm)</b>	<b>Weight (g)</b>
4/21/2022	Shasta River	Shasta RST	RST		
10/31/2023	Bogus Creek	Bogus Array B1 (RKM 0.1)	PIT Antenna		
11/2/2023	Shasta River	Shasta Weir Array 99 (RKM 0.2)	PIT Antenna		
<b>Tag #900254001786793</b>					
<b>Date</b>	<b>Stream</b>	<b>Location</b>	<b>Gear</b>	<b>Fork Length (mm)</b>	<b>Weight (g)</b>
11/16/2023	Klamath River	Iron Gate Hatchery		650	
11/27/2023	Bogus Creek	Bogus Array B1 (RKM 0.1)	PIT Antenna		
12/2/2023	Shasta River	Shasta Weir Array 99 (RKM 0.2)	PIT Antenna		
<b>Tag #900254000898038</b>					
<b>Date</b>	<b>Stream</b>	<b>Location</b>	<b>Gear</b>	<b>Fork Length (mm)</b>	<b>Weight (g)</b>
11/16/2023	Klamath River	Iron Gate Hatchery		660	
12/2/2023	Shasta River	Shasta Weir Array 99 (RKM 0.2)	PIT Antenna		

Table 3. Detection histories of all adult PIT-tagged Coho Salmon detected at the Shasta River weir array in the 2023-2024 season.



### **Bogus Creek**

The two PIT arrays operated in Bogus Creek are located at RKM 0.1 and RKM 0.15 (Map 6). These arrays are operated continuously.



Map 6. PIT arrays operated in the Bogus Creek watershed between October 2023 and January 2024.



The two PIT arrays at Bogus Creek each consist of one 20-foot flexible cord antenna, a waterproof node housing the IS1001 reader and an onshore enclosure housing the data logger and battery bank. Like the Shasta weir array, these systems at Bogus Creek have access to AC power and use battery chargers (Picture 13-14).



Picture 13. Bogus Creek downstream antenna.



Picture 14. Waterproof node housing IS1001 reader.



16 PIT-tagged adult Coho Salmon were detected on one or both of these antennas during the 2023-2024 season, including the two previously mentioned in the Shasta River section of this report. 14 of these 16 fish were tagged as adults at IGH. These fish varied significantly in the amount of time it took them to enter Bogus Creek after receiving their tag (Table 3).

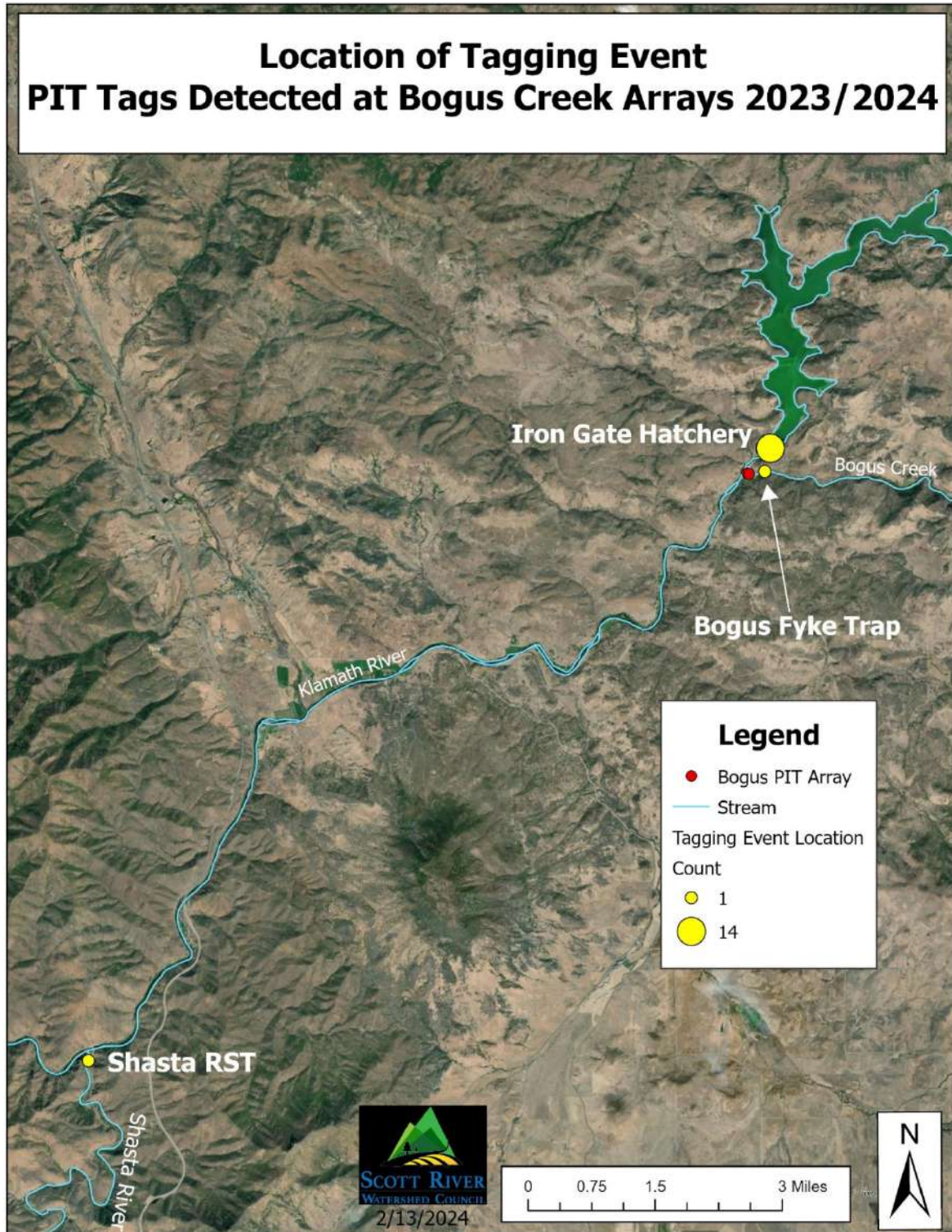
<b>Coho Salmon PIT-tagged at Iron Gate Hatchery and Detected in Bogus Creek</b>				
<b>Count</b>	<b>Average Forklength (cm)</b>	<b>Average Days Between Tag at IGH and Bogus Detection</b>	<b>Minimum Days Between Tag at IGH and Bogus Detection</b>	<b>Maximum Days Between Tag at IGH and Bogus Detection</b>
14	65.2	10	0	36

Table 4. Forklength and movement data from the Coho Salmon tagged at Iron Gate Hatchery and detected in Bogus Creek during the 2023-2024 season.

Only one of the 16 fish was tagged as a juvenile in Bogus Creek. This is the first detection of a natural-origin Coho Salmon returning to spawn in Bogus Creek since the beginning of SRWC’s monitoring in this watershed in 2022 (Table 4, Map 7).

<b>Tag #900254000445995</b>					
<b>Date</b>	<b>Stream</b>	<b>Location</b>	<b>Gear</b>	<b>Fork Length (mm)</b>	<b>Weight (g)</b>
2/19/2022	Bogus Creek	Bogus Fyke Trap	Fyke	100	
11/6/2023	Bogus Creek	Bogus Array B1 (RKM 0.1)	PIT Antenna		

Table 5. Detection history of the one adult Coho Salmon to have received its tag in Bogus Creek as a juvenile.



Map 7. Location of tagging event for all PIT-tagged adult Coho Salmon detected in the Bogus Creek watershed between October 2023 and January 2024.



## **Scott River Coho Salmon Spawning Ground Surveys Methods and Procedures for the 2023-2024 Season**

At the beginning of the season, Siskiyou Resource Conservation District hosted a training session that detailed the protocols established in 2001 (Maurer 2002). Staff from California Department of Fish and Wildlife, Quartz Valley Indian Reservation, Scott River Watershed Council and the Siskiyou Resource Conservation District attended (Photo 1).



*Photo 1. On November 18, 2023, staff from the Quartz Valley Indian Reservation, Scott River Watershed Council and Siskiyou Resource Conservation District practiced collecting biological samples from hatchery fish provided by the California Department of Fish and Wildlife.*

During the coho spawning season, spanning from mid-November through January, surveyors conducted thorough assessments of stream reaches. Operating in teams of two, occasionally accompanied by landowners, they traversed the stream wearing neoprene waders and felt-soled boots, moving downstream.

The surveyors meticulously recorded the number of live fish, redds, and carcasses observed, specifying the species. This information was documented on data sheets and mapped for each surveyed stream. In cases where survey activities could be performed without disturbing spawning fish, data on redd dimensions and substrate composition were gathered. To prevent double counting during subsequent surveys, flagging was strategically placed on the banks adjacent to newly identified redds.

GPS points were collected at sites of redds, carcasses, and unusual fish observations, such as those beyond the documented extent of spawning. Hand-held Global Positioning System (GPS) devices were utilized to log the precise locations of each observed redd and recovered carcass.

Each documented redd and carcass received a distinct identifying code, determined by the stream and reach, date, and sequential number. This unique code was then employed to label GPS coordinates within the hand-held unit, ensuring a direct correlation with the information recorded on the data sheets. GPS coordinates were captured in the NAD 83 datum and noted on the data sheets in decimal degrees.

A Federal Endangered Species Act Section 4(d) collection permit from the National Marine Fisheries Service (NMFS) was held by the Scott River Watershed Council (#27661) and the Siskiyou RCD (#27667) for biological sample collection from salvaged coho carcasses. Both organizations also maintained a current California Endangered Species Act Memorandum of Understanding with CDFW for this effort.

From each recovered coho carcass, tissue, scales, otoliths, and eyeballs were collected for age determination, DNA analysis, and research conducted by the University of California, Davis. Three sets of scale samples were taken from each carcass. The preferred location for scale collection is above the lateral line between the posterior insertion of the dorsal fin and the anterior insertion of the anal fin. Scales were collected after cleaning the area with a knife. Each set of scales was placed between absorptive paper and into a separate sample envelope and labeled with the unique identifier code that matches the GPS coordinates of its recovery. Sample envelopes and data sheets also record specific information about the carcass, including species identification, fork length measurement (cm), sex determination, and a check for hatchery markings. All fish are scanned with Biomark a HPR Plus™ reader, a hand-held battery powered Passive Integrated Transponder (PIT) reading device to documented PIT tagged fish.

Tissue sampling of coho salmon carcasses was conducted in accordance with the protocol established by the NMFS, Southwest Fisheries Science Center, Santa Cruz Laboratory. A pair of tissue samples was taken from each carcass by clipping, with a hole-puncher, two disks from the operculum tissue (gill plate). The tissue samples were placed between absorptive paper and placed in one of the sample envelopes, which also contained one of the scale samples. The envelope was labeled with information about the carcass, as described above, as well as the sample contents: Tissue + Scales.

At least one otolith was collected from each coho carcass with an intact head. A sharp knife was used to section the cranium by making a transverse cut from the dorsal side of the head to roughly above the posterior edge of the preopercular margin, revealing the opic capsule. Otoliths were carefully withdrawn using forceps, placed between absorptive paper and placed in one of the sample envelopes, which also contained one of the scale samples. The envelope was labeled with information about the carcass, as described above, as well as the sample contents: Otolith + Scales.

In total, there were three sample envelopes assembled for each carcass: one with only scales, a second with tissue and scale samples, and a third with otolith and scale samples. All tissue, scale and otolith samples were submitted to the CDFW Yreka Fisheries Office for distribution to individuals performing further analysis. This included staff of the NMFS, Southwest Fisheries



