Study 2d1 - Steelhead Spawner Surveys in Trinity River tributaries

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Abstract

Spawning surveys for winter-run steelhead were conducted on tributaries of the Trinity River from March 1 through June 30, 2000. We walked a total of 14 tributaries, three or more times each, for a single pass total of 101.1 km. Only eleven adult steelhead were observed, and 79 redds were marked and recorded. The highest density of steelhead redds occurred in Eltapom Creek at 8.72 redds per km, while the lowest density occurred in five different tributaries, where no redds were observed. Tributaries to be surveyed were randomly selected from a universe of all anadromous Trinity River tributaries upstream of the New River. Several selected tributaries duplicate the work of D.A. LaFaunce (1964), D.W. Rogers (1971, 1972), Ed Miller (1974), and the South Fork Steelhead Monitoring Project (1990-1995), and all applicable comparisons are made.

Introduction

The current state of knowledge regarding steelhead spawning habitat is limited. Most prior spawner surveys within the KMP ESU concentrated on salmon and were therefore terminated prior to steelhead spawning. Prior surveys have been conducted on main-stem Trinity tributaries in 1964, 1971, 1972, and 1974 to monitor the effect of Lewiston Dam on steelhead populations. Most recently, steelhead spawning survey were conducted in South Fork Trinity River tributaries in 1989 - 1995 under the Department's Trinity River Project. Basin-wide estimates of steelhead abundance provide little information on steelhead spawning. Information regarding spawning habitat will help to assess this critical component of steelhead life history.

Study Area

The area covered by these spawning surveys includes all anadromous tributaries of Trinity basin upstream of the New River, including the South Fork of the Trinity River. A stratified random sampling design was used to select tributaries within the basin. To develop a sampling universe, all anadromous tributaries within the named basins had to be identified. The entire basin was then stratified into two sub-basins, the South Fork and the main-stem, each of which was sampled approximately evenly. Originally, eight tributaries were selected from each basin. Two tributaries had to be dropped from the main-stem basin due to high flow problems. No replacement tributaries were chosen in the main-stem due to time restraints. The following Trinity River tributaries were surveyed from their confluence to a upstream migrational barrier except where noted.

Smoky Creek was surveyed from the South Fork Trinity River confluence to a waterfall barrier 6.7 km upstream. Access is available through Silver Creek Ranch.

Rattlesnake Creek was surveyed from the South Fork Trinity River confluence to a waterfall barrier

16.21 km upstream. Access is available via State Route 36.

Plummer Creek was surveyed from the South Fork Trinity River confluence to a waterfall barrier 5.18 km upstream. Access is available through River Spirit Land Conservancy or by Friend Lake trail.

Eltapom Creek was surveyed from the South Fork Trinity River confluence to a waterfall barrier 1.26 km upstream. Access is only available by crossing the South Fork Trinity River off of FH 311.

Pelletreau Creek was surveyed from the South Fork Trinity River confluence to log jam/ depositional barrier 1.41km upstream. Access is made from FH 311 just south of Hyampom.

East Fork of Hayfork Creek was surveyed from its confluence with Hayfork Creek to Byron Gulch approximately 6.77 km upstream. There is no apparent barrier on E.F. Hayfork creek; the survey end point was selected where suitable steelhead spawning habitat ended and low flows made fish access problematic. Access is available via FH 343.

Potato Creek was surveyed from its confluence East Fork Hayfork Creek to waterfall barrier 4.03 km upstream. Access is available via FH 343.

Tule Creek was surveyed from its confluence with Hayfork Creek to culvert barrier created by the 31N31 road, approximately 8.41 miles upstream. The majority of Tule Creek is accessible via FH 10.

Big French Creek was surveyed from the unnamed tributary below Brooks Ranch to Willow Gulch. The barrier to anadromous fish passage in Big French Creek is poorly documented and probably lies far within the wilderness area. Willow Gulch was selected as a end point because of its two day proximity to the trailhead. Access is only available by hiking and the trailhead is accessible via the 5N20 road. Poison oak and steep terrain made access treacherous at best.

E.F.N.F. Trinity River was surveyed from its confluence with North Fork Trinity River to an unnamed tributary above East Branch. The unnamed tributary above East Branch was selected as an end point because it was the farthest point accessible from the road within one day's hike. Suitable spawning habitat was plentiful above this end point. Access is available via FH 421 and several unmarked side roads which terminate at mining claims.

Deadwood Creek was surveyed from its confluence with the Trinity River to a waterfall barrier 3.82 km upstream. Access is available from Deadwood Road. Deadwood is final tributary to the Trinity River below Lewiston Dam.

Dutch Creek was surveyed from its confluence with the Trinity River to a culvert barrier created by a SPI logging road. Access is available via Dutch Creek Road, but it is not advisable to drive to the confluence, especially during winter flows.

South Fork of Indian Creek was surveyed from its confluence with Indian Creek to a waterfall barrier

1.49 km upstream. Access is available Redding Creek Rd. and by an unnamed SPI logging road. Avoid the paranoid miner if possible.

Redding Creek was surveyed from its confluence with the Trinity River to Byron Gulch approximately 20.86 km upstream. No apparent barrier was encountered during the survey, which ended at a point two days hike in from any driveable access. Access is available via Redding Creek road and several SPI logging roads, the upper two sections are only accessible by hiking cross-county.

Results

Table 1. Number of live steelhead observed, steelhead redds, distance surveyed, and redds/km for Trinity River tributaries.

Creek	# of Redds	Distance (km)	Redds/km	Live SH sighted
Smoky	10	6.77	1.63	2
Rattlesnake	12	16.21	0.74	0
Plummer	5	5.18	0.97	2
Eltapom	11	1.26	8.72	3
Pelletreau	0	1.41	0.00	0
E.F. Hayfork	0	6.77	0.00	1
Potato	4	4.03	0.99	0
Tule	16	8.41	1.90	1
Big French	3	3.05	0.98	0
E.F.N.F. Trinity	2	16.32	0.12	0
Deadwood	0	3.82	0.00	0
Dutch	0	5.55	0.00	0
S.F. Indian	0	1.49	0.00	0
Reading	16	20.86	0.77	2
Totals	**79**	**101.11**	**0.76**	**11**

Table 2. Trinity River Steelhead Spawning Survey Timing; Frequency surveyed and dates.

Creek	# of times surveyed	Dates Surveyed
Smoky	3	3/22-3/23, 4/27, 6/1
Rattlesnake	3	3/21-3/23, 5/2-5/4, 6/8-6/13
Plummer	3	3/15-3/16, 5/16-5/17, 6/13
Eltapom	4	4/10, 4/26, 5/30, 6/20
Pelletreau	3	4/10, 4/26, 5/30
E.F. Hayfork	4	3/13-3/15, 4/25, 5/23, 6/14-6/15
Potato	4	3/16, 4/13, 5/25, 6/19
Tule	4	3/20-3/28, 4/19-4/20, 5/15-5/16, 6/6-6/7
Big French	2	4/11-4/12, 5/23-5/24
E.F.N.F. Trinity	2	3/29-4/4, 5/8-5/10
Deadwood	4	3/8, 5/11, 5/18, /5
Dutch	4	3/5-3/8, 3/27-3/28, 5/4, 5/31
S.F. Indian	5	3/9, 3/20, 4/4, 5/5, 5/11
Reading	3	4/5-4/13, 5/17-5/26, 6/21-6/26

Information about each individual redd, including dimensions, habitat type, substrate, depth of water, and presence of fish was taken for all 79 redd sitings. This information is stored in Department files for future comparison. For a map of each individual redd location, recorded by global positioning systems, see Appendix 1 - Redd Survey Maps. Tributaries with no redds were not included in maps.

Discussion

Redd surveys serve as a good, but partially incomplete means of monitoring steelhead spawning escapement. Redd surveys are most appropriate when other means of estimating adult escapement or spawning success are not appropriate or impossible to conduct. In the Trinity basin, problems do occur which limit the estimation of winter-run steelhead. High flows and the extended length of adult steelhead migration make weir estimates partial at best. Several weirs were constructed to estimate winter-run steelhead escapement by the Department in 1989-1992 at Sandy Bar and at Forest Glen on the South Fork of the Trinity River (CDFG, 1990-95). Efforts were finally terminated after multiple blow-outs due to high flows.

Steelhead run size is highly variable from year to year, but the data gathered over the last 40 years in the Trinity basin shows the general trend that steelhead run sizes and natural production are diminishing.

This year proves no different, with steelhead returns that are highly variable between creeks, but lower overall. Work by D.A. LaFaunce in 1964 sets up good base-line numbers for natural production of steelhead in the Trinity basin. His survey shows that steelhead natural production was markedly higher in 1964 than in any of the following years.

Table 3. Results of work by D.A. LaFaunce, 1964. A Steelhead Spawning Survey of the Upper Trinity River System.

Tributary surveyed	Distance surveyed (km.)	Redds observed	Redds/km.
Deadwood Creek	1.66	27	16.26
S.F. Indian Creek	0.37	4	10.8
E.F.N.F. Trinity River	12.0	218	18.16
Redding Creek	16.3	279	17.11
Dutch Creek	2.6	72	27.6

Surveys conducted by D.W. Rogers in 1971, show that there had already been a sharp decline in steelhead spawning since 1964. This could have been an anomolous year, but surveys in 1972-1974 of other tributaries in the system show this general trend.

Table 4. Results of steelhead spawning surveys conducted by D.W. Rogers (1971).

Tributary surveyed	Distance surveyed (km.)	Redds observed	Redds/km.
Deadwood Creek	3.7	0	0
S.F. Indian Creek	1.85	3	1.62
Redding Creek	19.25	35	1.81
Dutch Creek	1.85	0	0

Table 5. Results of steelhead spawning surveys conducted by Ed Miller (1974)

Tributary surveyed	Distance surveyed (km.)	Redds observed	Redds/km.
Tule Creek	4.25	12	2.82

The South Fork Steelhead Monitoring Project conducted steelhead spawning surveys in the South Fork Trinity basin from 1990-1995 in conjunction with adult steelhead electrofishing to monitor spawning success (unsuccessful). These surveys are the most complete data-set to date, showing major spawning trends of steelhead in the Trinity basin. Eltapom creek is the jewel of the South Fork, consistently having the highest redd densities in the basin. This holds true for this year's survey as well, as Eltapom had four times the redd density of any other tributary. Notice the variation in redd densities from year to year; high quality tributaries fluctuate from two to 15 redd/km each year, while poor quality tributaries fluctuate between zero and two redds/km each year. I believe this year's results most closely resemble returns from 1992-1993. These were low production years, which were immediately followed by a year of higher production.

Table 6. Results of work by CDFG (1990-1995) Steelhead Spawning Survey, compared with Current Spawning Survey (2000). Distance surveyed and redd densities for 1990-1995, and 2000.

Tributary surveyed	Distance surveyed (km.)*	Redds/ km 1990	Redds/ km 1991	Redds/ km 1992	Redds/ km 1993	Redds/ km 1994	Redds/ km 1995	Redds/ km 2000
Eltapom Creek	1.3	14.0	6.2	10.0	13.5	19.2	2.5	8.72
Pelletreau Creek	0.8	0	2.5	0	0	1.7	0.9	0
E.F. Hayfork Creek	7.4	4.3	2.7	0.6	0.4	2.2	0.3	0
Potato Creek	2.4	2.1	0	0.4	0.4	0.9	0	0.99
Tule Creek	2.7	9.5	0.5	2.2	1.6	2.4	0.4	1.9
Plummer Creek	3.4	NS	6.6	7.9	5.0	6.1	2.1	0.97
Rattlesnake Creek	10.6	2.6	0.8	1.8	0.4	0.8	0.1	0.74
Smoky Creek	2.4	6.6	5.0	5.9	1.9	1.9	2.1	1.63

* Approximate distance surveyed; in some years survey distance may have differed by 5-10%.

Many problems exist that complicate and sometimes prevent redd surveys from occurring. Some of these problems create suspicion or bias within the data, while some prevent the proper coverage of a selected tributary.

One primary problem which affects sample design, as well as proper and even coverage, is access. Most of the Trinity basin is composed of rugged mountainous terrain with little road coverage. Roads that do exist are often poorly maintained logging roads, which rarely lead to the confluence of a selected tributary. Some tributaries lie within wilderness areas, where no roads exist, and hiking in to survey is the only possibility. Access problems are further compounded by extreme winter conditions such as snow storms. Some tributaries, such as the East Fork of the South Fork are not accessible by road until late April due to heavy snowpack.

Permission for access to private property is another possible complication affecting spawning surveys. Even though the riverbeds of all navigable rivers are held in the public trust by the State of California, it is the Department's policy to ascertain permission to cross private property, even when questioned tributaries are clearly navigable. Most of the Trinity basin is composed of US Forest Service and Bureau of Land Management property, but small portions do exist which are privately owned, either by private landowners or large timber companies. Permission had to be ascertained for access to all streams which flowed through private property. Only one tributary, Rush Creek, had to dropped because of lack of/denial of permission. Redding Creek also had refusals to be surveyed, but this was overcome by getting permission from the adjacent landowner. Sierra Pacific Industries was extremely helpful; they granted permission to conduct surveys on five different tributaries crossing their property.

Another problem facing the spawning survey is selection of the area to be surveyed within a selected tributary. In a perfect world, every tributary would be surveyed from confluence to a complete upstream barrier to migration. In reality, many barriers are not well documented; or were documented when popular knowledge identified log jams as impassable. All but four tributaries were surveyed to a complete barrier. E.F.N.F. of the Trinity River was surveyed to an unnamed tributary upstream of the East Branch. Big French Creek was surveyed to Willow Gulch, Redding Creek was Byron Gulch, and E.F. Hayfork Creek was surveyed to a different Byron Gulch. These cut-off points were selected based on extreme distance from access or lack of habitat.

Historically, only one or two passes was made of each tributary to quantify spawning. This could have possibly have left some redds unidentified, especially if surveys were late in the season, or interrupted by high flow events. During the 2000 survey, a minimum of three, and sometimes four passes of each tributary were made. Surveys are all offset by at least one month, in order to provide the best temporal coverage of the season as possible.

Recommendations

I would recommend the following additions and changes to the redd survey to gain a more complete understanding of steelhead spawning in the Trinity River basin.

A current survey of barriers to anadromous fish passage should be completed for the entire Trinity basin. Most habitat data available is incomplete and scattered around multiple agencies. Many tributaries which flow through private property have never been surveyed, so all useable habitat estimates are made from aerial photographs and topographic maps. Also, much of the data is antiquated; the definition of what constitutes a barrier to steelhead migration has dramatically changed within the last 10-20 years. In the 1970's, it was popular knowledge among fisheries professionals that a six foot log jam was a barrier to anadromous salmonids. We now know that this is simply untrue, it is possible for a perfectly conditioned adult steelhead to jump 18 vertical feet (WDFW, 1999).

Surveys should be conducted more frequently to identify redds that are possibly covered during spring high flow events. Michael Dean, of CDFG, suggested conducting surveys weekly for maximum coverage (pers comm, 1999). South Fork of Indian Creek and Dutch Creek were chosen to be surveyed at double the sampling interval, because of its close proximity to the Weaverville office, to examine if more frequent surveys would identify more redds. This additional in sampling effort was terminated when neither creek produced redds by mid-season.

There should be standardization of survey distances of the same creek between years. Whenever possible, are tributaries were surveyed from their confluence to an upstream migratonal barrier. Year to year variation in surveyed distances creates problems when making comparisons between years. When distance are not equal only redd density is comparable, and problems could arise with quality of included habitat between years.

An earlier start date should be initiated for tributaries which had few or no redds but obvious steelhead production. Both E.F.N.F. Trinity River and Dutch Creek were snorkeled to examine prescence/abscence of juvenile steelhead, particularly fry. E.F.N.F. had abundant fry numbers, while Dutch Creek had abundant fry in the lower half mile. This observation leads me to believe that successful steelhead spawning had occurred, but went unnoticed due to survey timing. I recommend an earlier start date for several tributaries, including Big French Creek, Dutch Creek, and E.F.N.F. Trinity River. An earlier start date will necessitate use of dry-suits, and will require extra training in high flow river safety.

I have several logistical recommendations which I believe will make surveys easier and more consistent between years and crew members. Crews should camp whenever possible to reduce commute time on multiple day surveys. Quad-runner all-terrain vehicles could be used to access certain tributaries which are otherwise unaccessible due to snow. Yearly training should be conducted for the crew for Swiftwater Rescue, Garmin global positioning system use, and steelhead redd identification. Finally, I would recommend daily data entry and downloading of map coordinates to simplify data storage and processing.

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