NAPA RIVER SALMON MONITORING PROJECT

SPAWNING YEAR 2005 REPORT

NAPA COUNTY, CALIFORNIA

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PREPARED BY

NAPA COUNTY RESOURCE CONSERVATION DISTRICT

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BACKGROUND

During the past several years, significant numbers of fall-run Chinook salmon (*Oncorhynchus tshawytscha*) have been observed spawning in the mainstem Napa River and several tributary streams. The Napa County Resource Conservation District (NCRCD) initiated an ongoing salmon monitoring program in 2003 to track Chinook abundance and distribution within the basin, and to quantify spawning success. Successful reproduction has been documented via the capture of juvenile salmon in the Napa River and Sulphur Creek in spring of 2005. It is not known whether these fish represent a self-sustaining population or are opportunistic strays from state and federal hatcheries, which release millions of young Chinook salmon into the upper San Francisco Estuary each year. The RCD plans to conduct genetic analysis in the next several years to determine the relationship between Napa River Chinook and other known stocks.

Very little is known about historical Chinook salmon abundance and distribution in Bay Area streams. In a recent review of existing fisheries information, no conclusive evidence of historical Chinook salmon populations could be found for the Napa River basin (Leidy et al., 2005). However, based on analysis of natural channel form, hydrology, and ecology, the Napa River likely supported a large, sustainable population of Chinook salmon under historical conditions (Stillwater Sciences, 2002). Additionally, the geographic location of the Napa River at the entrance to the Sacramento/San Joaquin River systems makes it likely that wild Chinook salmon would naturally stray into the Napa River during favorable periods. During the past 150 years, a combination of factors including reduction in spawning habitat, channel and floodplain alterations, and the introduction of exotic predatory fishes have all reduced the river's potential to support a viable population of Chinook salmon.

METHODS

Spawner surveys were conducted following California Department of Fish & Game protocols as described in the California Salmonid Stream Habitat Restoration Manual (Appendix A). Redd locations were recorded using a handheld Garmin GPS unit and marked with flagging. The excavated redd area was measured using a graduated gaff hook handle, and the specific type of habitat (pool, glide, riffle, run) where the redd was constructed was also recorded.

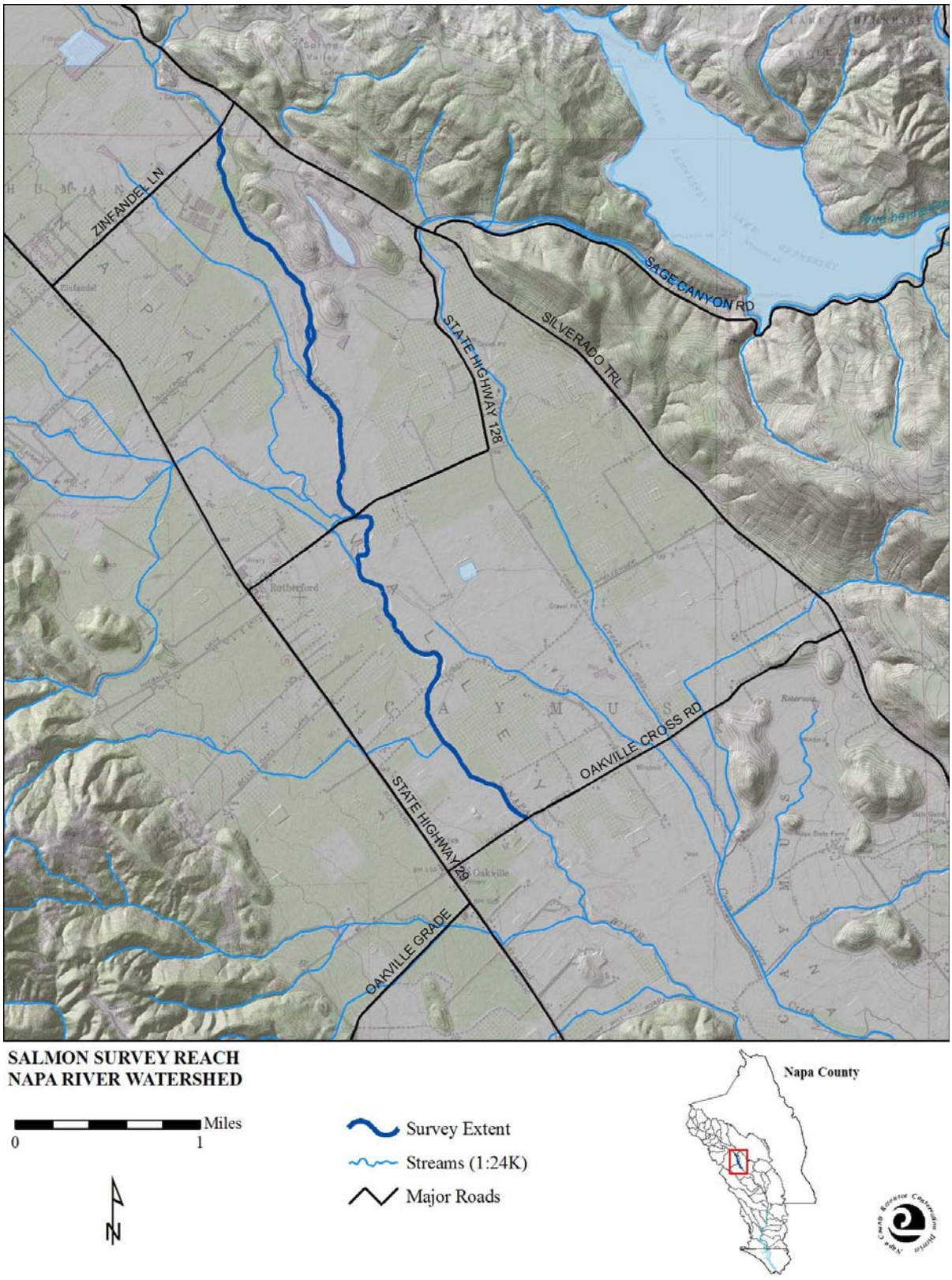

Figure 1. Location Map

RESULTS AND DISCUSSION

In 2005, Chinook spawning in the Napa River began immediately following the first storm of the season, which occurred on December 1. Salmon were observed in the river near St. Helena two days after this event. Several large groups of salmon were observed by people fishing near Trancas street in downtown Napa beginning in late October, presumably waiting for sufficient flows to migrate to upstream spawning areas.

A salmon spawner survey was conducted by Jonathan Koehler and Chad Edwards of the NCRCD on December 7, 2005 along a 4.7 mile (7.6 km) reach of the mainstem Napa River. The results of this survey are summarized in Table 1. The survey began at the Oakville Crossroad Bridge and continued upstream to the Zinfandel Lane Bridge (Figure 1). A total of 24,816 feet of channel was covered.

The survey documented 99 redds and approximately 293 live Chinook salmon spawning and holding. Of this total, 32 fish (11%) were grilse (< 55 cm). A sex ratio of approximately 1:1 was noted. Three salmon carcasses and one skeleton were recovered, and fin samples were collected and preserved for genetic analysis. No live salmon or recovered carcasses had visible fin clips.

A total of 99 redds were recorded within the surveyed reach, which gives a density of about four redds per 1,000 feet (Figures 3 and 4). Many redds were still being constructed by females at the time of the survey or were occupied by actively spawning fish. Approximately 81% of all redds were occupied. Redds were observed in a variety of habitat types (Figure 2). On a qualitative basis, redds in pool crests and riffles had more favorable hydraulic conditions than those constructed either in the middle of glides or at the glide/riffle transition. Glide habitats generally had much slower velocities and finer substrates dominated by sand and small gravel.

Unusually high redd densities were observed in the reach immediately downstream of the Zinfandel Lane Bridge (Figure 3). Several sites with four or more redds in one habitat unit were documented in this area. Redd superimposition was observed in at least six sites near the bridge. Competition for spawning patches and physical sparring between fish was also observed. The Zinfandel Lane Bridge is a low-flow barrier to Chinook salmon, and flow during the survey was not adequate to allow passage over the bridge apron. Such crowded spawning conditions are likely the direct result of limited upstream passage. The RCD, in cooperation with the United States Army Corps of Engineers, will conduct a feasibility study of the bridge in 2006 to develop design alternatives to improve passage.

The total numbers of both live fish and redds counted in 2005 was notably higher than in 2004. Densities of live salmon in this survey were about 11.8 fish per 1,000 feet compared with about 5.3 fish per 1,000 feet in 2004. This year's redd densities were about 4 redds per 1,000 feet compared with about 3.2 redds per 1,000 feet in 2004. These differences may be attributed to a wide array of factors, including natural variability

within the population and differences in surveying effectiveness. Long-term monitoring is needed to accurately judge population trends.

A series of major storms began on December 17, 2005 and peaked on New Years Eve with a flooding event of about 11,900 cfs measured at the Pope St. streamgage. This was the fourth largest flow recorded at the gage in 65 years of record. Following the storm, no adult salmon were observed in the survey reach during reconnaissance surveys throughout the first week of January, 2006.

The RCD conducted a snorkel survey on May 3, 2006 to document juvenile salmon between the Rutherford Crossroad and Zinfandel Lane. Only two chinook parr were observed. Both fish were observed in shallow riffle margins with mixed schools of other small native fishes including Californiia roach and juvenile Sacramento suckers and Sacramento pikeminnows. Such low densities of juvenile salmon are likely attributable to low survival during incubation as a result of heavy winter storms. Chinook salmon production from the 2005 cohort appears to be very low.

The New Years Eve event caused significant morphological change to the river channel, and likely caused extensive mortality to spawning adults and incubating eggs. An event of this magnitude would be expected to produce high bed mobility throughout the mainstem. Results from earlier fisheries studies (NCRCD, 2005) suggest that bed scour regularly reaches salmon egg burial depth, about six inches (15 cm), during much smaller storms. Juvenile salmon production from this year's spawning run is therefore expected to be very low, as indicated by low densities observed in spring 2006. It is possible, however unlikely, that the low number of juvenile chinook observed may have been due to early emigration to the estuary by smolts prior to our survey.

Survey Date	**7-Dec-2005**
Survey distance (ft)	24,816
Water temp (°C)	7.5
Air temp (°C)	8
Live salmon observed	218
Carcasses	3
Mean fork length (cm)	84
Range fork length (cm)	65-102
Adipose fin clip	0
Skeletons	1
Redd count	99

Table 1. Summarized salmon spawner/redd survey data.

Due to the late onset of rainy weather in 2005, which was then followed by intense storms in late December, the surveying window was very unfavorable and lasted for just over two weeks. As a result of this limited survey period, we were unable to collect a sufficient number of tissue samples to assess population genetics. Ongoing genetic sampling by the RCD is planned for the next several years to determine the genetic composition of the Napa River Chinook salmon population.

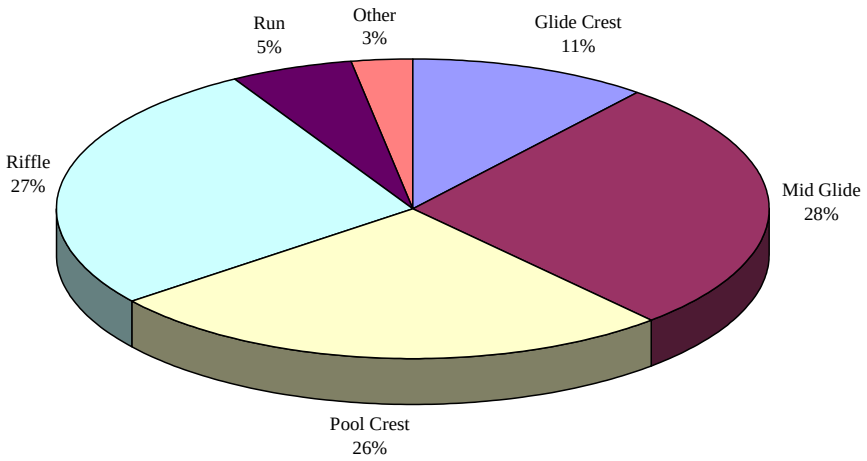

Figure 2. Redds by Habitat Type. Habitat type definitions given by the California Department of Fish and Game, California Salmonid Stream Habitat Restoration Manual, 2002.

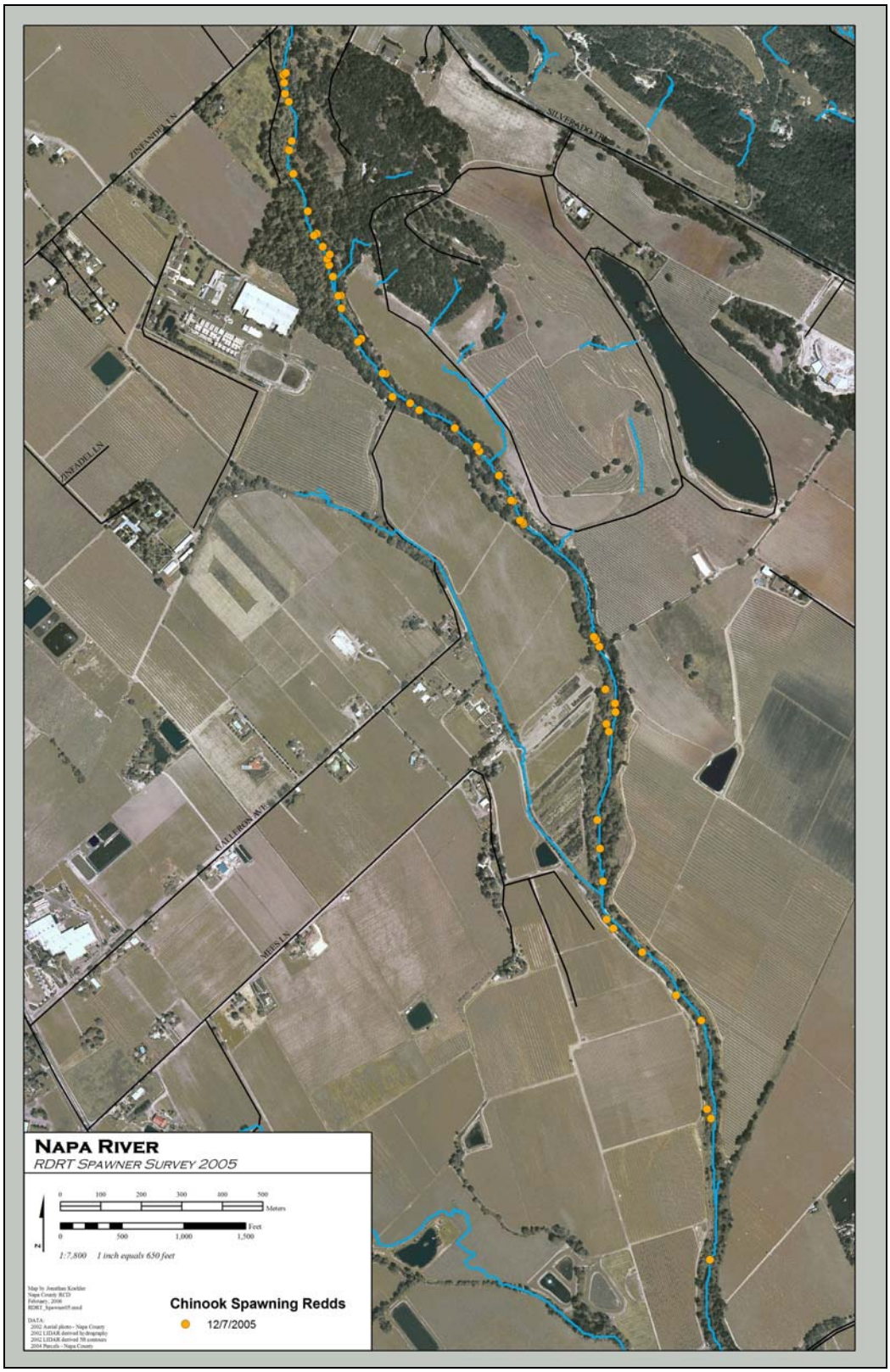

Figure 3. Chinook spawning redd locations on the Napa River between the Zinfandel Lane Bridge and the Rutherford Crossroad Bridge. Several sites contained multiple redds at the same location.

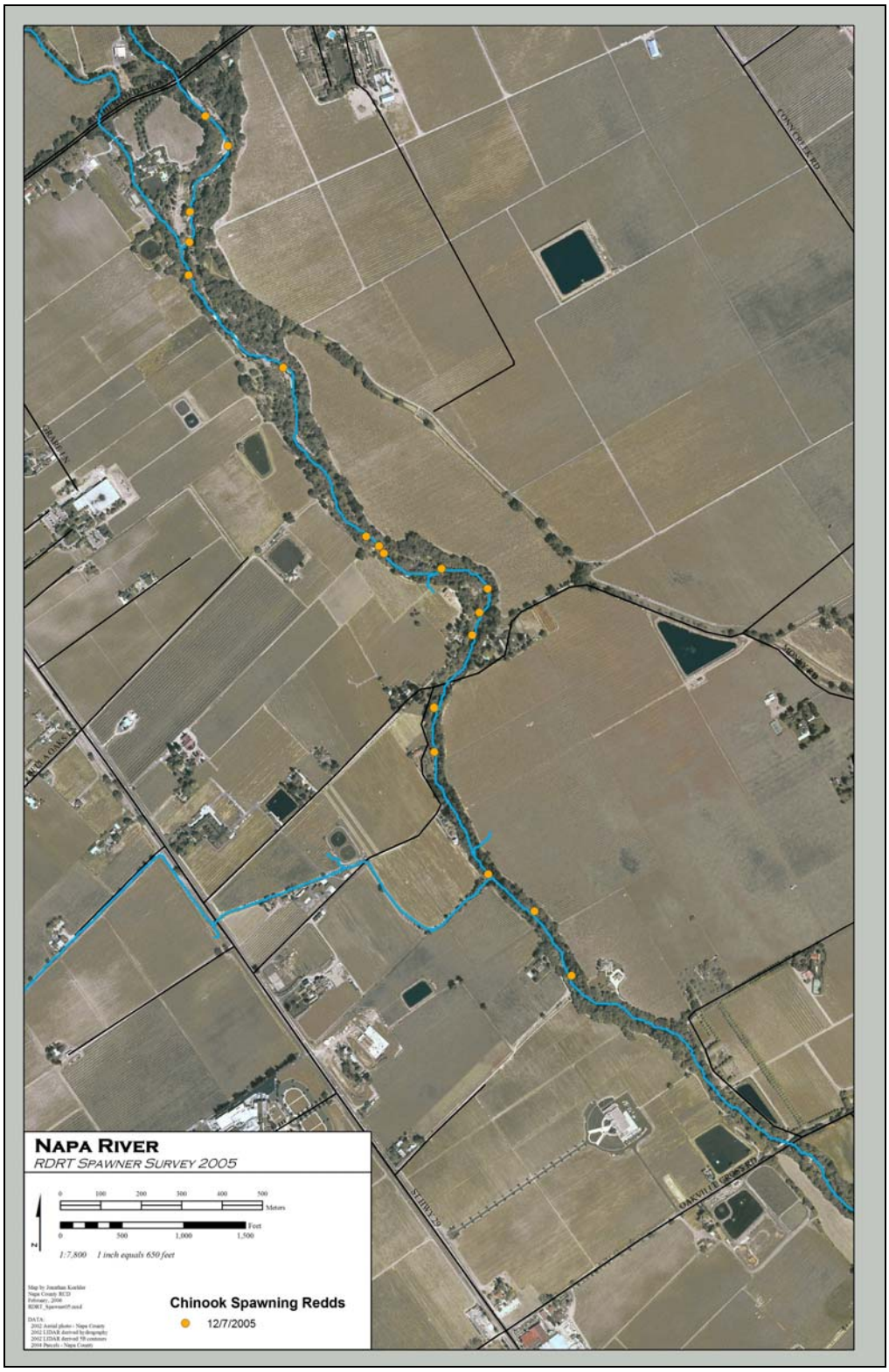

Figure 4. Chinook spawning redd locations on the Napa River between the Rutherford Crossroad (upstream) and the Oakville Crossroad (downstream extent).

Figure 5. Chinook salmon skeleton recovered below the Rutherford Crossroad. The skull is being tagged with a unique identifier for mark/recapture efforts. (December 7, 2006)

Figure 6. A school of approximately ten Chinook salmon holding in a pool near Zinfandel Lane. (December 7, 2006)

Figure 7. Adult male Chinook carcass recovered approximately 1,000 feet below Zinfandel Lane Bridge. (December 7, 2005).

REFERENCES

CDFG (California Department of Fish and Game). 2002. California Salmonid Stream Habitat Restoration Manual, third edition: Fish Sampling Methods: IV-7.

Leidy, R.A., G.S. Becker, B.N. Harvey. 2005. Historical distribution and current status of steelhead/rainbow trout *(Oncorhynchus mykiss)* in streams of the San Francisco Estuary, California. Center for Ecosystem Management and Restoration, Oakland, CA.

NCRCD (Napa County Resource Conservation District). 2005. Napa River Fisheries Study: The Rutherford Dust Society Restoration Reach, Napa County, California.

Stillwater Sciences. 2002. Napa River Basin Limiting Factors Analysis. http://www.swrcb.ca.gov/~rwqcb2

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This report is available online at http://www.napawatersheds.org

APPENDICES

APPENDIX A: SALMON SPAWNER SURVEYS

CALIFORNIA SALMONID STREAM HABITAT RESTORATION MANUAL
FISH SAMPLING METHODS IV-7
California Dept. of Fish & Game

Salmon spawner surveys (also called salmon carcass surveys) are stream bank or above-water surveys. Surveyors usually walk along the stream bank and record the number of spawned salmon carcasses, redds, and live adults. This information is useful to:

- Determine if adults are returning to and spawning within a stream reach or basin area;
- Determine which species or races are utilizing the sample area;
- Determine relative abundance and distribution of carcasses, redds or live fish within a sample area;
- Recover and record marked fish for mark studies;
- Identify preferred spawning habitat area.

Stream flow conditions can alter the timing and distribution of spawning activity from one year to the next. For annual *comparison of data it is recommended that weekly surveys be conducted throughout the entire potential time range of spawning activity.
Descriptions of spawning distribution within a basin should not rely on carcass counts conducted only during the assumed week of peak spawning. Spawner distribution within a stream system may be different for early versus late spawners.

The typical method for conducting spawner surveys is to walk along the stream bank or wade in the stream counting and recording all carcasses, redds and live fish observed. Carcasses are examined to determine species, sex, and/or missing fins. The fork lengths (FL) of fish are measured from the tip of the snout to middle of the tail to the nearest centimeter (cm). Counted carcasses are either cut in half or marked with a hog ring to eliminate being counted in subsequent surveys. With prior DFG approval, the heads of carcasses with missing adipose (Ad) fins, will be removed and retained for coded-wire-tag (CWT) extraction by DFG. All data is recorded on the Daily Salmon Spawning Stock Survey Field Form as indicated below.

Tools and Supplies Needed

- Thermometer
- Gaff hook, handle marked. in centimeters
- Waders with non-slip soles
- Pencils
- Waterproof field record form
- Waterproof ID tags_ for fish heads (Figure 11)
- Plastic "Ziploc" bags for fish heads

 Machete – and file or hog-ring-pliers and hog rings
 Vest or day pack'
 Polarized glasses
 Stream map to indicate location of spawning activity
 Drinking water and food

Instructions for Completing Daily Salmon Spawning. Stock Survey Field Form

1) **Stream** - Print the stream name.
2) **T-R-S** - Enter the township, section and range from the USGS quadrangle.
3) **Lat** - Latitude of the confluence of the stream determined from a 7.5-minute USGS quadrangle.
4) **Long** - Longitude of the confluence of the stream determined from a 7.5-minute USGS quadrangle.
5) **Quad** - Name of the USGS 7.5-minute quadrangle containing the confluence of the stream.
6) **Drainage** - Print the drainage name.
7) **County** - Enter the county in which the stream. is located
8) **Starting location** - Enter the starting point of the survey; for example, the confluence with another stream, a highway mileage marker, a bridge, etc.
9) **Lat and Long of the starting location** - Taken from a 7.5-minutes USGS quadrangle.
10) **Ending Location** - Enter the ending point of the survey; for example, the confluence with another stream, a highway mileage marker, a bridge, etc.
11) **Lat and Long of the ending location** - Taken from the 7.5-minute USGS quadrangle.
12) **Feet/miles surveyed** - Determine the distance of the survey using a map measurement device and a 7.5-minute USGS quadrangle. If the distance surveyed was measured using a hip chain, enter the distance in feet.
13) **Date of survey** - Enter the day's date: nm/dd/yy.
14) **Weather,-** Make a check mark to indicate weather conditions: clear, overcast, rain. If weather conditions chancre during the survey, note this in the remarks section at the end of the page.
15) **Water clarity** -Estimate water clarity at the beginning of the survey. If water clarity changes during the survey, note this in the remarks section at the end of the page.
16) **Water temperature** -Water temperature is taken in degrees Fahrenheit at the beginning of the survey.
17) **Air temperature** - Air temperature is to be taken in degrees Fahrenheit- at the beginning of the survey.
18) **Time** - Time when temperatures were taken.
19) **Crew** - Enter the names of the persons doing the survey.
20) **Number of live fish observed** - Enter the number of live chinook adults, chinook jacks (< 55 cm FL), coho, and steelhead observed. Identification of live fish can be very difficult. If positive identification is not possible, record the fish as an unknown.
21) **Number of carcasses examined** - Identify all carcasses to species and sex. Measure fork length in centimeters and record on the form. Examine all carcasses for adipose fin clips or any other fin clip. Mark all the carcasses using hog rings or cut carcasses in half after examination.
22) **Tag number of adipose-clipped fish and snout recoveries** - All carcasses must be examined for adipose fin clips. If the adipose fin is missing, the carcass may contain a CWT and the snout must be cut off and retained. Remove the snout by cutting across the head in the vicinity of the eyes; cut straight down from the eyes through the upper jaw and into the mouth cavity. Remove the snout in one piece. If unsure of the removal procedure; take the entire head. It is important not to lose the tag due to an improper cut. The project name, the recovery location, the species, length and sex of the fish, date and other relevant information must be recorded on a tag and wired to the snout. The project name will be recorded on the tag for later reference. The

snout or head must be frozen in a zip-lock bag and taken to DFG, where the coded-wire tags will be excised and decoded. Snouts must be individually bagged.
23) **Other fin clips observed** - Record any fin clips observed other than adipose fins.
24) **Number of skeletons observed** - Any fish that cannot be measured, or any identifiable parts of fish found are considered skeletons.- If it is possible to identify the species, record it appropriately; if not, record it as unknown.
25) **Number of redds observed** - Record the number and location of observed redds. This can be difficult in areas of heavy spawning due to multiple redds and superimposition of redds.
26) **Remarks** - Add any, information discovered during the. survey such as barriers, landslides, etc. Include any information necessary to clarify other entries on the field form.

Salmon CWT Recovery Tag			
Tag No.			
Project			
Location:			
Lat			
Long			
Species			
Race	Fall	Win	Spr
Sex	M	F	U
Recovery method			
Date			

APPENDIX B: Survey Details

Stream	Napa River
Date	12/7/2005
Start time	8:39 AM
End time	4:30 PM
Drainage	Napa River
County	Napa County
Start location	Oakville Crossroad Bridge
Start latitude	38.44664
Start longitude	-122.38222
End location	Zinfandel Lane Bridge
End latitude	38.49512
End longitude	-122.42582
Survey Distance (miles)	4.7
Survey Distance (feet)	24816
Weather	overcast
Water clarity	>4 ft
Air temp (c)	8
Water temp (c)	7.5
Crew:	Jonathan Koehler, Chad Edwards