NAPA CREEK SALMON MONITORING PROJECT

ANNUAL REPORT – YEAR 2

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PREPARED FOR

THE CITY OF NAPA
AGREEMENT #8981

BY

NAPA COUNTY RESOURCE CONSERVATION DISTRICT

JONATHAN KOEHLER
NCRCD SENIOR BIOLOGIST
(707) 252 – 4188 X 109
JONATHAN@NAPARCD.ORG

INTRODUCTION

In 2006, the Napa County Resource Conservation District (RCD), funded by the City of Napa, began a five-year study to develop a comprehensive fisheries assessment of Napa Creek (Figure 1). This monitoring project focuses on Chinook salmon (*Oncorhynchus tshawytscha*), steelhead trout (*Oncorhynchus mykiss*) and other native fish species. The study consists of four components to be carried out over the course of five years: habitat assessment, adult salmon escapement surveys, juvenile salmon surveys, and genetic analysis.

This report summarizes results of monitoring efforts between June 2006 and June 2007. Additional background and detailed habitat information for Napa Creek is available in the 2006 Year 1 report from the RCD.

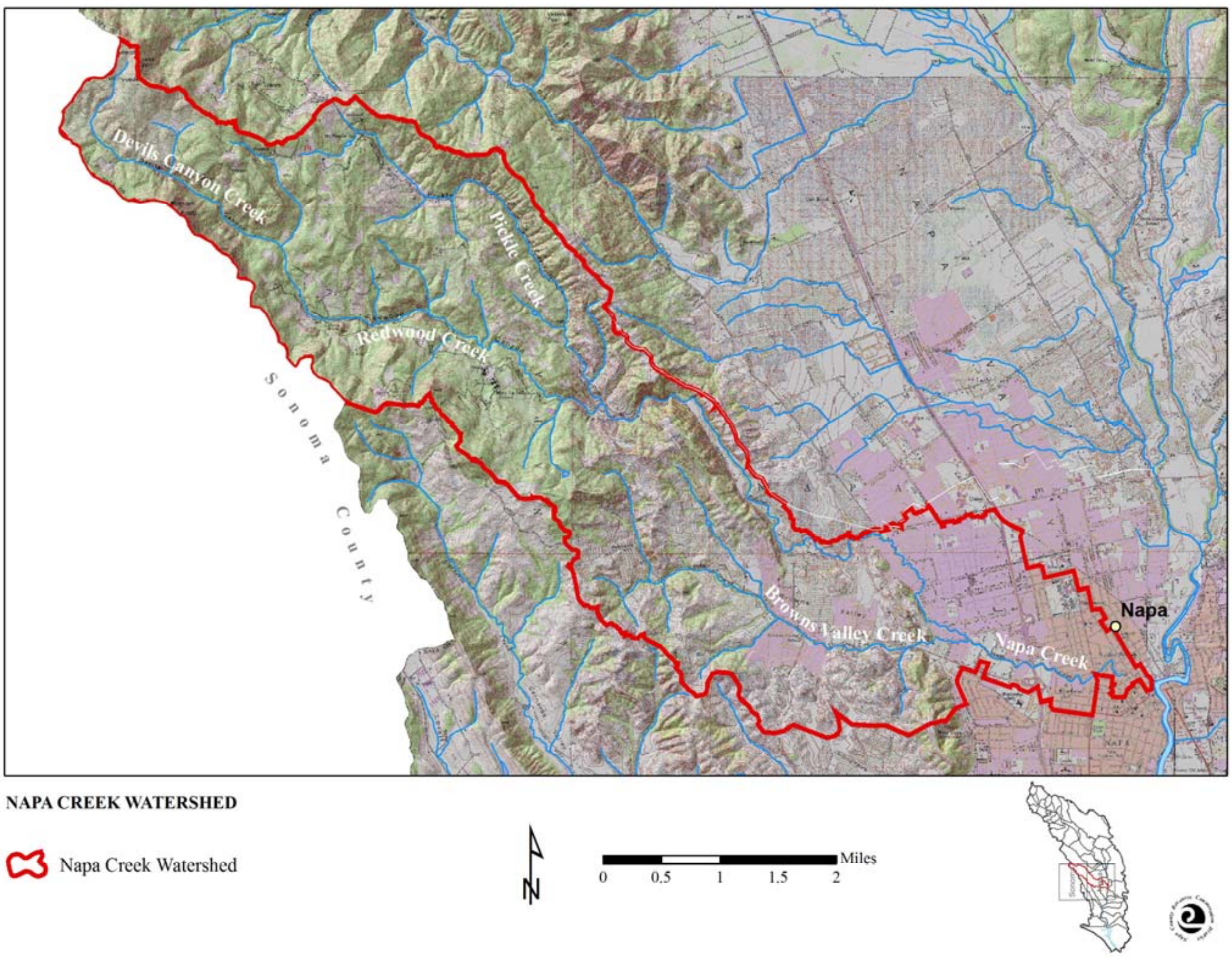

Figure 1. Napa Creek watershed map.

METHODS

RCD staff conducted a salmon spawner survey on November 29, 2006. The two person crew waded Napa Creek from the Napa River to the confluence of Browns Valley and Redwood Creek to count carcasses and live fish, map redd locations and characteristics, and identify critical habitat areas. Surveys were conducted following California Department of Fish & Game protocols as described in the California Salmonid Stream Habitat Restoration Manual (Flosi et al. 1998).

To determine whether water temperatures in Napa Creek are suitable for salmonid spawning and rearing, continuous temperature monitoring was carried out using a digital data logger (*Optic Stowaway Temp*) manufactured by Onset Computer Corporation. The monitoring site selected was in a potential steelhead rearing pool just upstream of Jefferson Street, which remains wet all year. Data from the logger was retrieved and remotely downloaded at approximately four-month intervals. The logger was housed inside a short length of ABS plastic pipe to protect it from damage and direct sunlight. The assembly was anchored to the streambed using a combination of cable and rebar. The logger was set to record water temperature continuously in 30-minute intervals. Physical characteristics of the site were documented at the time of installation including depth, canopy, substrate, estimated flow, and bank vegetation.

Gravel permeability was measured using equipment and methods from Stillwater Sciences. The following method is described in their Napa River Limiting Factors Analysis (Stillwater Sciences 2002):

> To determine the quality of streambed gravels for salmonid egg incubation and larval (alevin) rearing, substrate permeability was measured using a modified Mark IV standpipe (Terhune 1958, Barnard and McBain 1994). Gravels at potential spawning sites were mixed to a depth of 0.95 feet to simulate mixing and sorting conditions that would occur during redd construction by a spawning salmonid (see Kondolf and Wolman 1993 for more information on this topic).
>
> The standpipe used was 46.5 inches (118 cm) long, with a 1.0 inch (2.5 cm) inside diameter and a 1.25 inch (3.8 cm) outside diameter. The standpipe had a 2.75 inch-long band of perforations and was driven into the substrate so that the band of perforations extended in depth from approximately 0.64 to 0.86 feet below the bed surface. To reduce the potential for water 'slippage' down the pipe, the standpipe was held, but not forced in any direction, during the driving process.
>
> Permeability was measured by using a Thomas vacuum pump (Model 107CDC20, powered by a 12-volt rechargeable battery) to siphon water out of the standpipe to maintain the water level inside the standpipe exactly one-inch lower than the surrounding water. By measuring the volume of water siphoned out of the standpipe over a measured time interval, it was thus possible to determine the recharge rate of the water level in the standpipe under a standard one-inch pressure head. At each spawning patch assessed, the standpipe was driven in twice and at least five consecutive permeability measurements were taken.
>
> The recharge rate (units of volume per time) data measured in the field were converted into permeability (units of length per time) using an empirically derived rating table (Barnard and McBain 1994) and adjusted with a correction factor that accounts for temperature related changes in water viscosity that can affect permeability results (Barnard and McBain 1994).

RESULTS

Spawner survey results are summarized in Table 1. One adult Chinook salmon carcass was recovered from Napa Creek just upstream of Highway 29 (Figure 2). The fish was a male with a fork length of 90 cm (35 inches). A tissue sample was collected from the operculum for genetic analysis. The tissue sample was sent to the National Marine Fisheries Service Santa Cruz Laboratory in early 2007 along with over 40 samples collected from the Napa River. DNA was extracted and stabilized successfully from these samples and are expected to be analyzed in late 2007.

Survey Date	11/29/2006
Survey distance (ft)	11,130
Water temp (°C)	6
Air temp (°C)	10
Live Chinook salmon observed	1
Live Steelhead adults	None
Chinook Carcasses	1
Mean fork length (cm)	90
Range fork length (cm)	90
Adipose fin clip	None
Skeletons	None
Redd count	None

Table 1. Summarized salmon spawner survey results.

Figure 2. Adult male Chinook salmon carcass recovered from Napa Creek (11/29/06)

One live adult female Chinook salmon was observed during the survey holding in a pool near Jefferson Street. The fish appeared in good condition and was approximately 80 cm (31 inches) long. No spawning redds were observed during the survey.

Juvenile salmonid surveys were conducted using direct visual observation methods during February 2007. Snorkel surveys were deemed unsafe due to potential contamination from homeless encampments along the stream. Juvenile steelhead ranging from approximately 75 – 200 mm (3 - 8 inches) were observed in all sampling reaches from the Napa River to the upper end of the creek. Abundance appeared to be relatively low with most pools containing no observed fish. No juvenile Chinook salmon were observed.

An intensive assessment of spawning gravel permeability was conducted at ten locations throughout Napa Creek. Permeability results are shown in Table 2.

Site Code	Drive #	D50	Latitude °	Longitude °	Permeability (cm/hr)	Survival to Emergence Index	Sample Date
NC_PM_1	1	35	38.30417	-122.31176	2015	0.307	2/23/2007
NC_PM_1	2	30	38.30459	-122.31273	4351	0.421	2/23/2007
NC_PM_2	1	50	38.30171	-122.30219	2250	0.323	2/23/2007
NC_PM_2	2	13	38.30167	-122.30247	613	0.130	2/23/2007
NC_PM_3	1	65	38.30197	-122.3053	2224	0.322	2/23/2007
NC_PM_3	2	60	38.30157	-122.30541	3263	0.379	2/23/2007
NC_PM_4	1	20	38.29979	-122.29485	5749	0.463	2/28/2007
NC_PM_4	2	35	38.29933	-122.29557	2793	0.355	2/28/2007
NC_PM_5	1	70	38.30227	-122.29112	6120	0.472	2/28/2007
NC_PM_5	2	60	38.30221	-122.29077	43583	0.764	2/28/2007

Table 2. Summarized gravel permeability results. Average particle size on the streambed (D50) was visually estimated for each site. Permeability represents the calculated recharge rate of the standpipe. Survival to Emergence is an estimated index of egg survival while in the gravel represented as a percentage ranging from 0-1 (0 - 100% survival).

Results of continuous temperature monitoring are shown in Figure 3. Ongoing temperature monitoring is continuing through 2007 for long-term comparison.

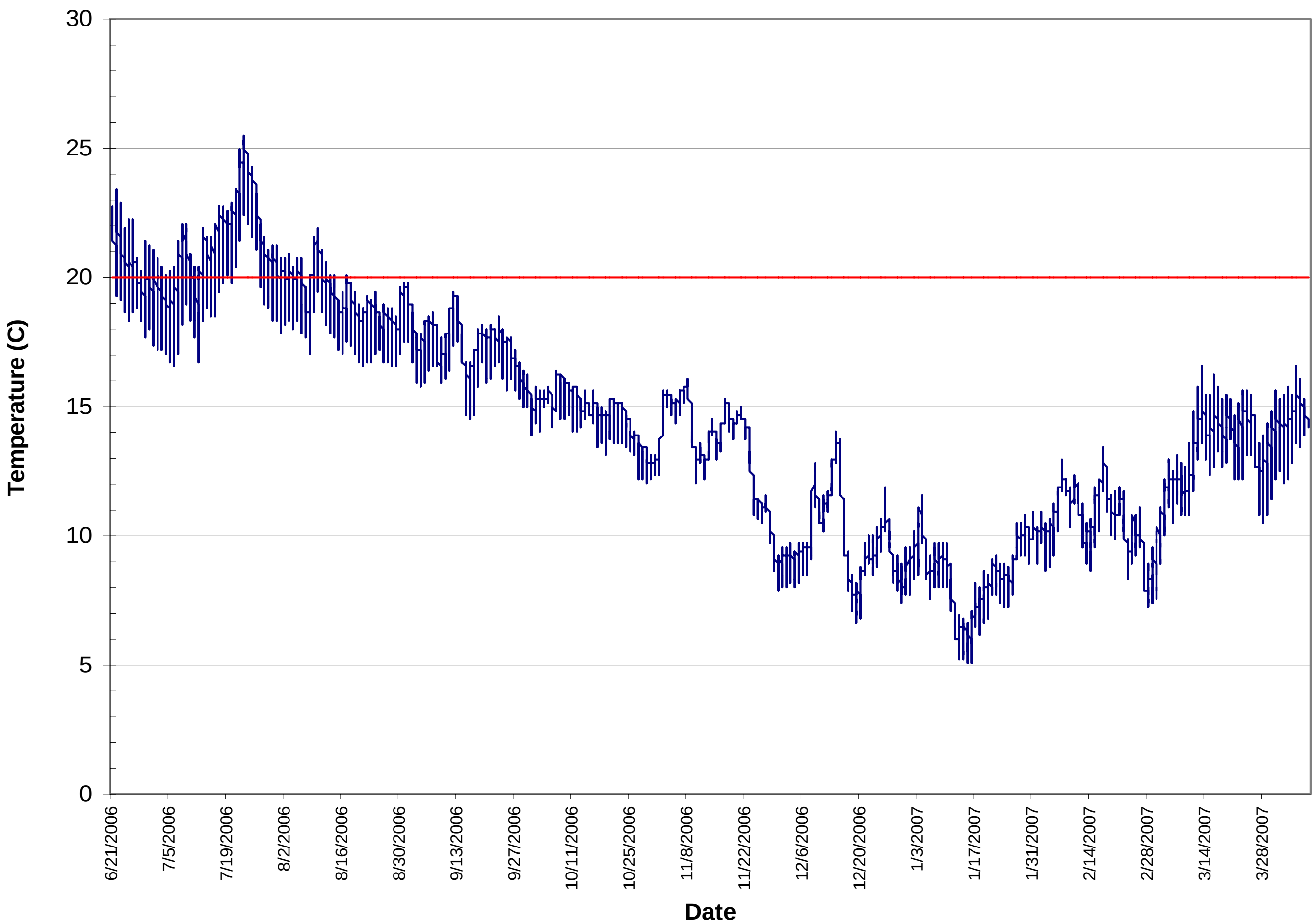

Figure 3. Continuous water temperature monitoring results. The red line represents a temperature threshold (20° C) for juvenile salmonid rearing. Temperatures above this line are generally unsuitable for supporting steelhead and salmon.

CONCLUSIONS

Two adult Chinook salmon were documented in Napa Creek, although it is unclear whether they were actively spawning or migrating through the stream to Redwood Creek. It appears that only a small number of individual salmon migrated into Napa Creek during the 2006 spawning year. These fish likely represent opportunistic strays from the Napa River, which were attracted to the high early season runoff patterns associated with this relatively urbanized stream. Continued genetic analysis of these fish and future generations will help determine whether there is a specific run of fish associated with Napa Creek.

Spawning gravel quality throughout Napa Creek was poor overall. The median index value for survival to emergence for all sites measured was 37%. This means we would expect only about a third of the eggs deposited in any given spawning patch to survive based on flow through the streambed. This low value is consistent with our observations of high amounts of fine sediments at most sites. Additional factors including temperature and scour from high winter flow would be expected to further reduce egg survival in any given year. Efforts to reduce the amount of fine sediment in Napa Creek would benefit habitat conditions and may greatly improve spawning success.

Water temperatures in Napa Creek were relatively high for much of the summer period, and would be expected to limit successful juvenile steelhead and salmon rearing. Chinook salmon are well adapted to such conditions, as the juveniles migrate to the estuary in late spring to avoid elevated summer temperatures. Therefore, high summer temperatures are likely more of a limiting factor for steelhead than for salmon in this system.

FUTURE MONITORING PLANS

- Conduct salmon spawner surveys in fall 2007. Increase frequency if feasible.
- Conduct ongoing water temperature monitoring through 2008. Add additional site if feasible.
- Conduct ongoing water quality monitoring at two sites.

REFERENCES

Barnard, K., and S. McBain. 1994. Standpipe to determine permeability, dissolved oxygen, and vertical particle size distribution in salmonid spawning gravels. Fish Habitat Relationships Technical Bulletin. No. 15. USDA Forest Service.

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