

Surveying the channel

### Stream Monitoring



Radio transmitter near York Creek stream

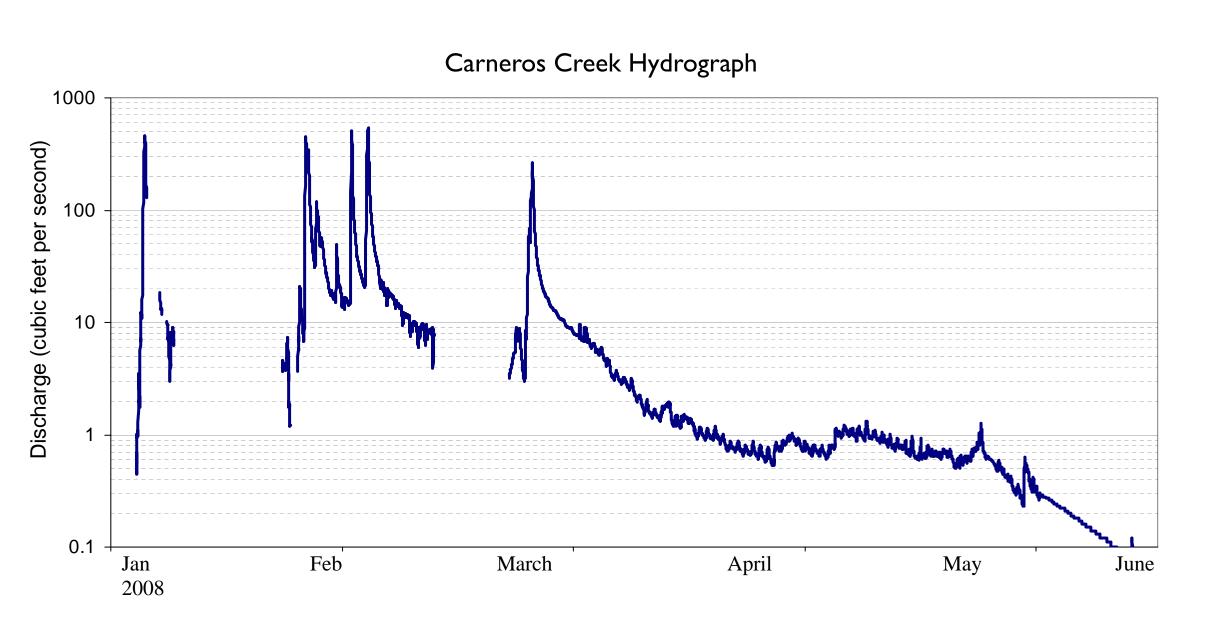
### Objective

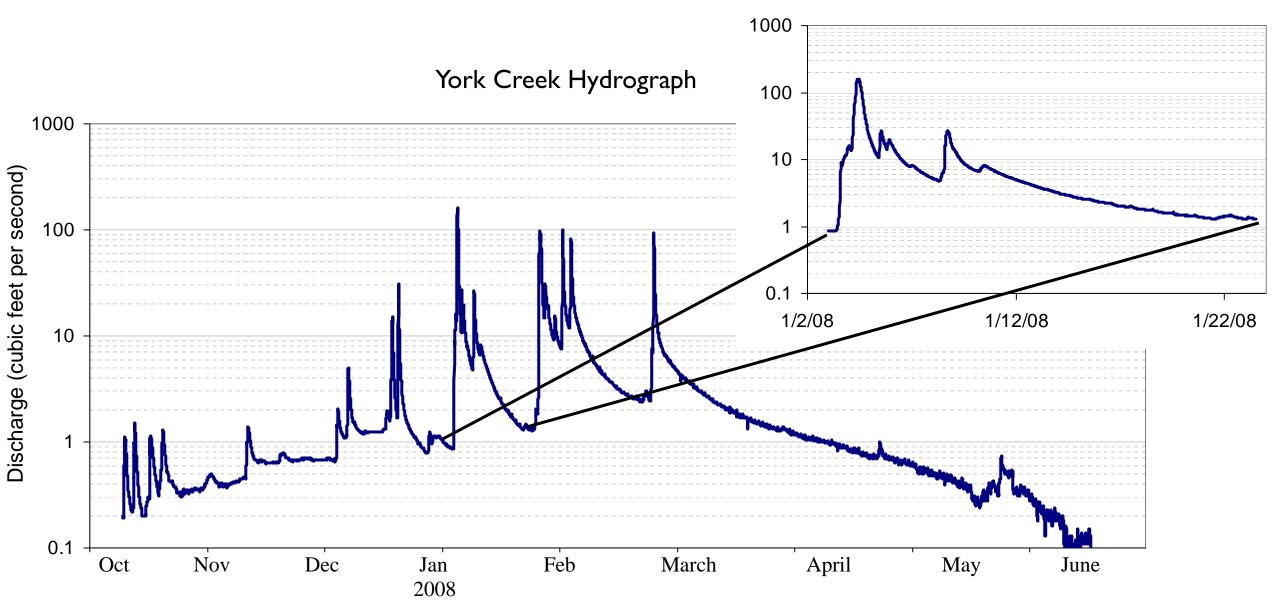
Make real time stream flow data accessible via website

### Methods

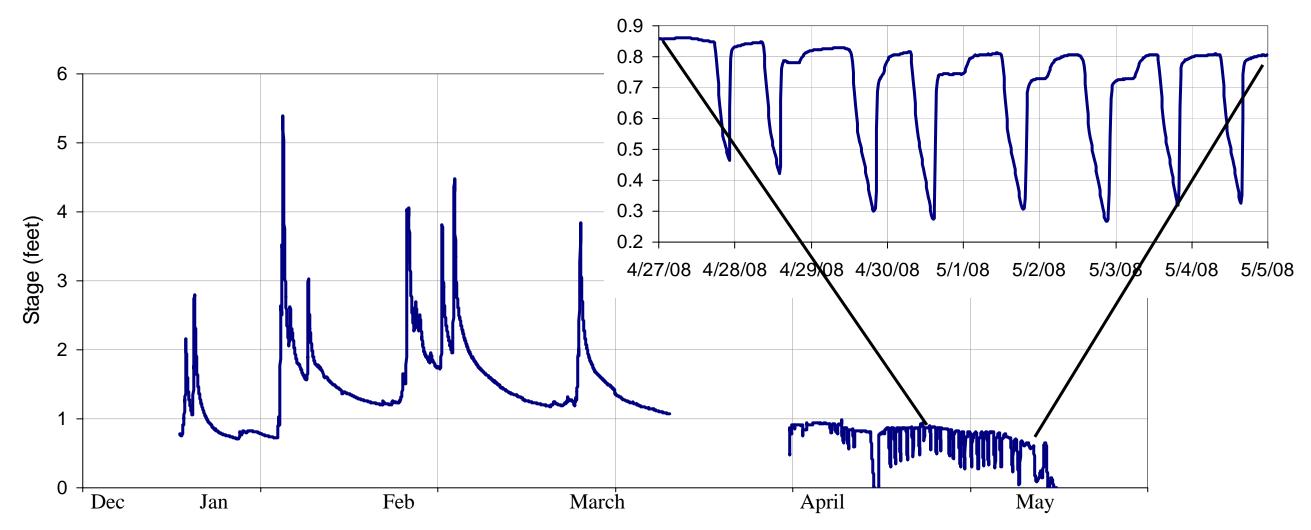
- Stream discharge measurements collected at 6 stations using automated equipment nstalled in streams
- Water level (stage) measured & recorded every 15 minutes with a submersible sensor secured to streambed or an ultrasonic sensor fastened to a bridge above the creek
- Stage measurements transmitted via telephone modem or radio transceiver to the server for the Water for Fish and Farms website
- Stage measurements converted to discharge at the website server with rating equations; each site has a unique equation derived by measuring discharge associated with a range of stages and fitting line among stage-discharge data points

### Results





Redwood Creek Hydrograph



Low discharge gauges measure flows <2 cubic feet per second

Change in discharge during single storm event can be detected by low discharge gauges

Discharge monitoring can identify unnatural patterns that may affect fish survival

# Water for Fish and Farms

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> Steelhead trout need water in streams in the late spring and summer to rear their young, and farmers need water at the same time to irrigate their crops. In 2006, the Napa County Resource Conservation District (RCD) obtained funding from the CALFED Watershed Program and the Department of Water Resources to study whether water withdrawals affect the amount of water available for fish during critical times (spring and summer) and whether the water needs of farmers and fish can both be met. The project aims to address a critical question raised by the San Francisco Bay Regional Water Quality Control Board regarding the impact that low flows may have on juvenile fish.

**Project Goals** 

Improve the ability of local land and water managers to make informed decisions about stream water diversions that benefit steelhead

## Hydrology Models

### Objective

Determine how timing & volume of pumping affect spring flows

REDWOOD CREEK

### Methods

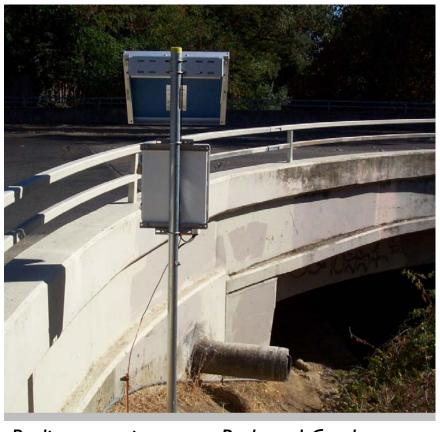
Model constructed for the Carneros Creek watershed using MIKE SHE software (DHI Water & Environment, Inc)

Model calibrated with 2002-06 rain data from 8 Carneros Creek sites; for 8 water users that pump for irrigation, pumping time series were constructed from the observed flow record and interviews with users

Calibrated model used to study 3 water-use scenarios: I. No pumping

2. Spring pumping: water users with a right pump water for frost protection in spring (current practice is to pump only during winter for storage)

3. Extra winter pumping for spring release: 2 water users pump more water than necessary for irrigation in winter & release extra water in spring to augment flow



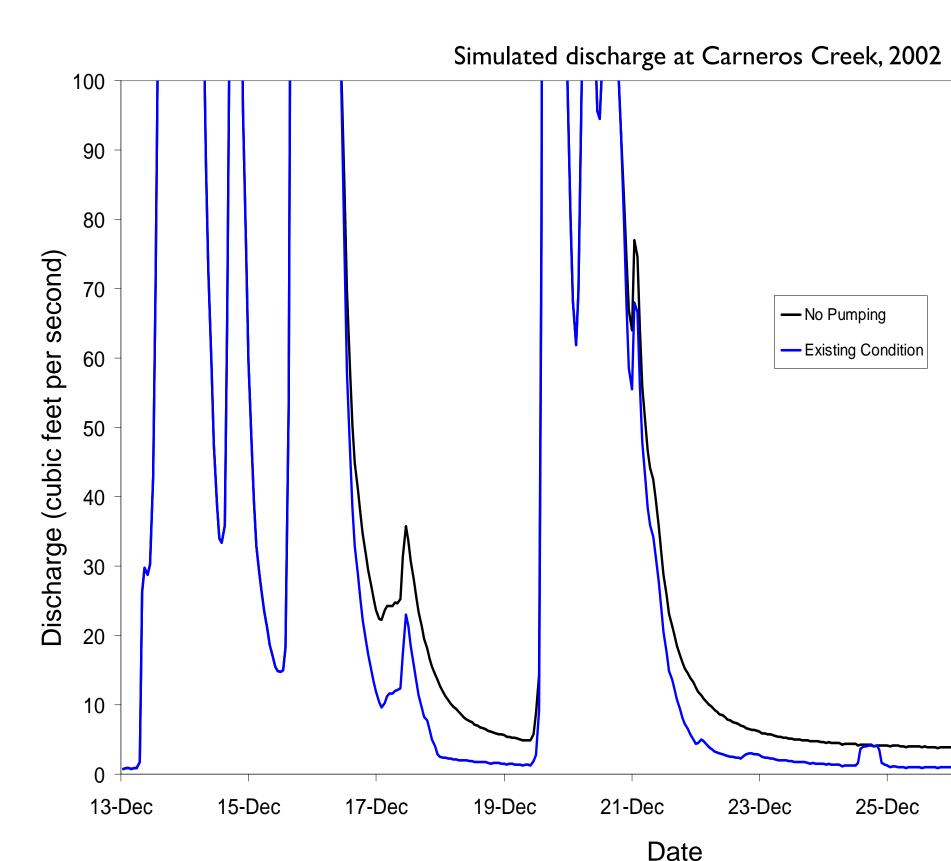
Radio transmitter near Redwood Creek gauge



Pickle Creek, a tributary of Redwood Creek

Results

The timing of withdrawals by water users (in winter) does not affect spring flows.



# ---- No Pumping ---- Existing Condition \_\_\_\_\_ 31-Dec Date



Improve scientific understanding of the relationships among water use, stream flow, and steelhead habitat

Determine whether altering the timing of water withdrawals in three Napa River tributaries (Carneros, Redwood, York Creeks) benefits steelhead without impairing water users

## Steelhead Surveys & Habitat Models

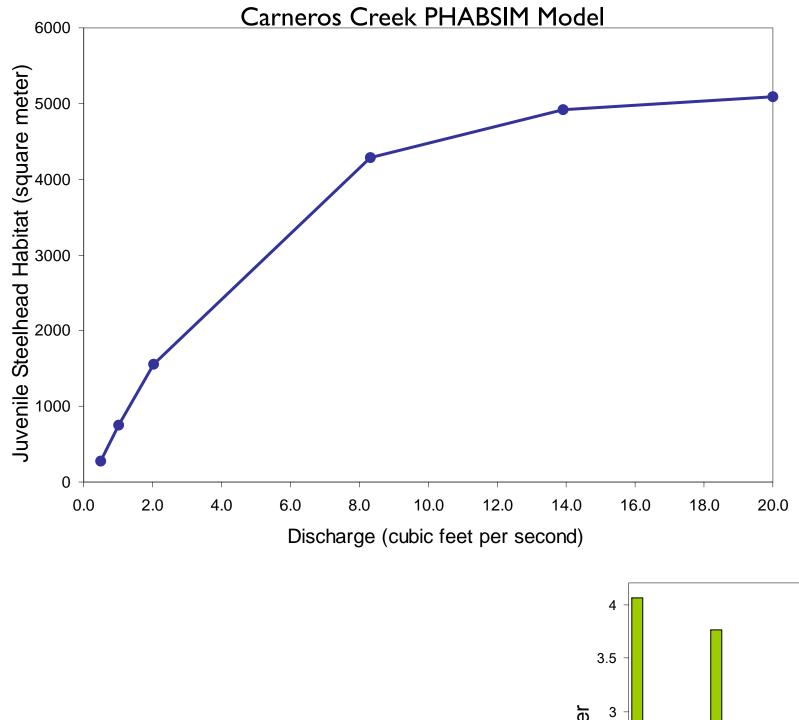
### Objective

Determine how flow affects amount of steelhead habitat

### Methods

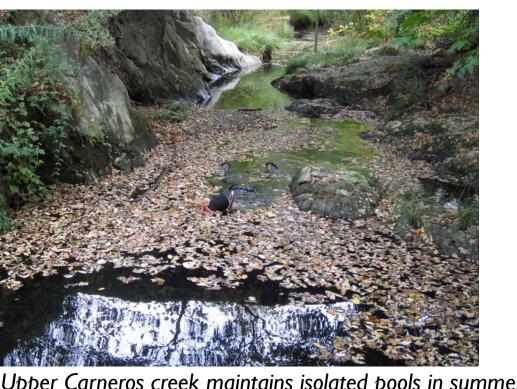
- Steelhead trout distribution and density estimated using snorkel surveys in 2 years, in spring and fall of both years
- Number & size of steelhead observed in randomly selected pools, riffles, & runs in all study reaches recorded
- To develop a physical habitat model (PHABSIM) of the effect of streamflow on juvenile steelhead habitat, water level and velocity were measured at 9 sites
- Flow thresholds for juvenile steelhead growth & survival derived from PHABSIM models

### Results



Fish abundance was very low in fall & as flows diminished, juvenile distribution was limited to pools

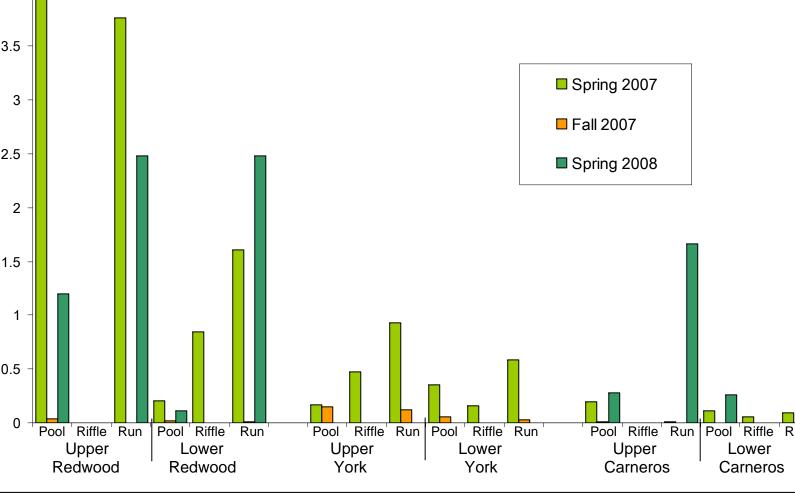




Juvenile steelhead habit decreases sharply at flows below 2 cubic feet per second

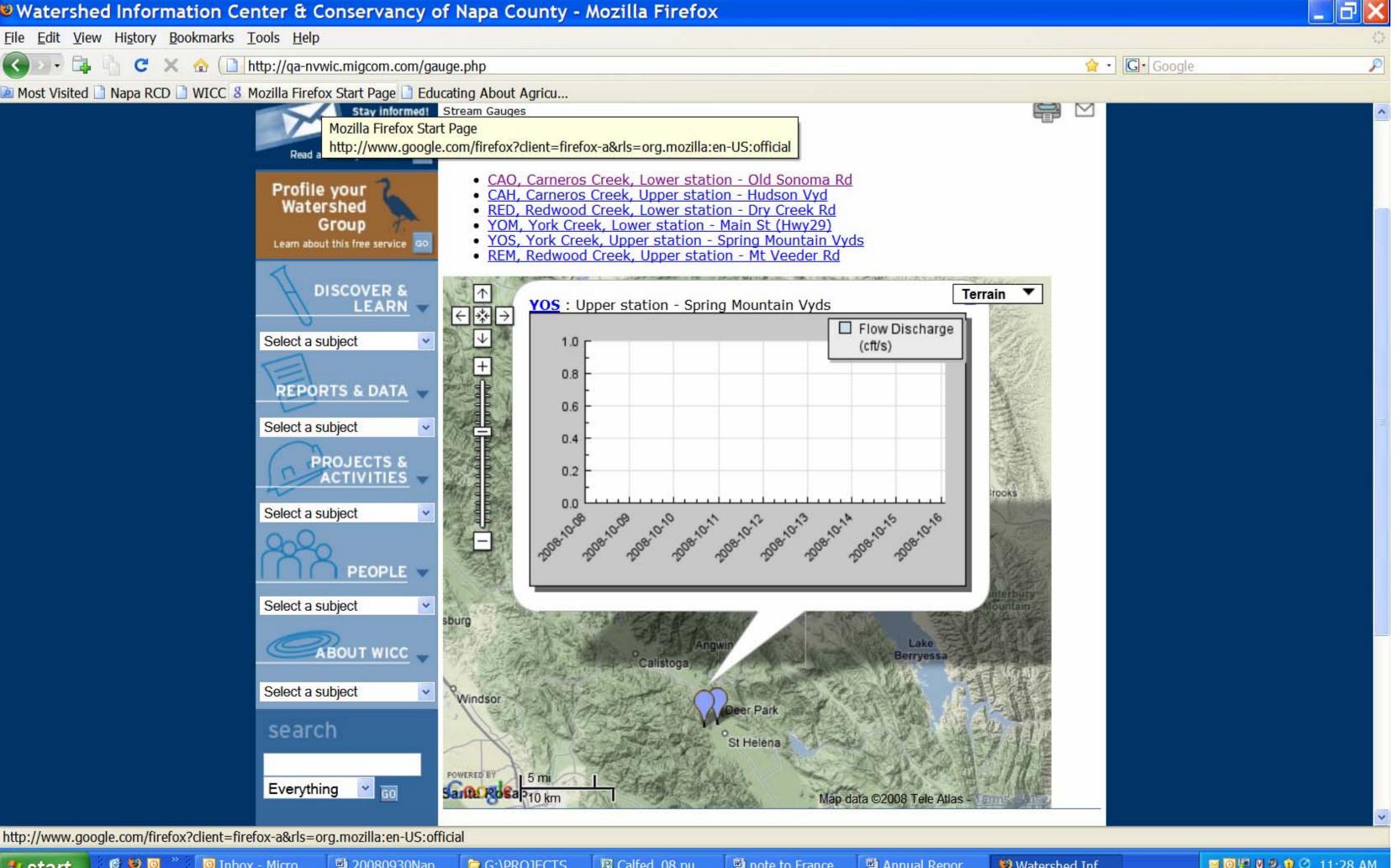
Above 13 cubic feet per second, there is only a slight increase in the amount of

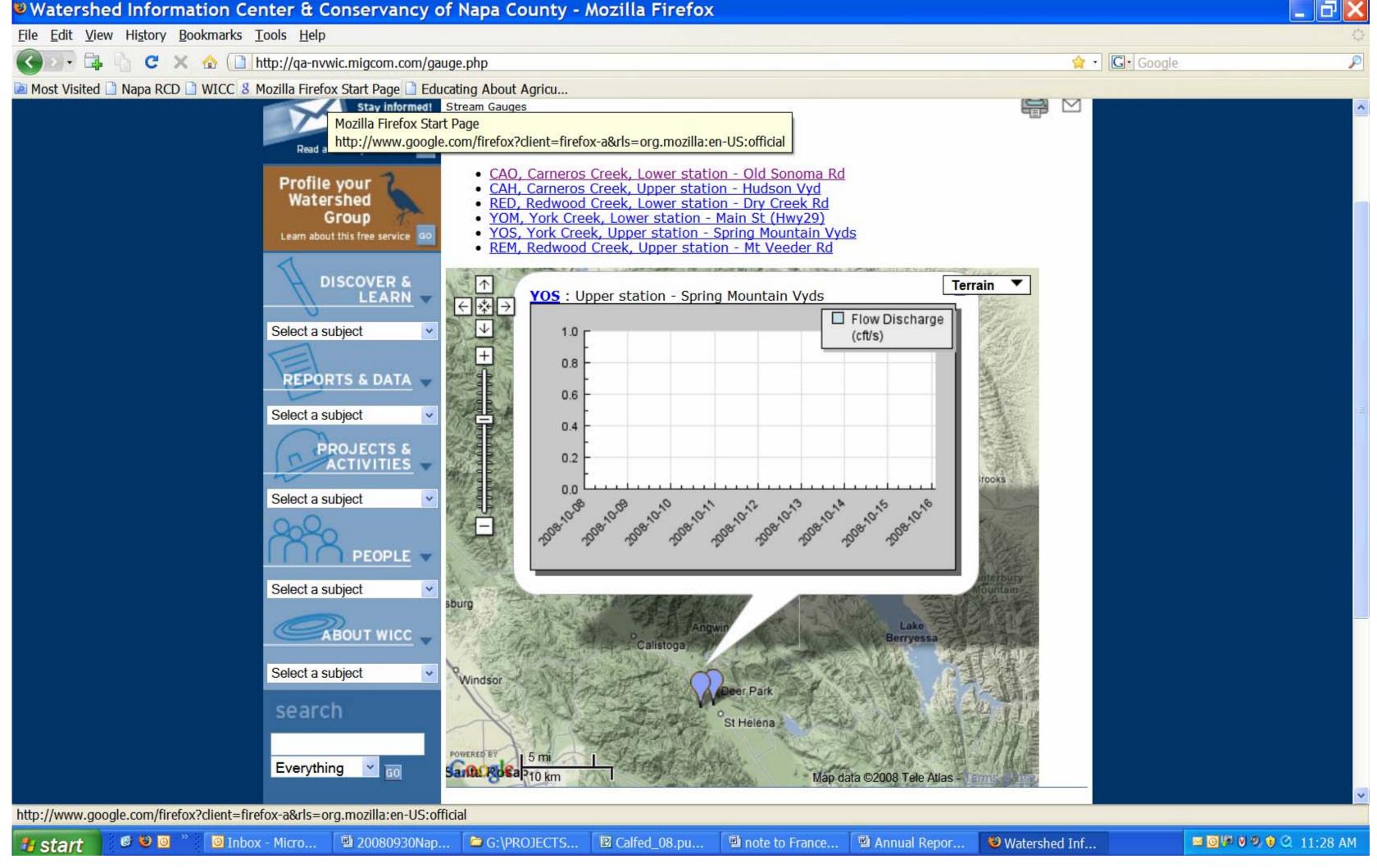
Juvenile Steelhead Survey

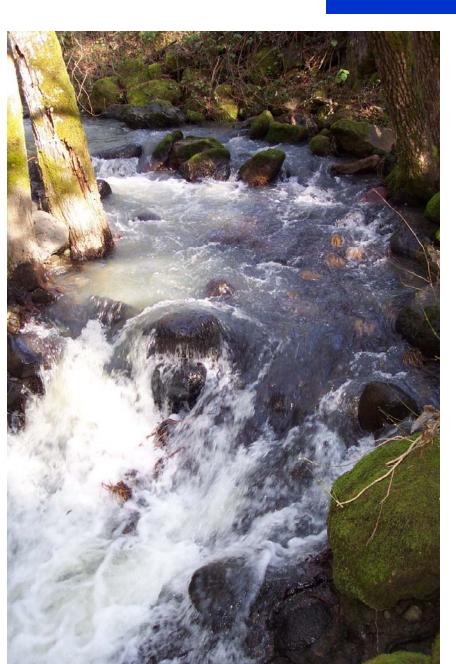




Website with real-time flow data & pumping advice; website will also contain general information about steelhead trout biology & Napa River watershed hydrology







York Creek



### Objective

Make stream flow measurements available to water users, inform water users how pumping affects fish habitat, & provide scientific advice about decision to pump based on current flow

Outreach

### Methods

Mailings to creek-side landowners in late spring to advertise critically low flows, brochure & presentation to describe project

## Conclusions

- In Carneros Creek, pumping in winter on the recession limbs of storms, as is normally practiced, does not affect springtime flow, and therefore, pumping in winter does not normally affect juvenile steelhead habitat.
- Springtime pumping from Carneros Creek, if it occurred, would significantly impair juvenile steelhead habitat, especially if flows were less than  $\sim 2$  cubic feet per second at the time. Therefore, we recommend that water users consult the Water for Fish and Farms website before pumping to determine the most recent flow measurement in the
- RCD will now concentrate on modeling the effects of pumping in Redwood Creek, paying particular attention to surface/groundwater interaction and to the activities of riparian diverters in the spring.

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