Trinity River Restoration Program Performance Measure:

Proportion of Natural Origin Salmonids Contributing to Total In-River Run

Hypothesis: As the numbers of naturally produced fish increase, the proportion of natural salmonids in the in-river run will increase, given constant or reduced hatchery production.

Importance: This performance measure provides feedback on predicted changes in the natural run size. We predicted in the Integrated Assessment Plan (IAP) that if our flows and rehabilitation actions were having a positive effect on our naturally produced salmonid runs that we would see an increase in natural fish as compared to hatchery fish. While both hatchery and natural fish experience the same ocean conditions, they differ in that natural fish experience in river conditions for the time the eggs are laid into the nests (redds). Therefore, this performance measure provides support for changes occurring in the numbers of natural salmonids in the Trinity River due to changing river conditions.

Targets, Predicted or Desired Response: We predict that the proportion of natural salmon in the total run will increase as the rehabilitation of the fluvial processes continues. Past investigations revealed that the contribution of hatchery-origin adult salmon to the total run, for all runs and species, is considerable.

Technical Approach: Temporary weir sites are deployed on the mainstem Trinity River, one near Junction City in late spring and another near the town of Willow Creek in late August. The Junction City site is focused on spring Chinook salmon, whereas the Willow Creek site is focused on fall Chinook, coho, and fall steelhead. The hatchery proportion of the run is determined by the number of fish with hatchery marks (adipose fin-clips for Chinook salmon and steelhead and right maxillary clips for coho salmon) observed in the weir sample. (See Task 2 in CDFG's Sinnen et al. 2010 for details.)

Standard analysis includes estimates of harvest and escapement (run-size) upstream of each weir site, the composition of the hatchery and natural components, separation of spring-and fall-run Chinook (run-timing), and estimates of age structure. This performance measure is based on the following parameters:

a. Run estimates for spring- and fall-run Chinook and coho, and for fall-run steelhead;
b. Hatchery-produced component of each run;
c. Estimated number of hatchery produced and naturally produced fish in each run.

The in-river run sizes were normalized to hatchery escapement to factor out some of the cyclic variation inherent in run size data. If the hatchery produces similar numbers of yearlings and fingerlings in similar health and condition every year, any change in the ratio of natural to hatchery salmon is hypothesized to be due to changes in the natural population. The proportion of natural origin salmon in the total run was calculated using the formula:

$$\frac{\text{Natural origin in river run}}{\text{Total in river run}} \times 100$$
$$\text{(harvest + escapement}$$

These data were plotted over time to examine the relationship for fall- and spring-run Chinook and coho salmon and steelhead.

Results: More hatchery than natural origin Chinook returned to the river on average starting in 1998. The data indicate that the percentage of naturally produced salmon in the in-river run has increased since 2004 for fall-run Chinook and since 2007 for spring-run Chinook (Figure 1). The final counts for all years are presented in the figures below. For spring-run Chinook the percentage of the total run composed of natural adults has increased but has not passed the 50 percent (Figure 1, dashed blue line) of the total in-river run in 2010. While our predictions of increased proportion of natural chinook compared to hatchery fish is being met, we still have concerns because of the natural variability in our chinook runs. The data for steelhead (Figure 2) and coho salmon (Figure 2) indicate that these runs are also dominated by hatchery fish. Hatchery output of chinook juveniles has been constant over several years (Figure 3). Both hatchery and natural juveniles experience similar ocean conditions following outmigration, but their early experiences are markedly different. Hatchery-reared juveniles may spend as much as a full year in the hatchery prior to release.

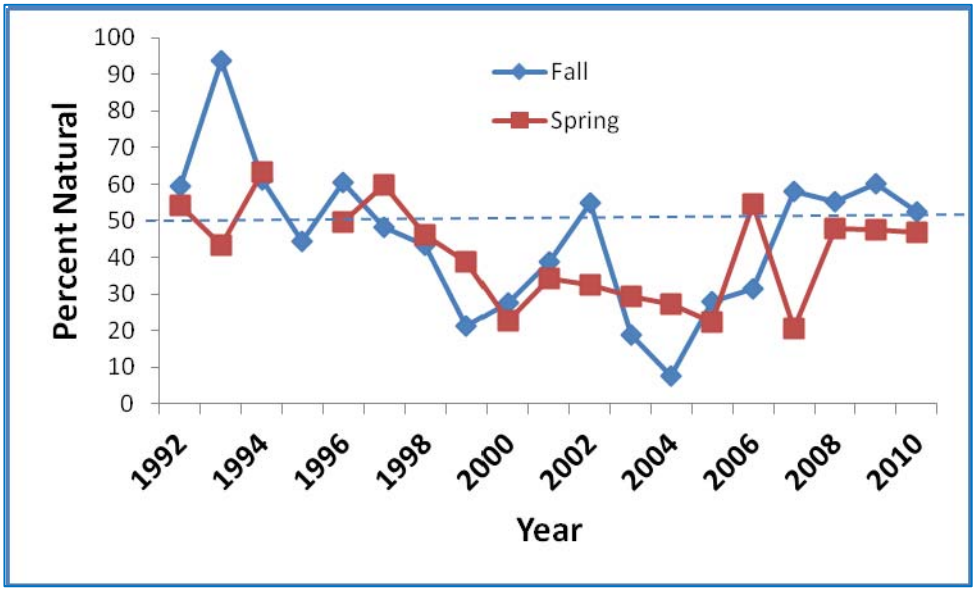

Figure 1. Natural fall- and spring- run Chinook* have increased relative to hatchery salmon in recent years. Dashed blue line is a visual guide to indicate when half the fish are natural.

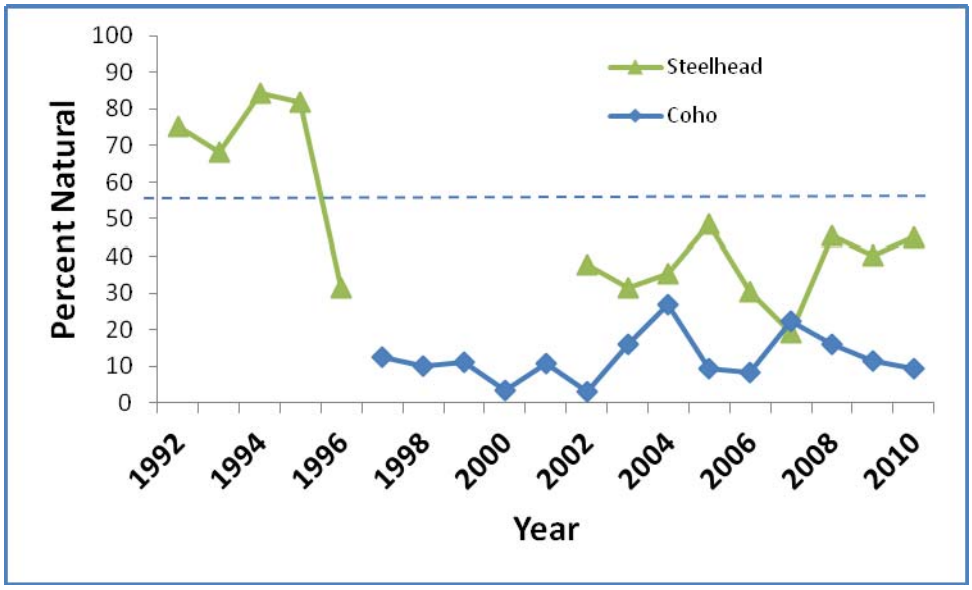

Figure 2. Returning fall-run steelhead and coho salmon * are mostly of hatchery origin.

*Revised based on final 2010 counts for all species

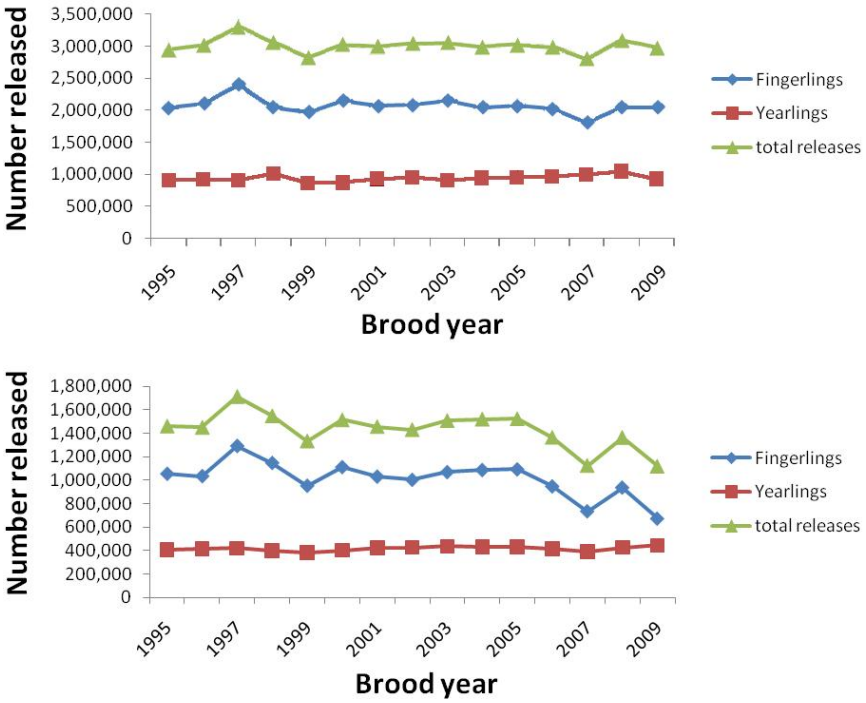

Figure 3. Trinity River Hatchery production of fall-run Chinook (top) and spring-run Chinook (bottom) is relatively constant over time.

Sources of Information: This assessment is based on annual surveys conducted by CDFG and program partners (Sinnen et al. 2010).

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