

Trinity River Restoration Program Performance Measure:

Abundance of Naturally Produced Juvenile Chinook Salmon

Hypothesis: Cumulative restoration actions will increase the abundance of naturally produced juvenile Chinook salmon which will lead to increases in the amount of naturally produced Chinook salmon available for harvest in the Pacific Ocean and Klamath River and in the amount of naturally produced Chinook salmon returning to spawn in the mainstem Trinity River.

Importance: This performance measure documents changes occurring in the numbers of naturally produced Chinook salmon juveniles in the Trinity River as the Restoration Program proceeds.

Objective: The objective of this assessment is to characterize the long-term trend in mainstem Trinity River naturally produced juvenile Chinook salmon abundance at Willow Creek, CA.

The following Program objectives relating to this project have been identified in the [Integrated Assessment Plan](#):

- 3.2.1 Increase fry abundance, growth, physical condition, and health from baseline conditions in the mainstem Trinity River within 3-4 brood cycles following rehabilitation of fluvial river processes.
- 3.2.2 Increase outmigrant juvenile life stage abundance, growth, physical condition and health from baseline conditions in the mainstem Trinity River within 3-4 brood cycles following rehabilitation of fluvial river processes.
- 3.2.3 Improve juvenile fish production as a function of water temperature and habitat flow relationships from baseline conditions in the mainstem Trinity River within 3-4 brood cycles following rehabilitation of fluvial river processes.
- 3.3.1 Sub-objective 3.2: Increase freshwater production of anadromous fish.

Targets, Predicted or Desired Response: We predict that a positive trend (the slope of the trend line will be a positive number significantly different from zero) in juvenile Chinook salmon abundance (March–August) will be detected over time.

Technical Approach: Past fishery investigations in the basin have focused primarily on adult returns, due to harvest allocation and escapement objectives. Data on adult returns, however, provide an indirect measure of restoration efforts in the basin because adult return data are affected by ocean mortality (both juveniles entering the ocean, and adult mortality), harvest at sea, and a number of other factors. Monitoring emigrating juvenile salmonid populations in conjunction with adult escapement, habitat availability data, and habitat suitability studies and spawning studies may facilitate the evaluation of restoration efforts because these studies focus on the freshwater phase, which is directly affected by instream conditions.

The abundance of naturally produced juvenile Chinook salmon should be a good indicator of habitat carrying capacity in the mainstem Trinity River. Since these data are collected annually, and the effort has remained relatively constant since 2007, we can compare abundance estimates from 2007 forward (Chinook salmon), examine the trends, and conduct power analyses. Data exists back to 1989, but the

effort was significantly different prior to 2007. A detailed technical review to be conducted in the future will attempt to integrate the older (pre-2007) data into the trend analyses.

To quantitatively assess juvenile salmonid production in the Trinity River, the Lower Trinity River site (TRWC) was operated by the Yurok Tribal Fisheries Program and the Arcata Office of the U.S. Fish and Wildlife Service (USFWS). The assessment was conducted using multiple rotary screw traps in the Lower Trinity River near Willow Creek, CA. An intensive mark-recapture sampling technique was employed using juvenile Chinook salmon obtained during trapping operations as well as some from the Trinity River Hatchery to generate efficiency estimates for juvenile Chinook salmon. Population estimates were generated using the technique developed by the Outmigrant Technical Review ([Schwarz et al. 2009](#)), and population estimates for both natural and hatchery juvenile Chinook salmon were calculated for the March through August emigration period.

Results: As shown in Figure 1, naturally produced juvenile Chinook salmon abundance appears to have increased steadily from 2007 through 2010. While the recent data indicate a positive trend, future analyses incorporating the magnitude of the spawning population that produced these outmigrants, as well as habitat availability and temperature regimes will be conducted.

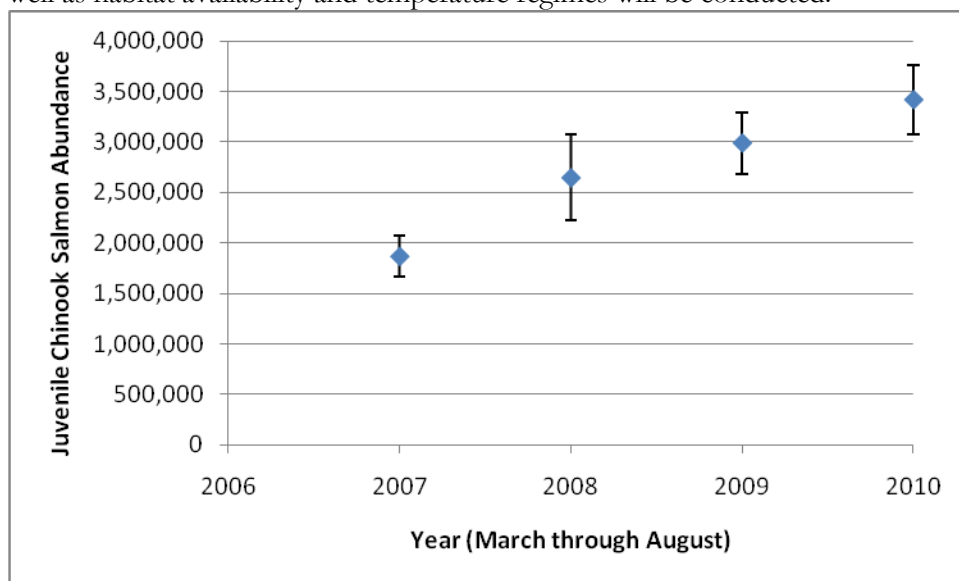


Figure 1. Abundance of naturally produced juvenile Chinook Salmon from March through August, 2007-2010. Error bars represent 95% confidence limits.

Sources of Information: This assessment is based on annual surveys conducted by USFWS, the Yurok Tribal Fisheries Program, and the Hoopa Valley Tribal Fisheries Department, and reported in [USFWS data series reports](#).

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