Trinity River Restoration Program Performance Measure

Abundance of Naturally Produced Juvenile Chinook Salmon

Hypothesis: Restoration actions will increase the abundance of naturally produced juvenile Chinook Salmon that will lead to increased populations of naturally-produced Chinook Salmon for harvest and escapement to the Trinity River.

Importance: This performance measure is important for assessing changes in juvenile salmon production that could result from restoration actions that improve spawning and rearing habitat for salmon.

Objective: The objective of this assessment is to characterize long-term trends in abundance of naturally-produced juvenile Chinook Salmon in the Trinity River upstream of Willow Creek, CA.

The following Program objectives relating to this project are identified in the Integrated Assessment Plan:

- 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 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 linear regression will be a positive number that is significantly greater than zero) in juvenile naturally produced Chinook Salmon abundance will be detected over time. Sampling typically occurs March through August, which is the timeframe during which most juvenile Chinook Salmon emigrate, but it is important to note a portion of the population is not sampled (i.e. September through February).

Technical Approach

Fishery investigations in the Trinity Basin have primarily focused on quantifying harvests of adult salmon (tribal and sport catch) and spawning escapement to evaluate progress toward meeting fish-production objectives of the TRRP. Adult returns, however, provide an indirect measure of restoration efforts in the basin because they are affected by ocean mortality (both juveniles entering the ocean and adult mortality), harvest at sea, and other factors outside the influence of restoration actions. Monitoring emigrating juvenile salmonid populations and adult escapement, rearing habitat availability and suitability, and spawning studies enable evaluation of restoration efforts because these studies focus on the freshwater phase of the salmon lifecycle, which is directly affected by instream conditions that are the focus of the TRRP.

To quantitatively assess juvenile salmonid production in the Trinity River, the Lower Trinity River site was operated by the Yurok Tribal Fisheries Program and the Arcata Office of the U.S. Fish and Wildlife Service. The assessment was conducted using rotary screw traps in the Lower Trinity River near Willow Creek, CA. A 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 trap-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. The method was used to calculate population size from 2007 through 2014, as the current level of effort (number of traps, standardized sampling season, and increased mark-recapture efforts) began in 2007.

Results: Annual population estimates of juvenile Chinook Salmon have exceeded the 2007 estimate in all years through 2014 (Figure 1). However, discontinuities in the increasing trend of abundance occurred in 2011 and 2013-14. It is possible that spawning population size or environmental conditions during egg incubation had an effect on juvenile Chinook Salmon abundance, but analyses to determine cause and effect have not been done. Future analyses relating the size of the spawning population to the number of juveniles produced, as well as habitat availability and temperature regimes will be conducted to assess factors that influence juvenile population sizes.

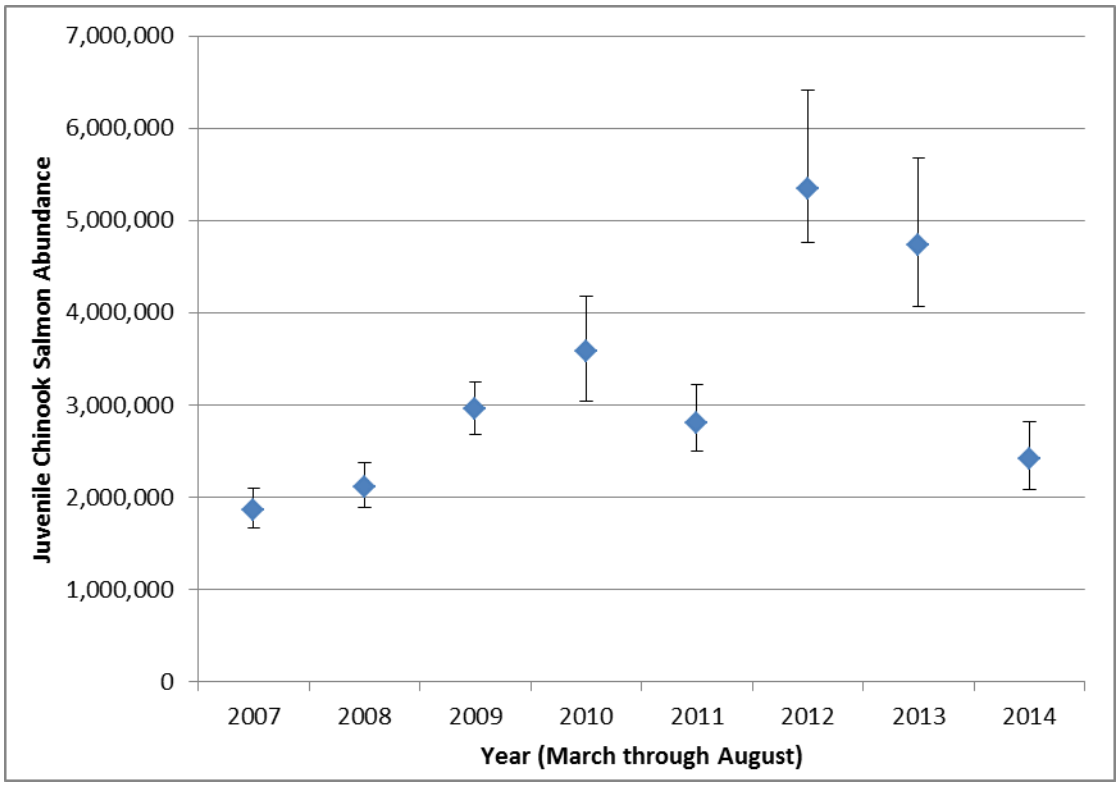

Figure 1. Abundance of naturally produced juvenile Chinook Salmon at the Willow Creek trap site from March through August, 2007-2014. Error bars represent 95% credible limits for the annual estimates.

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 (All reports available on the Arcata Fish and Wildlife Office [AFWO] website: http://www.fws.gov/arcata/fisheries/reportsDisplay.html. Data for Figure 1 are described in the following AFWO report numbers: DS 2009-16, DS 2011-20, DS 2012-27, DS 2013-28, DS 2013-29, DS 2013-34, DS 2014-38, DS 2015-44

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