Appendix A: Steelhead Trout, *Oncorhynchus mykiss*

By Lou Sian

Steelhead trout, *Oncorhynchus mykiss,* were once abundant along the California coast north to Alaska and the east and west coasts of the Kamchatka Peninsula with a few populations on mainland China. In California, their population was approximately 500,000 thirty years ago. They occupied coastal streams as far south as Malibu Creek in Los Angeles to the Smith River near the Oregon border and the Sacramento River basin. (NCRCD, 2006). The current population is estimated at 250,000. (NCRCD, 2006). Steelhead trout in the South/Central California population are federally listed threatened species. (SPCWS, 2006).

Commonly known as rainbow trout or steelhead salmon, this species is considered the most adaptable of the *Salmonidae* family which includes salmon, trout, and chars. Unlike other anadromous species, steelhead may live entirely in freshwater. Anadromous fish are spawned in freshwater but spend their adult lives in the ocean, returning to spawn in ancestral headwaters. In addition, steelhead do not die after spawning but may return from the ocean three or four times to spawn. I was not able to find why steelhead trout remain in fresh water or migrate to the ocean, but some speculate that it may be dependent on the availability of food. Steelhead may migrate when food is scarce and growth is slow or remain in streams when food is abundant and growth is rapid. (NCRCD, 2006).

The decline of steelhead trout population is due to loss of habitat. Anthropogenic (dams, culverts, roads, roads) effects that cause thermal pollution or siltation or prevent access to inland spawning areas, are some factors that degrade favorable habitat conditions. Hence, steelhead trout are indicators of healthy streams; each stage of life occupying riverine features often found in streams approaching the ideal state of equilibrium. (NCRCD, 2006) (Harrelson, et. al., 1994).

Stream as Habitat

Unless straightened by culverts or concrete channels, streams have alternating patterns of shallow riffles, runs, and deep pools. Water flowing through confined spaces like concrete culverts or piping will upon exiting incise the channel bed forming a plunge pool often several feet below

grade making it difficult for fish to swim upstream. Meanwhile, headward erosion (or erosion upstream) occurs as water is deflected by the narrower inlet end of the culvert. (Davis, 2006).

When given enough room and not bounded by revetment, streams develop a more sinuous habit. (Davis, 2006). The outer bends become deeper and banks may be undercut, bringing down trees and large woody debris while the opposite bank may be aggraded with rocks and debris forming bars. Though water moves faster in pools, rocks and cobbles are found in riffles which are shallow, turbulent areas that are well oxygenated. Riffles have greater friction than pools, and heavier rocks and cobbles lie strewn across the stream bed, whereas gravel and silt are easily carried into pools. (Davis, 2006).

Steelhead trout require clean, cool, well oxygenated water. Gravel and cobbles excavated by females for egg laying protect developing fish (alevins) for several weeks. In hatcheries at controlled temperatures of 51◦F, eggs hatch after 30 days. Silt carried into the stream from eroded banks will cover and destroy eggs. Alevins live off the yolk until the fry stage, spending most of their time among the gravel and cobbles, though larger fry prefer the deeper margins of bends, cut banks and deep pools. They often defend their territory. Rocks and boulders and large woody debris (LWDs) provide escape, and riparian vegetation provide cool shady areas for growth. (NCRCD, 2006)

Impacts and Solutions

Sedimentation in California is considered to be the main cause of water quality pollution along northern coastal drainages. (Sims 2002). Silviculture, agriculture, urbanization, roads, and trails intensify the force of water to mobilize sediment in the watershed. Sedimentation changes the morphology of streams making them less fit for fish propagation. Alternatively, removing culverts and other stream altering structures would restore the health of streams and increase their fitness for fish populations. Doubling the current population of steelhead trout would result in approximately $37.5 million in revenues. (NCRCDW, 2006).

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