

Evaluation of Suitable Juvenile Steelhead Trout Habitat in the Carmel River Lagoon

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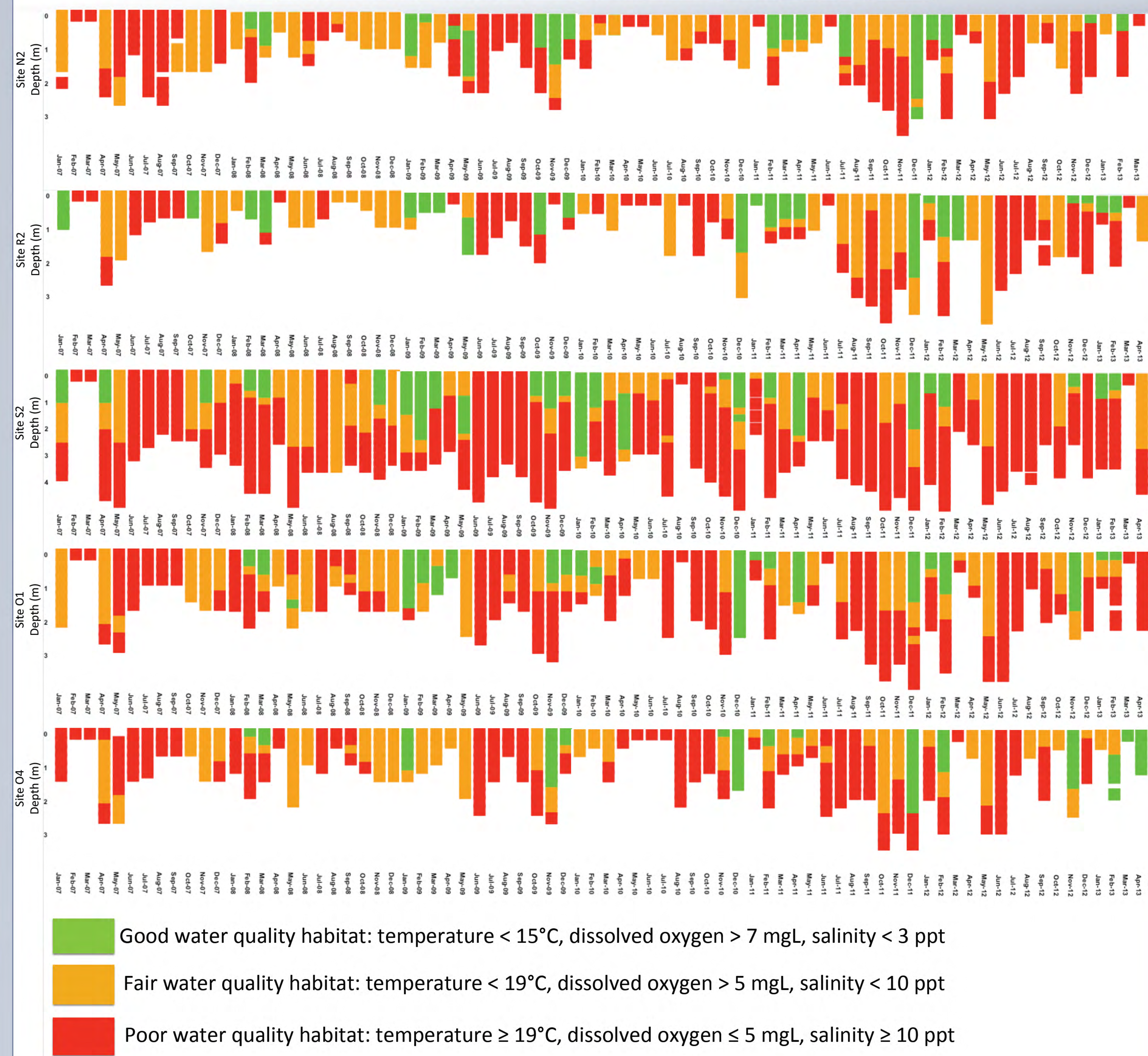
Introduction

Lagoon habitats associated with streams and rivers along the central California coast have been found to be important for juvenile steelhead rearing prior to migration into marine waters. Juvenile steelhead living in coastal lagoons were found to have faster growth rates and larger size at ocean entry when compared to juveniles that reared further upstream within the freshwater reaches, as well as a high return rate of adult steelhead for breeding (Hayes et al. 2008). Several studies have attributed the success of lagoon-reared salmon to a complex invertebrate prey community and the availability of a transition zone where fish can adjust to increasing salinity prior to migrating out to sea (Bond 2006). As the increased flow from the wet season fills the lagoon, the sandbar, which separates it from the ocean in drier months is eroded and eventually breached, allowing the smolts to move out to sea. This seasonal cycle depends upon sufficient fresh water flows and no interruption from artificial breaching of the lagoon in order to provide these habitat benefits. The goal in this study was to examine the availability of good water quality habitat for juvenile steelhead trout (*Oncorhynchus mykiss*) within the Carmel River Lagoon (CRL) under current management practices.



Location of sampling sites in the Carmel River Lagoon

Depth Profiles of Water Quality from January 2007 to May 2013



Methods and Findings

Temperature, salinity, and dissolved oxygen water quality parameters for the Carmel River Lagoon were measured in situ. Measurements were taken monthly from a kayak using a YSI Model 85 at 0.25 meter intervals from the surface to substrate at five sites. Using criteria established to represent good water quality habitat (GWQH) for juvenile steelhead trout, data from January 2007 to May 2013 were evaluated. Sites N2 and R2, near the mouth of the lagoon, had GWQH 22.1% and 20.3%, respectively, during those years. Site S2 in the south arm of the lagoon had GWQH 13.5% of the time. Sites O1 and O4, located in a part of the lagoon that was excavated and restored in 2004, had GWQH 14.8% and 12.5%, respectively, during the six and a half year period evaluated.

Conclusions

The good water quality habitat (GWQH) parameters needed to support successful steelhead growth and smoltification in the CRL are most sensitive to two things: availability of fresh water flows from upstream and artificial breaching of the lagoon resulting in abrupt changes to water depths and salinity. An increase in freshwater flows to the lagoon during drier months and cessation of artificial breaching of the lagoon mouth during the wet, winter months would likely help to increase the percentage of GWQH for steelhead rearing in the Carmel River Lagoon.

Threatened Species of the Carmel River Lagoon



Steelhead trout
(*Oncorhynchus mykiss*)

Listed as threatened by the U.S. Fish and Wildlife Service, these are born in fresh water streams, where they spend their first 1-3 years of life before emigrating to the ocean. Steelhead return to their native fresh water stream to spawn.



California red-legged frog
(*Rana aurora draytonni*)

This frog is listed as threatened and is protected by federal and California law. The main cause of the population decline is habitat loss and destruction, and the introduction of predatory species.



Western pond turtles
(*Clemmys marmorata*)

Western pond turtles are currently only recognized as a species of special concern by the California Department of Fish and Game. Western pond turtles have disappeared from British Columbia, are listed as endangered in Washington, and as sensitive with critical standing in Oregon.

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