Executive Summary

While populations of steelhead and rainbow trout (*Oncorhynchus mykiss*) continue to occur in the majority of the watersheds in the historical range south of the Golden Gate, the distribution of the sea-run (anadromous) form of the species has contracted substantially over time. Abundance, as measured in the average number of spawning individuals (i.e., run size), appears to be a fraction of historical values in most watersheds in the region. Reduced habitat availability due to creation of passage barriers and habitat degradation are the likeliest causes of steelhead's decline.

Ongoing conservation efforts are producing inspiring results throughout the region south of San Francisco, with many local, regional, state, and federal agencies cooperating with non-governmental organizations and others to address passage and habitat quality issues in steelhead streams. Nevertheless, the continuing perilous condition of steelhead suggests that a well-reasoned, comprehensive program to protect the best steelhead resources and alleviate continuing threats be developed as quickly as possible. This report responds to this need, recognizing limitations on funding, expertise, political will, and agency and non-governmental organization staff time, to identify a vital set of restoration actions in the regionally significant watersheds and streams.

This study analyzes information on rearing habitat to identify these regionally significant, or "anchor," watersheds. Using a systematic approach we determine which watersheds offer the greatest potential for producing steelhead smolts, including oversummering opportunities and conditions favoring high growth rates. Within these anchor watersheds we then identify the "essential" streams or reaches that offer the best habitat resources. We suggest that near-term restoration actions should protect and enhance cold-water habitat with adequate food supply in the essential streams, and should connect them with the ocean during key migration and movement periods.

We designated 25 anchor watersheds out of the 142 evaluated (18 percent). This figure represents about 26 percent of the 96 watersheds with evidence of recent steelhead use or other compelling reasons for consideration. Although the anchor watersheds contain almost 400 mainstem and tributary streams that are used by steelhead/rainbow trout, there are 88 essential streams that on a county-by-county basis contain between 52 and 86 percent of the available rearing habitat. These essential streams, which account for the majority of the available rearing habitat south of the Golden Gate, should be the near-term focus of steelhead restoration efforts in the region.

Across the study area, an additional 17 watersheds are considered non-anchor important watersheds. As described in the report, these watersheds are in pristine condition, have particularly proactive stakeholder groups, extend the range of the species, or otherwise merit special attention.

It is important to note that the amount of habitat in anchor watersheds and essential streams varies significantly across the region, as would be expected given the large climatic gradient that exists in the study area from the wetter north to the drier south. Given that the southern-most anchor watersheds represent the extreme southern extent of the species' range, it is not surprising to find lesser amounts of rearing habitat in anchor watersheds of Los Angeles, Orange, and San Diego counties than in the anchor watersheds of San Mateo and Santa Cruz counties. Our approach identifies anchor watersheds by comparing available habitat with habitat in other proximate watersheds rather than comparing potential productivity between geographically (and climatically)

distinct portions of the study area. We believe the steelhead in the southern anchor watersheds will require multiple "refugia" to withstand environmental variability in the future, giving each watershed capable of supporting reproduction and rearing special significance.

For the anchor watersheds, essential streams, and other important watersheds we used available information to characterize factors limiting steelhead production, the status of ongoing conservation efforts, and future restoration needs. Consistent with our experience in the San Francisco Estuary, the Eel River, and elsewhere, we found important restoration projects centered on three basic areas: passage barriers, instream flow provision for all phases of the steelhead life history, and channel and riparian enhancement. Our study placed particular emphasis on barrier removals and modifications to provide a scientific basis for capital spending priorities. In many streams the severity of existing barriers has not been determined, and in these instances we could not prioritize these projects. We encourage spending in the anchor watersheds to apply the standardized, powerful assessment tools currently available to the remaining un-surveyed barriers.

There are several high-profile dam removal projects in various stages of planning in the study area. In particular, San Clemente Dam (Carmel River), Matilija Dam (Ventura River), and Rindge Dam (Malibu Creek), represent major dam removal projects that are required to allow access to the bulk of the historical habitat. Important barrier modifications also should be pursued in the tributaries of Malibu Creek. Ongoing efforts to improve passage at the Vern Freeman diversion facility on the Santa Clara River, combined with passage projects in Santa Paula and Sespe creeks, have the potential to increase production in this important system. An unusual passage project affecting the sandbar at the mouth of San Mateo Creek (San Diego County) may be necessary to create migration opportunities.

Regarding flows, we recommend that a comprehensive program to connect high quality spawning and rearing habitats within the anchor watersheds be undertaken. Rearing steelhead may migrate away from habitats of declining quality (*e.g.*, due to declining spring baseflow) and require hydrologic connectivity between these areas and other habitat refugia for survival. Several anchor watersheds have long migration corridors between suitable spawning and rearing habitat and the ocean where existing conditions appear to limit potential production. The Carmel, Santa Maria, Ventura, and Santa Clara rivers are important examples of watersheds suffering from poor passage conditions due to flow considerations in the lower watershed. More commonly, habitat quality is reduced by the cumulative effect of water diversions. Instream flows are being analyzed in a number of important watersheds of the study area including San Gregorio Creek, Pajaro River tributaries, and the Big Sur River. Significant gaging, analysis, and modification of diversion practices will be necessary in many of the essential streams to allow for successful restoration.

Channel and riparian work recommended in this report also must be thoughtfully developed. In particular, we noted a lack of applied geomorphic studies throughout the region that identify and rank erosion control and other channel improvement projects. In these instances we were only able to recommend further study. Channel and riparian enhancement opportunities also are severely limited by access to private property and by stream setback policy and enforcement. While it is beyond the scope of the current report to propose policy changes, we acknowledge that anchor watershed restoration cannot be completed without the cooperation of local jurisdictions and private landowners in protecting and restoring stream corridors.

Several anchor watersheds would benefit from establishing a public process that engages local stakeholders and other interested parties in defining and advancing restoration priorities. In particular, restoration in the Salinas River in its tributary Arroyo Seco would benefit from the opportunity for all stakeholders to consider passage, flows, and other habitat quality issues in a proactive and integrated manner. This also appears to be the case in the Little Sur River in Monterey County, Arroyo de la Cruz and San Carpoforo Creek in San Luis Obispo County, Jalama Creek in Santa Barbara County, and San Mateo Creek in San Diego County. The experiences of those involved in salmonid restoration in coastal California and beyond clearly indicate the necessity of stakeholder involvement for successfully implementing the often complex, costly, and time-consuming projects that are required for watershed restoration.

Estimating costs for the various projects and programs recommended to rehabilitate the streams of the anchor watersheds was beyond the scope of this study. In most cases, necessary information is lacking and must be developed through conceptual design efforts for specific barrier modification or stream enhancement projects. Implementing the actions envisioned here (and to monitor and adaptively manage the associated, long-term restoration processes) will require a significant and ongoing commitment of financial resources. We believe the most promising and equitable funding approach is to establish a fee for the use of ecological services provided by streams (*e.g.*, water supply, public trust resources, stormwater discharge, *etc.*). This approach could generate a stable revenue source commensurate with the restoration tasks before us. Ideally, funds would be administered by a local conservation district accountable to the ratepayers. Such a program has the potential to raise stakeholder awareness of impacts to streams (decreasing future restoration costs), increase public involvement, and accomplish watershed-wide goals such as maintaining adequate flows and intact stream corridors.

Finally, we hope that the current study is helpful in advancing steelhead restoration efforts on a finite numbers of actions in the most important central and southern California coastal watersheds. Achieving consensus on priorities is key to achieving habitat conditions that show, with adequate monitoring, a biological response that can be used to build further support. Restored steelhead runs can inspire the public to protect our waterways, and will provide a valuable focus for ecosystem-scale planning and management.