FISHERY RESOURCES CONDITIONS OF THE CORTE MADERA CREEK WATERSHED, MARIN COUNTY, CALIFORNIA

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EXECUTIVE SUMMARY

The Corte Madera Creek Watershed and its tributaries are among the few streams flowing to San Francisco Bay that retain a steelhead trout population. The Friends of Corte Madera Creek Watershed (Friends) are interested in restoring the watershed. As part of the watershed project, Friends contracted with A. A. Rich and Associates (AAR), a fisheries and ecological consulting firm, to undertake a fishery resources investigation and prepare this Fishery Resources Technical Report. The results of this study, including the proposed restoration and monitoring suggestions are part of a comprehensive watershed plan to improve water quality, fishery resources, and native vegetation and wildlife in the Corte Madera Creek Watershed. This fishery resources report identifies how the declining trend in the steelhead population can be reversed. The report identifies some of the factors limiting the steelhead trout population, formulates corrective actions, describes how to monitor the success of those actions, and presents an action plan for the restoration of the Corte Madera Creek Watershed as long-term steelhead trout habitat.

This report addresses the status of the existing fishery resources conditions within the Corte Madera Creek Watershed. More specifically, the objectives of this study are to:

- Provide life stage and habitat information on the rainbow/steelhead trout;
- Provide a historical perspective, to the extent possible, on the fishery resources conditions;
- Assess water temperature conditions from April to October;
- Assess physical habitat conditions during the low-flow season;
- Assess fishery resources population conditions during the low flow season;
- Identify some limiting factors for the rainbow/steelhead trout; and,
- Design a Steelhead Restoration Plan which will improve rainbow/steelhead populations.

To carry out the objectives, the following types of surveys were undertaken: (1) Water temperature monitoring, beginning in the spring and extending through the summer; (2) Habitat surveys during the dry months; and, (3) Fish population surveys during the dry months. The results from the water temperature monitoring demonstrated that, despite potentially thermally stressful conditions in many areas of the watershed, there appeared to be "thermal refuge" areas (thermal refugia) where the trout could reside during the hotter summer months. The areas where water temperatures were suitable appeared to be the areas where the greatest number of salmonids were collected. With regard to smoltification, water temperatures began to become thermally stressful, beginning in May. If the fish emigrate out of the system before May, as they may, this would not be a problem.

Corte Madera Creek is highly channelized as a result of various activities (e.g., USACE concrete flood control channel and landowners' retaining walls) undertaken to control flooding during the winter months. The U.S. Army Corps of Engineers (USACE) flood control channel serves only as a migration route for the anadromous steelhead trout. The upstream areas of Corte Madera Creek consist of long lateral scour pools alternating with riffle areas, habitat used by a variety of fish species, although none in great abundance.

San Anselmo Creek had the greatest variety of habitats of any of the creeks within the Corte Madera Creek Watershed, probably due to the fact that it flows through towns, but its origin lies in the relatively unimpacted reaches within the Cascade Canyon Open Space Preserve. Throughout its length, it was characterized by alternating lateral scour pool/riffle sequences. In the lower more urban reaches, the lateral scour pools were associated with retaining walls and rip rap, whereas in the upper more natural areas, they were associated with bedrock. The creek along Cascade Road in

Fairfax was dry for more than a mile, but substrate consisted almost entirely of gravel suitable for trout spawning.

Although short on water by the end of summer, Cascade Creek offered the best trout habitat of the entire creek system. It was characterized by bedrock pools and cascades, abundant canopy, and clean clear water. Although there was no spawning gravel, the pools provided rearing habitat for trout. The uppermost boundary for fish migration was the Cascade Falls. Sleepy Hollow Creek was characterized by low flows, and a heavily urbanized (e.g., retaining walls, bridge pillars, concrete in the creek) channel. In the lowermost reaches, the habitat during the late summer months was suitable for stickleback and roach; higher up in the drainage, there were some appropriate pools for trout. Although dry throughout much of the upper sections, the substrate was gravel suitable for trout spawning.

At the time of the habitat surveys, most of Ross Creek was dry. The only area where there was flowing water and a number of pools suitable for trout was within the Natalie Coffin Greene Park area. From the results of our "spot check" observations, it appeared that Fairfax Creek had little water in it by the end of the dry season. There were lateral scour pools and shallow riffles throughout the Creek, substrate consisted of gravel, sand and silt, and there was abundant vegetative cover.

Fish species collected in the Corte Madera Creek Watershed included rainbow/steelhead trout, threespine stickleback, California roach, sculpin species, and Sacramento sucker. Limiting factors for trout production were lack of stream flows and high water temperatures, depending upon both the creek and location of the reach within a creek. Of the five fish species collected, trout were the most abundant in San Anselmo, Cascade, and Ross creeks; only trout were collected in Cascade and Ross creeks. Roach, stickleback and sucker were the predominant species in Corte Madera Creek; trout and roach were the most prevalent species in San Anselmo Creek; and, stickleback and roach were the most prevalent species in Sleepy Hollow Creek.

The mean trout populations, as a function of habitat type, within the Corte Madera Creek Watershed were as follows: (1) Corte Madera Creek - 0.03-0.14 fish/square meter of fish habitat; (2) San Anselmo Creek - 0.01-12.76 fish/square meter; (3) Cascade Creek - 0.59-0.84 fish/square meter; (4) Sleepy Hollow Creek - 0.02-0.41 fish/square meter; and, Ross Creek - 0.25 fish/square meter. The greatest numbers of trout were collected in San Anselmo and Cascade creeks within the Cascade Canyon Open Space Preserve. However, there was no statistical difference in population sizes between any of the various creeks, due to the wide variability in the number of rainbow/steelhead trout in the various habitat types.

Based on the size distribution, the juvenile rainbow/steelhead trout were probably from three to four different age classes. Most of the trout were young-of-the-year (i.e., hatched during spring of 1999) fish, but there were some older fish in both San Anselmo and Sleepy Hollow creeks. The greatest variety of age classes came from these two creeks, as well, suggesting that there is a self-sustaining population of rainbow/steelhead trout in the watershed, albeit small. Of particular interest was the variety of age classes in the first bedrock pools sampled in the Cascade Canyon Open Space Preserve, upstream of the dry creek bed which extended for over a mile in length.

Based on the length data, the stickleback collected were young-of-the-year fish, the roach and suckers, from one to four years old, and the sculpin from one to five years old. The report provides a Steelhead Restoration Plan for the Corte Madera Creek Watershed which incorporates both science and public involvement to achieve watershed improvement. The three phases to the plan are: (1) Phase I- Undertake preliminary baseline surveys; (2) Design Steelhead Restoration Plan; (3) Phase III - Implementation of restoration actions, research and surveys; (4) Phase IV - Monitoring Results of Restoration Actions; and, (5) Adaptive Management.