Assessment of Southern California Steelhead Trout

On the Cleveland National Forest

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I. INTRODUCTION AND OBJECTIVES

The Cleveland National Forest (CNF) was ordered (US District Court, 2011) to assess the current viability of Southern California Steelhead trout (*Oncorhynchus mykiss*) populations in the CNF to support the Forest's determination of effect upon steelhead under their revised Forest Plan (USDA, 2006) and subsequent development of an Incidental Take Statement by the National Oceanic and Atmospheric Administration (NOAA). The objective of the following assessment was to satisfy this court order by describing the current extent and viability of steelhead and associated habitat on the Cleveland National Forest.

Based upon the background information regarding steelhead provided in the draft Biological Assessment for steelhead in San Mateo Creek (USDA, 2012) and a steelhead management plan for San Juan and San Mateo watersheds (CDM et al., 2007), a field inventory was conducted on CNF land in the San Juan Creek and San Mateo Creek watersheds. San Mateo Creek is the only CNF watershed currently having Endangered Species Act (ESA)-designated Critical Habitat for steelhead (see Figure 1). Potential exists for steelhead occupancy on CNF land in this watershed based primarily upon its relatively close proximity to the ocean in conjunction with documented steelhead occupancy on downstream private and CNF ownership in the past decade, with few to no physical barriers to anadromous access to CNF land (Hovey, 2004; USDA, 2012). Though several physical migration barriers (Figures 2 and 3) exist on San Juan Cr. and the associated Trabuco Cr. tributary that extends downstream of CNF land, this drainage is recognized as having potential for steelhead reintroduction onto CNF land due to close proximity to the ocean and documented steelhead occupancy on downstream private ownership in the past decade (NOAA, 2006; Brennan et al., 2008).

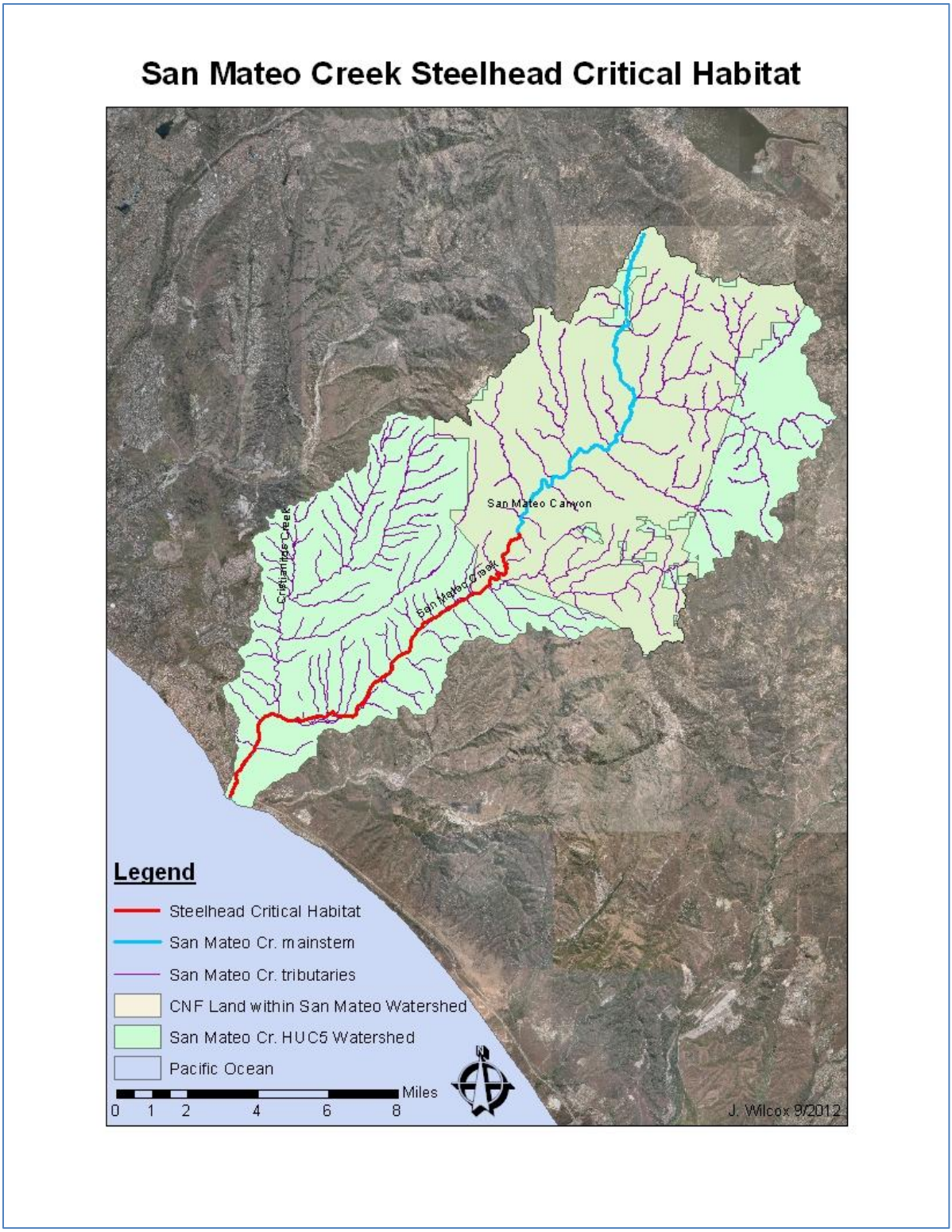

Figure 1. Critical Habitat for southern steelhead in San Mateo Cr. as designated by NOAA Fisheries in 2002 under the Endangered Species Act, defining habitat considered suitable for supporting steelhead trout.

Figure 2. Metrolink rail crossing concrete and aggregate structure (looking upstream) on Trabuco Cr. several miles downstream of CNF land in San Juan Capistrano, CA. This approximately 30-foot tall structure is a barrier to all life stages of southern steelhead trout. The barrier height is increasing due to continual vertical scour at the base of this large artificially hardened streambed structure. Photo from CDM, et al. 2007.

Figure 3. Metrolink rail crossing concrete and aggregate structure (looking downstream) on Trabuco Cr. several miles downstream of CNF land in San Juan Capistrano, CA. This approximately 30-foot tall structure is a barrier to all life stages of southern steelhead trout. Photo from author, September 7, 2012.

II. METHODS

The field inventories were comprised of a comprehensive biological presence-absence survey in conjunction with a physical habitat assessment adapted from the California Department of Fish and Game (CDFG) California Salmonid Stream Habitat Restoration Manual protocols for watershed assessment (2011). Due to the extremely low numbers of documented steelhead (USDC, 2012) in these two watersheds in recent decades, this assessment included habitat suitability as a surrogate for fish enumeration to characterize steelhead potential on the CNF. Habitat assessment included noting the extent of perennial waters as accurately as possible, documenting suspected physical barriers to up/downstream fish movement, and conducting comprehensive water temperature monitoring.

The biological inventory involved a progressive combination of bankside observation, snorkel surveying, seine and hand-netting, and electroshocking. Mainstem Trabuco Cr. was surveyed from the CNF boundary upstream to the end of the Trabuco Canyon road, approximately one-half mile upstream of the Holy Jim tributary. Mainstem San Juan Cr. was surveyed from the CNF boundary upstream approximately two miles. The surveyed reaches of San Mateo Cr. are shown on Figure 4. The selection of technique(s) was based upon specific stream site condition. Direct bankside observation, as a sole inventory method, was warranted in only very small and shallow accessible pools with minimal turbidity and vegetation to allow for accurate viewing into the water column with polarized sunglasses. Due to the infrequency of suitable water, this was the least employed of the survey techniques. Similarly, snorkel surveying was conducted infrequently due to insufficient water depths and/or visibility, though several of the deepest pools (6-7 feet in mid-August) in San Mateo Creek were most accurately surveyed via snorkeling with an underwater flashlight. After surveying from the bank or snorkel observation, seine and/or hand-netting was conducted to collect as many aquatic specimens as possible (Figure 5). A minimum of a single pass through each pool selected for netting was conducted using an expandable 4-foot deep by 33-foot long seine net and/or 14-inch square hand nets, depending upon the dimensions of the selected pools and how thorough the netting effort proved to be. Pools with uneven channel beds such as those that were boulder-dominated, in addition to heavily vegetated habitats, were netted two or three times. Electroshocking was only applied several river miles upstream of designated Critical Habitat in pools that lacked the visibility and access to support the effective application of the other survey techniques. Low voltage (100V) and sensitive pulse rates were applied in accordance with NOAA guidelines (USDC, 2000).

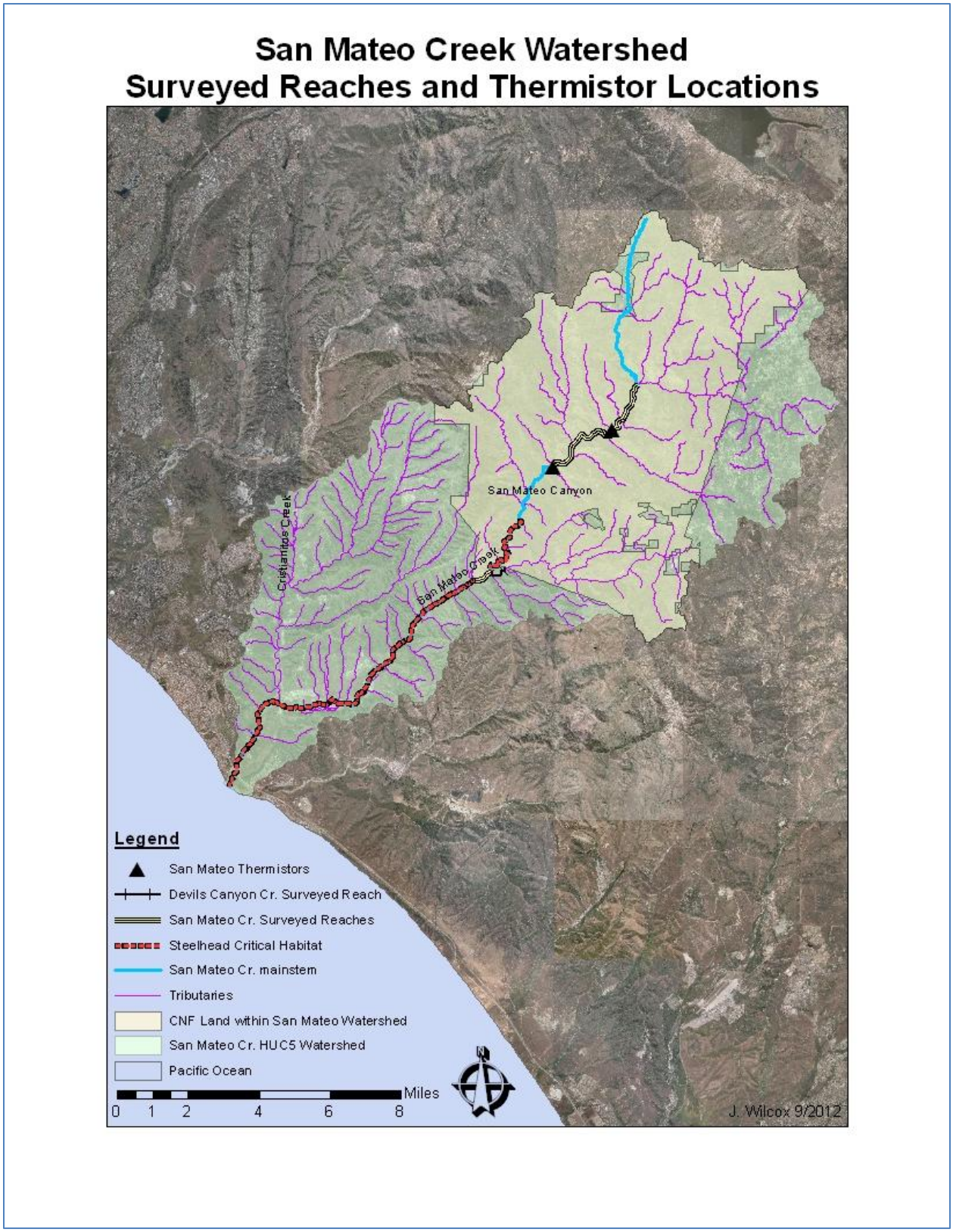

Figure 4. Surveyed stream reaches and thermistor locations in the San Mateo Cr. watershed. The lower mainstem reach on the CNF will be inventoried as access to this remote location.

Figure 5. Seine and hand netting was the primary survey methodology selected for aquatic inventory due primarily to poor water clarity.

Electroshocking was applied in Trabuco Creek in conjunction with CDFG biologists, where genetic tissue samples of suspected hatchery *O. mykiss* were collected for forwarding to a current CDFG trout genetics testing program (Figure 5).

Figure 6. Rainbow trout were electroshocked by CDFG in Trabuco Cr. to confirm the extent of hatchery stocking influence on the local *O. mykiss* population. Distinctly different size classes were captured, confirming the presence of natural reproduction in the wild, though a current hatchery stocking program by CDFG is thought to be the source of all *O. mykiss* in Trabuco Cr.

Water temperature monitoring was implemented by installing battery-powered thermistor units (Onset Corp. Hobos©) in the deepest location of pools predicted to be perennially watered and at least 40% diurnally shaded based upon their location and relatively large depth and surface area. The thermistors were calibrated using a NIST-certified digital thermometer in both a cold and warm water bath prior to deployment to ensure accuracy. Temperatures were recorded at hourly intervals with comparative NIST thermometer measurements recorded at the time of deployment. Mid-season comparative measurements and operational checking was

conducted as time allowed and observed single measurements were compared with current southern steelhead temperature thresholds as defined by the best available scientific literature.

III. RESULTS

No suspected steelhead have been observed to date. Over two dozen *O. mykiss* were electroshocked in Trabuco Cr., a tributary of San Juan Cr. (Figure 5). The genetic tissue sampling results of these fish are going to be processed by CDFG in the coming months and are expected to confirm they are of either direct hatchery origin, or progeny of hatchery-derived fish due to a current hatchery resident rainbow trout stocking program in Trabuco Cr.

Introduced non-native aquatic species including Green Sunfish (*Lepomis cyanellis*), Black Bullhead (*Ameiurus melas*), Golden Shiner (*Notemigoneus crysoleucas*), Bluegill (*Lepomis machrochirus*), Largemouth bass (*Micropterus salmoides*), Mosquitofish (*Gambusia affinis*), American Bullfrog (*Rana catesbeiana*), and Red Swamp Crayfish (*Procambarus clarkia*) were documented at infestation levels in the surveyed segment of San Mateo Cr. (Figures 7 and 8). Golden shiner, Mosquitofish and Red Swamp Crayfish were found to be prolific in portions of San Juan Cr. All non-native aquatic species were removed from watered habitats and killed as encountered. One native fish species, Arroyo chub (*Gila orcutti*), was documented as commonplace in mainstem Trabuco and San Juan Creeks (Figure 8).

Figure 7. Introduced non-native aquatic species were common in mainstem San Juan Cr., relatively few in Trabuco Cr., and infested San Mateo Cr. Species in clockwise order from upper left: Green sunfish, Golden shiner, Bluegill sunfish, Bullfrog, Largemouth bass, Black bullhead.

Figure 8. Introduced non-native aquatic species were prolific and broadly distributed in all surveyed waters of the San Mateo watershed. Green sunfish and golden shiner were the most common fish, while American bullfrog and Red Swamp Crayfish were also found in very high densities more appropriately measured by weight in aggregate than via population enumeration.

Figure 9. Arroyo chub (*Gila orcutti*) was the only confirmed native fish species observed during the aquatic inventory. This species was not noted in the San Mateo drainage, but was present in mainstem San Juan and Trabuco creeks.

Additionally, four native amphibian and aquatic reptile species were observed, including California treefrog (*Hyla cadaverina*), California newt (*Taricha torosa*), Pacific treefrog (*Hyla regilla*), and Southwestern pond turtle (*Clemmys marmorata pallida*).

Approximately three-quarters of the mainstem drainage network inventoried for steelhead in San Mateo Cr. lacked visible surface water by early September, with approximately 90% dry stream bed conditions in San Juan Cr. mainstem at this time (Figure 10). Trabuco Cr. was the most perennially watered channel, with surface water along the majority of the lower two stream miles on the CNF.

Figure 10. San Juan (left) and San Mateo (right) were predominantly dry by early September 2012.

Water temperature data revealed consistently high spot readings in random pools (Figure 11) as well as from continuously collected thermistor data. One thermistor, located approximately 7.5 stream miles upstream from the CNF boundary (Figure 4) has been analyzed to date. The 7-day average daily maximum temperature was 25.31 °C, with a peak reading of 25.57°C (78.03°F), (Figure 12).

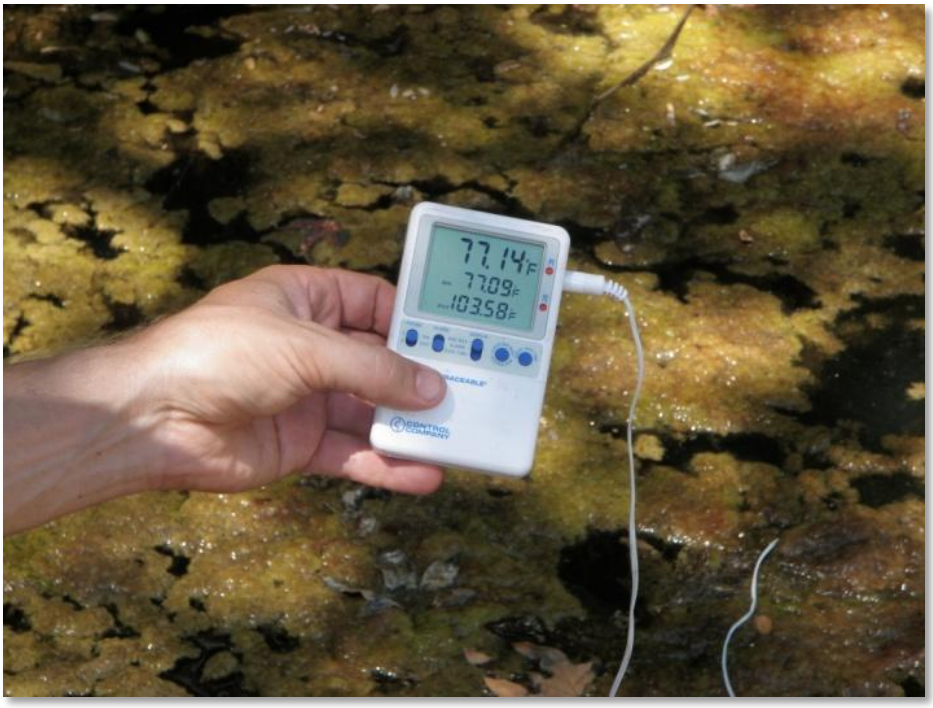

Figure 11. Triple digit air temperatures and minimal shade result in warm eutrophic aquatic conditions in San Mateo and San Juan Creek mainstem drainages.

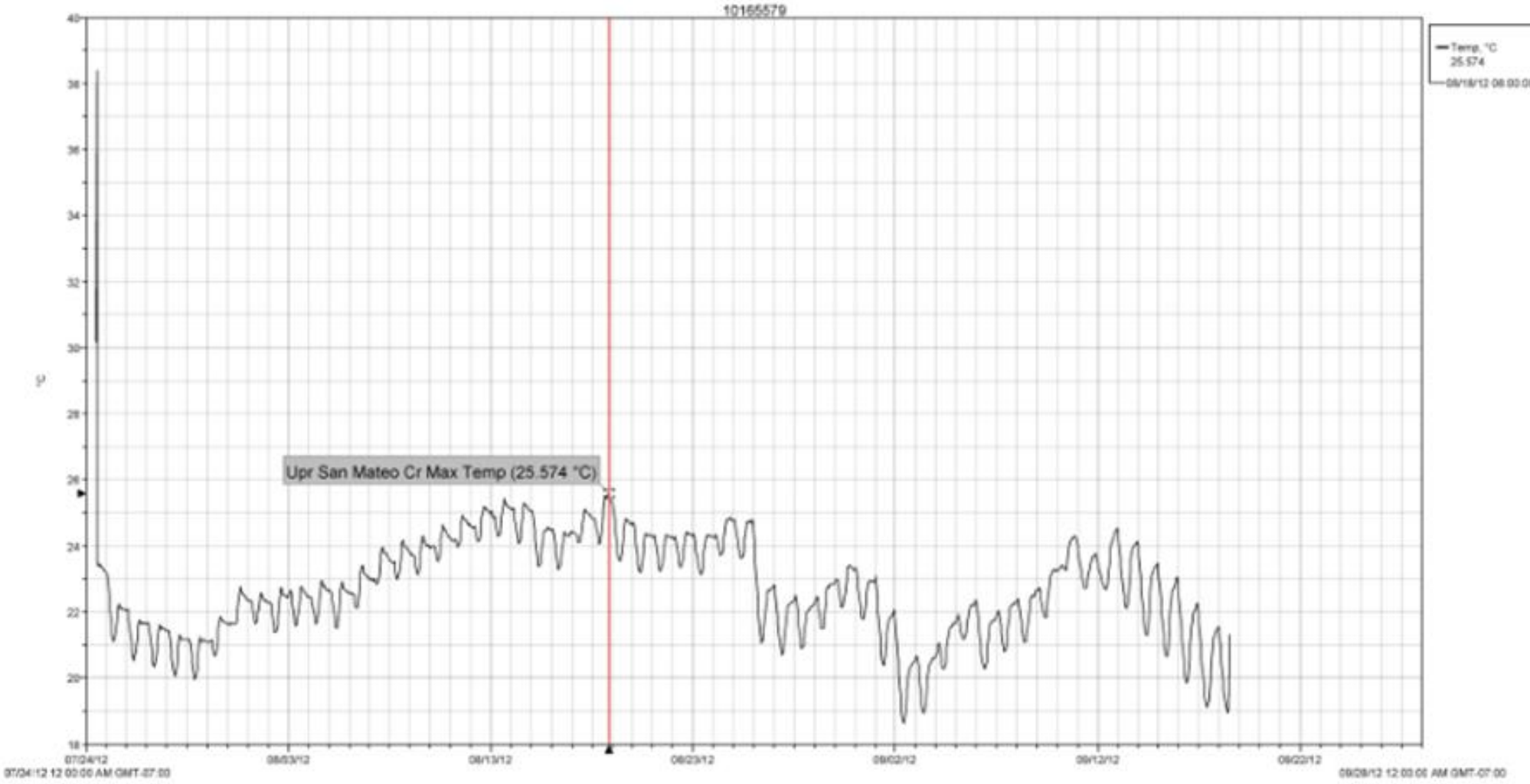

Figure 12. Thermograph data from Hobo thermistor deployed in upper San Mateo Creek approximately 7.5 stream miles upstream of the CNF boundary on 7/24/2012 and downloaded 9/18/2012. The 7-day average daily maximum temperature was 25.31 °C (8/12-8/19), with a peak reading of 25.57°C (78.03°F) measured on 8/18/2012.

IV. DISCUSSION

With annual precipitation ranging between 8 and 30 inches of rain, streams on the CNF flow predominantly intermittently, with seasonal water bodies characterizing most of the overall drainage network. This semi-arid landscape of arroyos is within the natural range of variability for the Southern California ecoregion, though low to no surface flow conditions are likely exacerbated in their intensity due to the prevalence of municipal and/or agricultural water withdrawals. In addition, the winter rains of 2011-12 were below normal, resulting in a lower than normal water table (USGS, 2012). This further diminished the extent of perennial surface water, reducing both pool surface area and residual depth, resulting in increased confinement of fish and other aquatic organisms and exposure to both thermal input and predation. These conditions limit the distribution and abundance of all aquatic organisms, especially anadromous species like steelhead.

While water temperatures were not measured at documented lethal levels (Spina, 2007), observed temperatures are likely high enough to impair growth and overall condition of steelhead (Myrick and Cech, 2000), thereby reducing the fitness required for resistance to freshwater disease and predation as well as smoltification and ultimately ocean survival.

When considering the gamut of physical and biological stressors a potential steelhead individual or population would likely encounter in these focus watersheds, it is unlikely and infrequent at best that southern steelhead would enter onto CNF lands, let alone persist. In the rare event of successful spawning on CNF lands, juvenile steelhead persistence in the face of thermal and predatory challenges would be a highly improbable chance event.

The most likely location for steelhead to occupy CNF lands appears to be in the Devils Canyon tributary of San Mateo Cr., since they were last observed there in winter of 2003 by Tim Hovey of CDFG (Figure 13). According to Tim, there are periodic high flow freshets that result in large numbers of non-native warmwater fishes washed up on the beach at the mouth of San Mateo Cr., whereas the Devils Canyon tributary has a naturally aggraded bedload barrier at its confluence with San Mateo Cr. that he believes prevents infestation of this stream reach, thereby supporting observed adult steelhead and their progeny (pers. comm). It is possible that non-native species that are inclined to lentic habitats are not able to migrate up into Devils Canyon due to a discharge velocity barrier, whereas steelhead have this capability. If this is the case, this may support the concern that the source of the invasive species in San Mateo Cr. is in the headwaters, resulting in downstream flushing and redistribution of these species during higher flow conditions. He also surmises that the Devils Canyon tributary may have slightly cooler water temperatures than mainstem San Mateo Cr., further supporting steelhead.

Figure 13. Tim Hovey of CDFG (left) and Mike Rouse of USMC Camp Pendleton (right) at the pool marking the upstream extent of steelhead documented (by Tim in December 2003) in Devils Canyon Cr. on CNF land, a tributary to San Mateo Cr. Photo taken by author 9/17/2012.

The primary implication of the results of this work regarding the potential for effect of CNF activities upon southern steelhead is that without occupancy, direct and indirect effects are not possible. Only potential future occupancy could be affected through changes in vegetation distribution, sediment production and transport, and associated hydrology, resulting from Forest activities such as fire suppression and road and trail use and management. The magnitude of any of these potential direct and indirect effects is likely small and of short duration with relatively distant proximity to steelhead critical habitat.

V. RECOMMENDATIONS FOR FUTURE WORK

Long-term aquatic fauna distribution and water temperature datasets are recommended for informing the multi-partner Southern steelhead trout recovery effort.

The application of USFS Aquatic Organism Passage survey protocols to measure the physical degree of fish passage barriers in the San Mateo and San Juan watersheds would be valuable current habitat data to complement accounts of historical steelhead distribution. Probabilities of fish navigability could be developed from site specific streambed gradient and projected flow discharge information.

Non-native aquatic invasive species eradication testing could be considered in San Mateo Cr. as the only meaningful attempt at restoration of this watershed's aquatic fauna. Summer low water conditions may support successful microsite treatments such as piscicide and/or desiccation. Short of these techniques, repeating the removal of some of these non-natives as was done in this project will amount to small scale treatment and not restorative control. Public education regarding the importance of not releasing aquatic invasive species is also imperative if long-term restoration is to be achieved.

VI. APPENDIX - MONITORING PLAN

As recommended based upon the higher flows required to support adult steelhead migration, the CNF intends to continue this assessment during the wet season flow regime to fully characterize steelhead on the Forest. Specifically, as required by the aforementioned court order, the CNF will initiate a survey for steelhead trout occupancy whenever the San Mateo Creek sandbar is breached, as this would provide potential upstream anadromous access to adult steelhead. Stream discharge flow information from the USGS stream gauge station 11046300, near San Clemente, CA on the Camp Pendleton Marine Corps Base, will be a primary trigger for survey initiation. Survey methodologies will mirror those described in this document, with an increase in snorkel observation expected during higher water conditions. Additionally, water temperature monitoring will continue, with a focus on identifying and tracking suitable microhabitats for steelhead based upon magnitude and duration of stressing temperatures. All inventory and monitoring progress and results will be made available to interested parties such as NOAA and CDFG, as well as the public.

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