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Mr. Donn W. Furman, Deputy City Attorney
City and County of San Francisco
Office of the City Attorney
1390 Market Street, Suite 418
San Francisco, CA 94102

Subject: Comments on Proposed Listing Determinations for 27 ESUs of West Coast Salmonids

Dear Mr. Furman:

This letter was prepared by ENTRIX, Inc, at the request of the City and County of San Francisco's Public Utilities Commission (SFPUC) in response the Notice in Federal Register Vol. 69 No. 113 for June 14, 2004, 50 CFR Parts 223 and 224. The SFPUC owns and operates the water supply system for the City of San Francisco. ENTRIX, staff have provided technical support to the City on fishery issues in the San Francisco Bay watersheads since 1995. These comments are made based upon our knowledge of the existing fishery and watershed.

On June 14, 2004, the National Marine Fisheries Service of the National Oceanic and Atmospheric Administration (NOAA Fisheries) proposed listing determinations for 27 Evolutionarily Significant Units (ESUs) of West Coast United States salmonid fish species (69 FR 33102-33179). Included in the proposal for the Central California Coast steelhead rainbow trout ESU (*Oncorhynchus mykiss*) (CCC ESU) was the resident population of native *O. mykiss* above rubber dam No. 1 in Alameda Creek, Alameda County, California owned and operated by the Alameda County Water District (hereafter referred to as the Alameda Creek resident rainbow trout population). Alameda Creek flows into the San Francisco Bay in the City of Fremont. Upstream of the confluence with the bay is a series of barriers to anadromous fish upstream migration. It has clearly been established that the most downstream significant barrier is a grade control structure in the flood control channel referred to as the BART weir, (located near the BART tracks). The barrier is located at River Mile (RM) 10 from the mouth of Alameda Creek and completely blocks all upstream access for

anadromous fish. There are a series of other barriers of in the lower 18 miles of Alameda Creek including three inflatable dams (at about RM 8, 10 and 11), a USGS gaging weir (at about RM 13.5) two unused dams (RM 14.7 and 16.5) and a second grade control structure to protect an underground pipeline in the Sunol Valley at RM 18.

At least one resident rainbow trout population occurs upstream of the barrier, primarily within City's two water supply reservoirs (San Antonio and Calaveras reservoirs) and their tributaries and in Alameda Creek within and upstream of Sunol Regional Park. Resident rainbow trout also occur in Arroyo Mocho, a tributary to Arroyo de la Laguna, southeast of the town of Livermore.

Calaveras and San Antonio reservoirs including 33,000 acres of the adjoining watershed lands are owned and administered by the City and County of San Francisco. As such, the City has long recognized a responsibility to protect and enhance all of the plant and wildlife species of the watershed and have proactively engaged the cooperation and assistance of the various federal and state resources agencies in these efforts. For instance, San Antonio Reservoir watershed lands are closed to the public and are managed to support a tule elk herd. Calaveras Reservoir is also a closed watershed and managed as a wintering ground for golden eagles. Both reservoirs have watershed keepers that live on-site and are deputized for the purpose of protecting the watershed resources from illegal activities including poaching and theft of resources.

The City is currently collaborating with other agencies and stakeholders in a dedicated, strongly supported effort to restore anadromous steelhead in the Alameda Creek watershed. The long-term investment made by the City and County of San Francisco (CCSF) toward protection of resident rainbow trout in the Alameda Creek watershed and the collaborative effort of the City and other agencies in the restoration of steelhead is clear evidence that management of important aquatic resources and steelhead restoration and recovery are viable, tenured goals in the Alameda Creek watershed.

With these investments in mind Entrix, Inc. is submiting the following discussion and comments regarding the proposed addition of the resident rainbow trout population in Alameda Creek to the CCC ESU.

We have identified two fundamental deficiencies associated with the proposed listing:

- An incomplete, token consideration of the substantial protective and conservation measures currently ongoing in the Alameda Creek watershed to restore anadromous runs of steelhead to the stream.

- A perfunctory citation of the science underlying a determination that would ultimately be the sole basis for NOAA's determination that the Alameda Creek

resident rainbow trout population are the same as steelhead in the Central California Coast ESU.

We believe that reevaluation of the proposed listing in light of information available under those analyses and rules would result in a decision to vacate that part of the proposal package. This letter details our concerns and offers further comments and potential solutions.

In this section of the letter we outline the major points of our disagreement with the proposed inclusion of the Alameda Creek resident rainbow trout population in the CCC ESU. Detailed discussions of these points are included in subsequent sections.

1. ***Existing Conservation and Protection Measures.*** We are very concerned that the proposed ESU inclusion does not consider the long-term commitment of the CCSF to manage their reservoirs and watershed lands for the protection of water quality and associated natural resources. It is precisely our long-term management policy that has resulted in the preservation of the resident rainbow trout population in both CCSF reservoirs and in the Alameda Creek watershed. The proposed listing did not consider the extensive restoration work ongoing in Alameda Creek since 1999 by the Alameda Creek Fisheries Restoration Workgroup (ACFRW). The workgroup includes federal and state resource agencies (including NOAA Fisheries) as well as community volunteers, our own agency, flood control agencies and other water purveyors along with the various cities within the watershed and the US Army Corps of Engineers, the California Coastal Conservancy, and the Alameda Creek Alliance. Several on-the-ground restoration actions have already occurred, many others are in the planning and permit approval stages, and a Steelhead Restoration Plan was published in 2002.

2. ***State Expertise and Prelisting Involvement.*** We are concerned that the proposed protection of the Alameda Creek resident rainbow trout population under the ESA contradicts the joint US Fish and Wildlife Service/NOAA Fisheries policy to utilize appropriate state agency (e.g., California Department of Fish and Game (DFG)) expertise to design and implement prelisting stabilization actions to alleviate or remove threats to populations or habitat, so that ESA-listing priority becomes reduced or unwarranted. The State has also published a Steelhead Management Plan.

3. ***Best Available Scientific Evidence.*** We are extremely concerned that NOAA Fisheries did not base their proposed grouping of the Alameda Creek resident rainbow trout population with the Central California Coast steelhead ESU on the "best available scientific evidence" as required by the ESA. We will show that the laboratory data and studies used by NOAA Fisheries to indicate that Alameda Creek resident rainbow trout and anadromous

steelhead populations are genetically similar or identical are neither scientifically robust nor reproducible, primarily due to the fact that the studies cited did not have a sufficiently rigorous study design and were further limited by sampling bias and inadequate sample sizes. Additionally the studies that NOAA used were never designed to answer the question that NOAA is seeking to answer. Scientific knowledge of steelhead population genetics throughout the natural range of the species is also inadequate to permit any robust interpretation of the genetic analysis used by NOAA Fisheries to determine population uniformity, and the interpretation of these limited data that led to the Alameda Creek grouping was just one of several equally possible but contradictory conclusions afforded by the data.

4. ***Viable Salmonid Population.*** We are concerned that the determination to include the native, resident rainbow trout population in Alameda Creek in the CCC ESU was made despite the considerable, scientific uncertainty regarding need and associated benefits to the ESU particularly in light of Viable Salmonid Populations (VSP, McElhany et al 2000, Varanasi 2004) criteria. We will show how most VSP criteria are not met, per NMFS 2003 and Vernasi 2004, and that VSP criteria that NOAA considers to be achieved are not met. We will also show that the Biological Review Team's (BRT's) VSP evaluation presents a strong argument for restoration, but provides no support for the listing of the Alameda Creek resident rainbow trout population.

5. ***Sparing Use of ESU Listing.*** In light of the preceding four points, we believe that the rationale behind NOAA Fisheries' proposed inclusion of the Alameda Creek resident rainbow trout population in the Central California Coast steelhead ESU is unfounded and thus the proposal contravenes the letter and spirit of ESA listing in general and the "sparing use" provisions for ESUs in particular.

EXISTING CONSERVATION AND PROTECTION MEASURES

Fundamental to conducting status review updates and proposing any new listing determinations for an ESU is consideration of conservation efforts that provide substantial benefit to the protection and conservation of the ESU (ESA 4b1a, Policy for Evaluation of Conservation Efforts When Making Listing Decisions [PECE] published in 50 CFR Chapter IV Volume 68, No 60). The ESA..."requires that [the Federal government] take into account all conservation efforts being made to protect a species". The policy identifies..."criteria [to be] used in determining whether formalized conservation efforts that have yet to be implemented show effectiveness and contribute to making listing species as threatened or endangered unnecessary". Guidance for consideration of Conservation and Protection Measures are promulgated in the PECE. The policy establishes two basic criteria:

(1) The certainty that the conservation efforts will be implemented and

(2) The certainty that the efforts will be effective.

NOAA Fisheries staff is required to evaluate the Conservation and Protection Measures already in place (PECE). However, NOAA ignored important protective measures employed by the CCSF on their watershed lands that are collectively responsible for the continued existence of the resident rainbow trout populations in the reservoirs today. In contrast, similar rainbow trout populations have disappeared where these measures have not been employed (e.g., Lake Del Valle). Ongoing studies on CCSF watershed lands indicate resident rainbow trout are abundant both within the reservoirs and in the unimpaired tributaries to the reservoirs. No available data supports a decline in these existing populations. NOAA Fisheries acknowledged only selective conservation efforts and protection measures yet to be implemented which will protect resident rainbow trout populations and are designed to restore a viable steelhead population in the Alameda Creek watershed. There is no evidence that the bulk of the measures were seriously considered pursuant to making the listing determination.

Conservation management and recovery measures ongoing in the Alameda Creek watershed protect the resident rainbow trout populations in the reservoirs and are dedicated to restore and sustain a truly viable anadromous steelhead population within the watershed. The benefits to the ESU are clear – availability of up to an additional 50 miles of steelhead spawning and rearing habitat (depending upon water year conditions) to CCC ESU steelhead, increasing abundance, productivity, diversity and spatial linkage within the ESU. The benefit or need to list the resident rainbow trout population in Alameda Creek based upon need for protection and ultimately conservation within the ESU is dubious in light of the considerable benefit clearly associated with the current conservation and protection actions.

The following conservation efforts have either been implemented or will be implemented in the Alameda Creek watershed and address the request for additional information under item (7) by NOAA in the Federal Register Notice to identify efforts being made to protect salmonid populations in California, Oregon, Washington and Idaho. The following list identifies that there are limits to the quantity and quality of available information known to NOAA and adds to the bulk of evidence presented in this letter in support of overturning the proposed addition of listing resident rainbow trout in Alameda Creek to the CCC ESU.

MANAGEMENT PLANS AND AGREEMENTS

State Protective Efforts

The ESA provides that NOAA make listing determination after taking into account those efforts being made by any state or any political subdivision of a State to

protect such species. Ongoing management and protection of the resident rainbow trout population in Alameda Creek stem from a variety of state laws, policies and programs including laws in the Fish and Game Code, policies approved by the Fish and Game Commission, the legislated responsibility of the Department of Fish and Game (DFG) and Management and Restoration Plans developed and approved by DFG. The following activities have occurred with DFG approval or participation in the Alameda Creek watershed

The CCSF Reservoir Watershed Management for the Protection of Water Quality

Objective: Protect drinking water supplies from contamination
Effectiveness: High
Expected benefit to population, ESU: No public access on watershed lands, no angling in reservoirs or tributary streams, sustain improved water quality conditions in reservoirs and streams, increase in abundance of resident rainbow trout populations
Elimination of one or more threats: No harvest from reservoir populations,
Timetable: Ongoing
Certainty: Yes
Permits: None Required
Funding: Available, provided through the Land and Resources Management Service of SFPUC
Commitment: High

Alameda Watershed Management Plan

Objective: Manage and maintain watershed lands in an environmentally responsible way
Effectiveness: High
Expected benefit to population, ESU: Improve aquatic habitat conditions, along Alameda Creek.
Elimination of one or more threats: Decrease in grazing practices on watershed lands, improve connectivity and habitat in Alameda Creek
Timetable: Plan Adopted in 2000
Certainty: High
Permits: None required
Funding: Available, provided by the SFPUC
Commitment: High

Alameda Creek HCP

Objective: Comprehensive, long-term management and conservation measures for Federal endangered, threatened and candidate species
Effectiveness: High

Expected benefit to population, ESU: Resident rainbow trout included as a protected species in the HCP process. Provide protection measures for resident rainbow trout in Alameda Creek; provide for long-term management and conservation.
Elimination of one or more threats: Decrease in grazing practices on watershed lands, improve riparian habitat conditions, and stream habitat quality
Timetable: Started in 2002
Certainty: High
Permits: Will ultimately result in approved HCP
Funding: Available, provided by SFPUC
Commitment: High

Steelhead Restoration Plan for Alameda Creek

Objective: Evaluate restoration needs and develop priorities for restoring an anadromous steelhead run to Alameda Creek
Effectiveness: High
Expected benefit to population, ESU: Identified limiting factors and prioritizes their implementation
Elimination of one or more threats: Access, spawning and rearing habitat
Timetable: Ongoing
Certainty: High
Permits: CEQA/NEPA, 404, 401, DFG 1600,
Funding: Available from multiple sources
Commitment: High

Installation of Fish Ladders in Arroyo Mocho

Objective: Provide fish passage to Arroyo Mocho to expand potential habitat availability for steelhead
Effectiveness: Potentially High
Expected benefit to population, ESU: Reconnect Arroyo Mocho to remainder of Alameda Creek watershed and increase spawning and habitat availability in watershed
Elimination of one or more threats: Reduce fragmentation
Timetable: Completed in 2003
Certainty: Yes
Permits: N/A
Funding: Available, provided by Zone 7
Commitment: High

Removal of Two Swim Dams in Sunol Regional Park

Objective: Improve habitat conditions and fish passage in Alameda Creek
Effectiveness: Yes

Expected benefit to population, ESU: reduce barriers in Alameda Creek
Elimination of one or more threats: Improve connectivity, improve habitat conditions
Timetable: Completed in 2001
Certainty: Yes
Permits: N/A
Funding: Available, provided by East Bay Regional Parks
Commitment: High

Removal of Niles and Sunol Dams

Objective: Improve and facilitate fish passage for anadromous fish through Niles Canyon
Effectiveness: Potentially High
Expected benefit to population, ESU: Improves passage at river mile 14.7 and provides passage at river mile 16.5.
Elimination of one or more threats: Access, Habitat fragmentation,
Timetable: CEQA review in progress, demolition scheduled for 2005
Certainty: High
Permits: CEQA/NEPA, 404, 401, DFG 1600
Funding: Available, $6.9 million provided by SFPUC
Commitment: High

Provide Fish Passage at the BART Weir

Objective: Provide passage for anadromous steelhead around a complete barrier at river mile 10.
Effectiveness: Very High
Expected benefit to population, ESU: Provides passage at river mile 10 opens up system to restore anadromous runs
Elimination of one or more threats: Access, fragmentation
Timetable: Currently in ACOE 1135 Process
Certainty: Uncertain
Permits: CEQA/NEPA, 404, 401, and 1600
Funding: No firm funding immediately available. Strongly supported by various agencies with available matching funds, including funds controlled by NOAA Fisheries for restoration activities within tributaries to San Francisco Bay.
Commitment: Questionable

Provide Fish Passage at the PG&E Grade Control Structure in Sunol Valley

Objective: Provide passage at a complete barrier located at river mile 18
Effectiveness: Yes
Expected benefit to population, ESU: provides access to upstream spawning and rearing habitat between river mile 18 and 27.

Elimination of one or more threats: Access, fragmentationTimetable: 2005-2010
Certainty: Yes
Permits: CEQA/NEPA, 404, 401, DFG 1600
Funding: Available, provided by PG&E
Commitment: High

Install and Operated Hypolimnetic Oxygenation System in Calaveras Reservoir

Objective: Improve water quality and available summer habitat in Calaveras Reservoir during operations under lower reservoir levels required per California Division of Safety and Dams (DSOD).
Effectiveness: High
Expected benefit to population, ESU: Improve summer habitat for resident rainbow trout by increasing dissolved oxygen levels at depths in the reservoir,.
Elimination of one or more threats: Reduce threat of local extinction
Timetable: 2005
Certainty: Yes
Permits: CEQA
Funding: Available, provided by the SFPUC
Commitment: High

Protect Resident Rainbow Trout from Entrainment to Sunol Valley Water Treatment Plant

Objective: Installed fish screens and employed reservoir operational criteria to prevent entrainment of resident rainbow trout in water intakes to the Sunol Valley Water Treatment Plant from Calaveras Reservoir.
Effectiveness: Moderate
Expected benefit to population, ESU: Eliminates a potential source of mortality for resident rainbow trout in Calaveras Reservoir.
Elimination of one or more threats: Source of Mortality in Calaveras Reservoir
Timetable: Screens installed in 1991 and DFG MOU addressing operations initiated in 1991
Certainty: Yes
Permits: DFG 1600
Funding: CCSF provided over $1 million for screen installation.
Commitment: High

ONGOING MONITORING AND ASSESSMENT ACTIONS

- Predation Study on San Antonio and Calaveras Reservoirs to assess bass' impact on juvenile trout. Pilot study of methods completed in 2003. First year fieldwork completed in 2004. Analysis in progress.

- Annual Fisheries Monitoring Studies of Alameda Creek (Annual since 1998-conducted by SFPUC biologists). These studies measure and report changes in species composition in the creek study areas.

- Trapping Studies to Develop Information on Reservoir Populations of Rainbow Trout (Annual Since 2002-conducted by SFPUC biologists and Alameda Creek Alliance volunteers)

- Evaluation of Channel Conditions in the Quarry Reach of Sunol Valley (SFPUC)

- Evaluation of Outmigration Conditions through lower Sunol Valley (SFPUC)

- Aerial Survey for Rearing Habitat Potential in the Upper Alameda Creek Watershed Fall 2002(SFPUC)

- Pilot Macroinvertebrate Bioassessment performed in 2002

BEST AVAILABLE SCIENTIFIC EVIDENCE

Use of the best available scientific evidence is a stated requirement in listing determinations for ESUs. The ESA does not succinctly define best available scientific evidence, but several policies and guidelines have been promulgated to direct NOAA in the use of information relative to its utility, objectivity and accuracy that can aid in determination of the information's appropriateness as meeting the requirement of best available science. Policy regarding peer review of information used to establish scientific support for determinations also provides a measure of best available science. Typically, it is the role of the BRT to identify and address questions surrounding the listing determination using best available science. Generally, this approach involves identifying relevant questions, defining the approach to be used to address the question and an objective conclusion as to the meaning of any results aimed at reducing uncertainties surrounding the question. Such a process clearly describes the data, methods and any assumptions, and thus provides for a transparent, reproducible action.

NOAA has identified the context of questions regarding listing determinations for anadromous salmonids that need to be addressed using the best available scientific evidence. The recognition of distinct vertebrate populations and

assessment of salmonid population viability, including risk of extinction, are the primary components defining the context in which a listing determination is to be assessed. The BRT uses their analyses to make recommendations as to listing and the status of any listing. The recommendation is considered in light of conservation and protection measures that could influence the BRT conclusions (e.g., increased habitat availability and commensurate increases in abundance, productivity, etc. resulting from restoration actions) and a proposed determination is made.

The questions regarding the relationship of resident rainbow trout to anadromous populations in listed ESUs received considerable attention from the BRT (NOAA 2003, Varanasi 2004). The reader is referred to the BRT's report, the Salmonid Hatchery Inventory and Effects Evaluation Report and the BRT Workshop Report for more detailed descriptions of the viability of individual natural populations and hatchery stocks within these ESUs. The BRT concluded that the ESU status of many resident rainbow trout populations remains in doubt, and therefore adopted a structure for determining the ESU status based upon geographic association within listed steelhead ESUs. The same biological principles used to determine ESU membership of hatchery rainbow trout were used to evaluate resident rainbow trout membership:

- The extent of reproductive isolation from other populations within the ESU, and

- Evidence of biological divergence from other populations within the ESU.

The BRT also conceptually applied VSP criteria to evaluate the effect of including resident rainbow trout populations to listed ESUs including contemplated changes in the risk of extinction (Varanasi 2004). Conclusions pertinent to the resident rainbow trout population in Alameda Creek (Case 3 residents)[1] include:

- Relatively little information is available on the ESU status of resident rainbow trout populations above relatively recent man-made barriers (Case 3 residents) requiring case-by-case evaluation

- Case 3 populations that historically were part of the ESU may no longer represent the ESU biologically because of (a) bottlenecks and/or local adaptation and rapid evolutionary divergence in a novel environment; or (b) displacement or introgression from nonnative, hatchery-origin rainbow trout.

- A viable ESU typically has multiple viable populations that have sufficient abundance and growth rates, possess a variation in traits, and are spatially

[1] Case 3 residents: Relatively recent (e.g., within last 100 years) human actions or man-made barriers (e.g., construction of a dam without provision for upstream fish passage) separate resident and anadromous forms.

well distributed to survive environmental variation and natural or anthropogenic catastrophes (however, it should be recognized that some ESUs may historically only have had a single population).

- Isolated resident rainbow trout populations can become vulnerable to local extinction if habitat downstream becomes inhospitable or unavailable, and natural recolonization can be difficult.

- Connectivity among populations greatly reduces the risk that populations at low abundance will be extirpated; reductions in population connectivity can increase ESU extinction risk.

- The anadromous form represents a critical component of the species' evolutionary "bet-hedging" strategy for coping with environmental and ecological challenges, as well as an opportunistic means of increasing scope for growth and reproductive potential.

- Although abundant resident rainbow trout populations can reduce risks to ESU abundance, their contribution to ESU productivity, spatial structure, and diversity is unclear.

- At present there is a high likelihood that ESU viability will not be secure unless there is an adequate opportunity for continued expression of anadromy and other migratory strategies.

Most of the above stated conclusions were directed at co-occurring resident and anadromous *O. mykiss*. Application of these conclusions to Alameda Creeks Case 3 resident rainbow trout population generates rather strong conclusions regarding the contribution of such populations to the viability of the ESU.

Because the Alameda Creek resident rainbow trout population occurs above a series of impassible barriers, it is clearly reproductively isolated from other populations in the ESU.

The Alameda Creek resident population is spatially isolated, its productivity or contribution to growth of the ESU is dubious (contribution could only occur through downstream migration, primarily during reservoir spills that have very low frequency of occurrence , and its diversity is unknown (discussed below). The contribution of the resident rainbow trout population to the abundance of *O. mykiss* with a potential for anadromy and thus additive to the ESU population is unknown. However under current conditions of isolation, Alameda Creek resident rainbow trout population offers, at best, a genetic bank that may or may not constitute a potential source for restoring like populations given catastrophic losses of anadromous populations within the ESU.

There is no information on the biological divergence of the Alameda Creek resident population from other populations in the ESU.

There is documented proof that frequent and abundant plantings of non-native steelhead and, hatchery rainbow trout and other species of salmonids have occurred in the watershed since 1873. These plantings have likely reproduced with native *O. mykiss*. The Alameda Creek watershed was consistently planted with stocks from the Sisson Hatchery that were principally from Central Valley steelhead stocks prior to the 1900's and from Klamath River steelhead stocks after 1900. Stocking was documented as early as 1873, well before any reservoirs were established on Alameda Creek. Plantings were routinely made in Alameda Creek, and included plants into Indian Creek, La Costa Creek, Calaveras Creek and in Smith Creek (tributary to Arroyo Hondo) as well as other tributaries to the Alameda Creek system between 1873 and 1915 (Commissioner of Fisheries Reports 1872-73 through 1914-1916)

- The Alameda Creek system was repeatedly stocked with hatchery rainbow trout from 1921 through 1943 (The Livermore Herald compiled by C. Hanson, 2004).

- The Alameda Creek watershed was routinely stocked with hatchery produced rainbow trout from 1937 through 1995, including annual summer stocking of catcheable-sized, hatchery produced rainbow trout within the lower Niles Canyon reach of Alameda Creek, and intermittent stocking of hatchery produced rainbow trout in the upper Alameda Creek watershed between 1945 and 1995 (Leidy 2003).

- San Antonio Reservoir was stocked with hatchery produced rainbow trout immediately following closure of Turner dam in the mid 1960's (F. Marino pers. Comm)

There is no scientific evidence that confirms the Alameda Creek resident population contains an anadromous component, expressed or otherwise.

Overall, there is no strong, scientific argument that the listing of Alameda Creek resident rainbow trout population will reduce the ESUs risk of extinction or even provide for a viable salmonid population (McElhany 2000) in Alameda Creek, even if there was no evidence of natural history or genetic divergence from other populations within the ESU. Conversely, the BRT's findings strongly support restoration of the Alameda Creek steelhead population by removing barriers to migration and providing access to and improvement of spawning and rearing habitat in the Alameda Creek watershed. The restoration measures currently being pursued will allow anadromy, increase population abundance and productivity, and increase spatial connectivity within the ESU, since there is no viable anadromous *O. mykiss* population currently within the Alameda Creek watershed. Restoration will also increase biological diversity and will likely

increase the number of viable populations and thus improve the viability of the ESU. Listing will not provide the same protections. However, restoration actions that result in restoring anadromous runs will, in effect, result in including the Alameda Creek system to the CCC ESU

New Information and Best Available Science

The BRT's scientific policies and guidelines as a basis for listing determinations appear sound and robust. In addressing listing determination for hatchery and resident populations in listed ESUs, the BRT identified two biological principles that, in the absence of information on life history and population viability, would help determine the membership of such populations in an ESU. These principles are:

- The extent of reproductive isolation from other populations within the ESU, and

- Evidence of biological divergence from other populations within the ESU.

Although we believe that the exclusive use of these principles to determine membership of a case 3 resident population in an ESU does not address the issues of reducing the risk of extinction or improving the viability of the ESU, we recognize the importance and utility of such information to the listing process. As such, we have conducted an extensive evaluation of the scientific information used by NOAA to apply these principles to the Alameda Creek resident population. Our primary conclusion is that NOAA Fisheries did not adhere to its own policies and guidelines regarding scientific data quality standards.

BRT members and regional NOAA Fisheries personnel confirmed that the only scientific information they used to make the Alameda Creek ESU listing determination was provided by Nielsen (2003). Evaluation by two peer reviewers indicates that Nielsen's (2003) research does not adequately address NOAA Fisheries' scientific standards because it lacks transparency and reproducibility, and because NOAA's conclusions are not justified by the data presented in the two papers. Further, much of the data used by Nielsen (2003) originated in research reported by Nielsen and Fountain (1999), which was also flawed by a small sample size and a study design that was not established to answer the question of whether or not Alameda Creek resident rainbow trout are identical genetically to anadromous steelhead collected from downstream of the BART weir. Nielsen and Fountain (1999) and Nielsen (2003) cannot be used by NOAA to establish the genetic relationship of Alameda Creek rainbow trout to any ESU. Below we provide reviews of both reports by two anonymous reviewers conducted independently and detail the reasons that neither report offers sufficient information to justify inclusion of the Alameda Creek resident rainbow trout population in the Central Coast Steelhead ESU.

Reviewer No. 1

Review of Nielsen and Fountain, 1999

Nielsen and Fountain (1999) concluded that:

1) Alameda Creek resident rainbow trout are genetically most similar to Alameda Creek and Lagunitas Creek (Marin County) steelhead and should be included in the Central California Coast ESU (rather than the Central Valley ESU);

2) Some hatchery derived fish stocked in Alameda Creek may have affected the endemic population's genetic diversity, but not within mainstem Alameda Creek itself.

The report does not provide sufficient evidence to justify either conclusion, and it does not provide sufficient information to permit reproductive analysis of microsatellite (nuclear) DNA diversity in Alameda and neighboring creeks.

Specific Comments:

The report is limited by inadequate sample sizes, unjustified genetic assumptions, and lack of statistical significance.

- The entire Alameda Creek sample ("AEM#," n=44) was apparently lumped from subsamples collected from several locations within the drainage. There is no explicit justification presented for such subsample lumping into a single "Alameda Creek" unit, such as absence of sub-population structure based on genetic distance measures such as Fst. Further, the authors state that "GENOPOP's analysis of population independence was significant for all paired comparisons suggesting differences in population allelic structure for each stream locality". This suggests significant population subdivision among localities within Alameda Creek and certainly among Alameda County watersheds, and therefore that the individual subsample sizes were probably too small. Note that in the 2003 report all 1999 Alameda County samples (N=70) also comprise a single sample.

- The stated sample size for AEMb samples collected below the BART Weir is 11, but the table of genetic distances indicates that only 3 samples were used in the analysis. Neither sample size is adequate to make these genetic comparisons. To use microsatellite loci to infer genetic relationships among populations, adequate sample size is normally at least 50 individuals.

- Sample sizes for Palo Seco, Sheppard, San Leandro, and San Lorenzo are also too small to infer population relationships.

- Assuming genetic homogeneity among the Alameda Creek samples, the only comparison with sufficiently large sample size for Alameda County is between AEM and AEMa, two rainbow trout samples collected above barriers to upstream migration. Inferences regarding relationship between rainbow and steelhead entering Alameda Creek are probably impossible to make with these data.

- Because many of the "differences" are not statistically significant, it is difficult to tell whether the Lagunitas Creek samples are really more similar to AEM, Mokelumne River, Scott Creek or American River samples. The Nielsen and Fountain (1999) table indicates that they all have low genetic distances.

- The gene tree includes a collection with sample size of one (Sheppard Creek) and a few collections with sample sizes under ten. Only one bootstrap is statistically significant (the clustering of Mokelumne River samples with other Central Valley populations).

NIELSEN 2003

Specific Comments:

1. The report lacks clarity, reproducibility, and consistency with the earlier report.

   - Nielsen and Fountain (1999) used 10 loci to establish relationships among Alameda Creek and Alameda County rainbow populations and their relationship to Central Valley populations. 2002 data included 14 loci and mtDNA. There is no information on how many loci were used to establish the Neighbor-Joining (NJ) tree in Figure 1.

   - Alameda County samples from the 1999 study (N=70) likely comprise various subdivided populations and should be deconstructed into their source watersheds. Based on the information in Nielsen and Fountain (1999), it is difficult to believe that 1) the 1999 collection was found to be in Hardy-Weinberg equilibrium because the significant sub-structure mentioned in Nielsen and Fountain (1999) suggests that these small populations do not constitute a single random mating population. This is further emphasized by the fact that many of the sample sites in the 1999 report are reproductively isolated from other population sample sites and therefore would not be expected to be in Hardy-Weinberg equilibrium, and 2) that "no significant year-to-year variation [was detected] among samples collected from Alameda Creek, 1997 – 2002." Why then were samples from different years not combined to make a larger overall n? Furthermore, significant subdivision among different reaches of Alameda Creek (Arroyo Hondo, Arroyo Mocho, and San Antonio Reservoir) did not

show significant population sub-structure but we do not know which of these sub-populations the 1999 samples resemble.

- Bootstrap values on the NJ tree support the clustering of Alameda Creek 2002 with Alameda County 1999 collections. It is unclear whether the 1999 Alameda Creek branch consists of 1997-1999 samples (including those collected below the BART weir and the 48 NMFS samples) or 70 samples collected from Alameda Creek and other Alameda County creeks. Furthermore, the 1999 dendogram is significantly different than the 2002 dendogram. A particularly egregious example is that the San Lorenzo population is located on a branch with significant bootstrap support clustering many of the Central Valley populations, but the 2002 tree with ostensibly the same data (same population sizes) are interspersed with East Bay populations.

2. Do Nielsen and Fountain (1999) and Nielsen (2003) studies show continuity of results?

- Generally it is difficult to assess whether the 2003 study adds resolution to Nielsen and Fountain's (1999) conclusions. The sample sizes are larger and the number and variety of genetic markers were increased. There is confusion about which Alameda Creek 1997 – 1999 samples were used in the 2002 analyses. If the 1998 NOAA Fisheries samples were not used, they should not be listed in the sample collection table. If they were used, the report should demonstrate that 1997 – 1999 Alameda County collections are homogenous.

- The NJ tree in Nielsen and Fountain (1999) clusters Central Valley stocks with a bootstrap value of 91%. This suggests two ESUs, one consisting of Central Valley stocks and the other consisting of coastal stocks represented by Lagunitas Creek and including Alameda County populations. In contrast, the 2003 report shows no bootstrap support for separation of Central Valley and Alameda County (coastal) stocks. This is surprising in light of the larger sample sizes in 2002 and potentially greater number of loci analyzed. In this tree, there is no evidence for two ESUs or a particularly close relationship among Alameda and Lagunitas Creeks. The tree does suggest that temporal variation is less significant than spatial variation. There is not enough information in this paper to support or refute the relationship of Arroyo Mocho trout to the Whitney Hatchery strain. There is no information at all on the relationship of resident trout and steelhead.

Reviewer No. 2.

Two papers, Nielsen and Fountain (1999) and Nielsen (2003), interpret genetic data from Alameda Creek and a number of neighboring locations in an attempt to address these subjects. The following paragraphs discuss the following aspects of these papers:

1. study design
2. adequacy of samples
3. adequacy of analysis
4. interpretation

Study Design

In general, the use of genetic data to evaluate relatedness among groups of individuals is plagued by the problem of continuity. That is, there is a continuum of relatedness, and what one considers "different" is arbitrary. This problem is most commonly approached using statistical criteria, in such cases a predefined statistical test is applied to data collected under the strict guidelines of a study design. Relatedness is then evaluated statistically using a probability statement and testing a hypothesis or hypotheses. When applied to species such as *O. mykiss* that exhibits overlapping generations[2] samples must be collected in a manner that allows variation from temporal as well as geographic variation to be statistically partitioned. In other words, there must be replication over a large geographic area and over a number of years, preferably over an entire generation (six to seven years in the case of steelhead). Sampling in such a manner allows researchers to determine whether differences that may be observed among sample groups are large relative to differences noted across a broad geographic range, and further whether observed differences are stable in time. While not completely satisfying, such relative differences – if temporally stable – may yield insight into historical population structure, and hence may provide guidance from a conservation perspective.

In the case of Nielsen and Fountain (1999) and Nielsen 2003 it appears that samples and analyses were conducted in the absence of a predefined study design. Therefore, it is unclear whether the geographic distribution of sample effort was appropriate for the purposes of the study. In addition, it is clear that temporal replication of sample effort is insufficient to properly partition geographic and temporal variation.

Given the lack of temporal replication, these papers suffer from the inability to determine whether observed differences are temporally stable, hence interpretation of the data is substantially limited, and the utility of the data for

[2] Juveniles born in the same year may spawn in one to six years, hence adults spawning in a given year may be of various ages..

management is questionable. In general, a study design should be formulated to very specifically address the conservation value of both resident and anadromous forms of *O. mykiss* in Alameda Creek. Such a study should include a good geographic representation of locations in Alameda Creek above and below impediments to migration. These locations, once established, should be sampled annually for a minimum of three years, preferably six to seven years. Contemporaneous collection effort should occur in a number of tributaries across the state of California to provide spatial resolution. Prior to sampling, a study design should be established that outlines hypotheses to be tested as well as the statistical tests that will be used.

Adequacy of Samples

A summary of sampling issues for each paper is provided below:

Nielsen and Fountain 1999:

- sample sizes are very small in most cases, unless the samples are considered to be a census they are of questionable value

- it is unclear whether samples were juveniles or adults (presumably juveniles given that electrofishing was used)
  - if samples were taken from juveniles how were anadromous versus resident forms separated?
  - if samples were taken from juveniles researchers should statistically evaluate the potential relatedness among individuals within samples – *e.g.,* low observed heterozygosity could be the result of sampling siblings

- It appears that samples were collected in the absence of a unified study plan – if samples were obtained for other purposes they may not be representative of the group of interest in this study

- the samples lack adequate temporal replication– there is insufficient sample replication to allow a reasonable assessment of temporal variation

Nielsen 2003:

- seven out of 14 sample groups have fewer than 50 samples, unless the samples are considered a census, data may be insufficient to rigorously assess the questions of interest
- 1997 – 1999 samples from Nielsen and Fountain 1999 are inappropriately grouped

Adequacy of Analysis

In general, the analyses presented in Nielsen and Fountain 1999 and Nielsen 2003 are commonly used and are justifiable given the available data. Additional analysis effort could evaluate the relatedness of individuals within sample groups. Such an analysis would aid in interpretation of similarities within and differences between sample groups. For example, low heterozygosity observed within several sample groups might be the result of the inadvertent sampling of siblings. The largest shortcomings of the analyses are the apparent lack of a predefined study designs and inadequate temporal replication. Without greater temporal replication it is impossible to determine whether observed geographically based genetic differences are stable. Without some measure of stability it would be inappropriate to make conclusions regarding the overall relatedness of resident and anadromous *O. mykiss.*

Interpretation

In general both papers lack: 1) *adequate detail regarding the distribution of sample effort*; 2) *a predefined study design*; and 3) *clear reporting of results.* Taken together these factors increase the difficulty of evaluating the interpretations of the data. Some potential problems are listed below:

Nielsen and Fountain 1999:

- In general, the table of genetic distances (Table 4) does not correspond well to the N-J tree (Figure 1), suggesting that relationships within the "Coastal" group may not be stable.

Nielsen 2003

- On page 10 the paper states "We found no significant year-to-year variation among samples collected from Alameda Creek, 1997-2002." However, the NJ tree on page nine (Figure 1) shows very high (90%) bootstrap support for the separation of 1997-99 vs. 2002 Alameda Creek samples. Further, 1997-99 samples were inappropriately grouped given that differences between those groups were shown to be significant in the 1999 paper. Also, the 1997 – 1999 samples and 2002 samples do not appear to be from the same groups of fish, suggesting that data are inadequate for the test to begin with. Also, 2002 samples are inappropriately grouped given that they were also demonstrated to differ significantly on page six of the report. In short, a proper analysis should be conducted which appropriately partitions temporal and geographic variation.

- The paper claims that the genetic integrity of resident rainbow trout has been retained despite hatchery stocking – however the

researchers have not presented any type of analysis that would indicate how sensitive their tests might be to such introgression (*e.g.*, how many successful hatchery spawners would be required to trigger a positive result).

SUMMARY

In general, data are inadequate to evaluate either of the two subjects of interest. The relationship between resident and anadromous forms of *O. mykiss* either above or below barriers on Alameda Creek cannot be rigorously assessed without greater sample effort. Both papers suggest that anadromous and resident *O. mykiss* within Alameda Creek are more similar to one another than either group is to anadromous or resident *O. mykiss* from other watersheds. None-the-less, without appropriate temporal replication, the stability of these relationships is simply unknown.

Similarly, the potential benefits of using resident rainbow trout as a source of broodstock for supplementation of anadromous *O. mykiss* cannot be meaningfully evaluated with the available data and analyses. Based on Nielsen and Fountain 1999 one could reasonably ask whether the landlocked populations retain ample genetic diversity to establish a healthy anadromous population. In fact, the efficacy of establishing an anadromous run of *O. mykiss* using the resident form is only very peripherally a genetics/ESU question, and assumes that the resident form can produce the anadromous form. While some data indicate that this phenomenon does occur, a proper monitoring and evaluation study should be employed to determine whether such an assumption is warranted.

Sparing Use of ESU Listing

In light of the evidence provide in this letter, and given the options for the future management of the rainbow trout resource in Alameda Creek, it is prudent to encourage restoration of an anadromous run of steelhead in the Alameda Creek watershed instead of proposing this listing under the ESA. NOAA Fisheries could take of strong leadership role in addressing fish passage at the BART weir to begin the process of restoring anadromy to the system. This is most critical passage site on the system at this time and is also one of the biggest challenges to overcome in the system, and one of the least solidly funded restoration actions. Proposing to list resident rainbow trout population in the ESU does not address the biggest problem in the watershed today, that of fish passage at the BART weir.

CONCLUSIONS

- The only information reported by NOAA Fisheries that supported their listing determination to include the resident rainbow trout population in Alameda Creek in the CCC ESU (Nielsen 2003) is inconclusive and does not support the proposed determination.

- The information reported by Nielsen (2003) and supporting information in Nielsen and Fountain (1999) does not meet the data quality act criteria for utility, objectivity, and accuracy.

- NOAA Fisheries did not evaluate the information pursuant to NOAA policy and thus incorrectly interpreted the utility and inappropriately allowed the information to influence their determination.

- The best available science was insufficient for the BRT to make a categorical determination as to membership of resident populations isolated upstream of man-made structures and therefore recommended that membership of each such population in an ESU be determined on a case-by-case basis subject to availability of applicable, empirical information.

- NOAA Fisheries did not thoroughly consider conservation and protective measures in the Alameda Creek watershed and thus ignored the extensive efforts to restore steelhead to the watershed.

- The BRT assessment of the benefits of resident rainbow trout population membership in an ESU using VSP and accompanying extinction risk analysis did not identify how adding case 3 populations improved the ESU viability and reduced risk of extinction. The BRT assessment did demonstrate the substantial benefit to the ESU associated with reestablishing anadromous populations in a vacated stream system as will occur upon completion of the conservation actions presently underway within the Alameda Creek watershed.

- The Alameda Creek resident rainbow trout population is a demonstrated, high priority with the State of California, evidenced by numerous protection actions undertaken by the California Department of Fish and Game and the State Water Resources Control Board, and has benefited from vigilant, proactive conservation and protection measures undertaken by the City and County of San Francisco and other stakeholders in the Alameda Creek watershed.

- There is no available scientific information concerning the Alameda Creek resident rainbow trout population that establishes its status as an anadromous component of a listed ESU along the Pacific Coast or as a resident population of a listed ESU that warrants this unique determination as proposed.

- Adding the Alameda Creek resident rainbow trout population to the CCC ESU is not an ineffective use of the ESA and could harm the restoration and conservation activities already in effect in the Alameda Creek watershed. If NOAA Fisheries focused more on a leadership role to support their regulatory interest, the end result would be more beneficial to the restoration of an andromous run of steelhead in the Alameda Creek system and ultimately benefit the CCC ESU

Sincerely,

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Senior Consultants

(for William Snider)
William Snider
Senior Project Scientist

LITERATURE CITED

Fish and Game Commission Biennial Report 1892-1873

Fish and Game Commission Biennial Report 1874-1875

Fish and Game Commission Biennial Report 1876-1877

Fish and Game Commission Biennial Report 1878-1879

Fish and Game Commission Biennial Report 1880

Fish and Game Commission Biennial Report 1881-1882

Fish and Game Commission Biennial Report 1886-1888

Fish and Game Commission Biennial Report 1888-1890

Fish and Game Commission Biennial Report 1890-1891

Fish and Game Commission Biennial Report 1895-1896

Fish and Game Commission Biennial Report 1912-1914

Fish and Game Commission Biennial Report 1914-1916

Fish and Game Commission Biennial Report 1916-1918

Fish and Game Commission Biennial Report 1923-1934

Federal Register, Endangered and Threatened Species: Proposed listing determinations for 27 ESUs of West Coast Salmonids. Proposed Rules. June 14, 2004. 69:33102 – 33179

Leidy, R.A., G.S. Becker, and B.N. Harvey. 2003. Historical Distribution and Current Status of Steelhead (Oncorhynchus mykiss), Coho Salmon (O. kisutch), and Chinook Salmon (O. tshawytscha) in Streams of the San Francisco Estuary, California. US Environmental Protection Agency, Region 9 and Center for Ecosystem Management and Restoration. October 2003.

McElhany, P., M.H. Ruckelshaus, M.J. Ford, T.C. Wainwright, and E.P. Bjorkstedt. 2000. Viable salmonid populations and the recovery of evolutionary significant units. U.S. Dept. Commer., NOAA Tech. Memo. NFMS-NWFSC-42, 156 p.

Nielsen, J. 2003. Population Genetic Structure of Alameda Creek Rainbow/Steelhead Trout - 2002. US Geological Survey. Alaska Science Center. Anchorage, AK. December, 2003.

Nielsen, J. L. and M. C. Fountain. 1999. Microsatellite analyses of Alameda Creek rainbow/steelhead trout. Technical Report submitted to Applied Marine Sciences, Inc. Livermore, CA. October 7, 1999.

NOAA 2003. Updated Status of Federally Listed ESUs of West Coast Salmon and Steelhead. West Coast Salmon Biological Review Team. Northwest Fisheries Science Center 2725 Montlake Boulevard East Seattle, WA 98112 and Southwest Fisheries Science Center Santa Cruz Laboratory 110 Shaffer Road Santa Cruz, CA 95060, July 2003.

Sarrow, J., Historical fisheries info on Alameda Creek/Zone 7 Jurisdiction, Letter to Tom Taylor dated 16 September 2004.

Varanasi, U. 2004. Memorandum - Extinction risk assessments for Evolutionarily Significant Units (ESUs) of West Coast *Oncohynchus mykiss*. February 3, 2004.