

Diane Riddle
September 28, 2007
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EXHIBIT D

EXHIBIT D

A.A. RICH AND ASSOCIATES

Alice A. Rich, Ph.D.
Principal

September 29, 2003

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RE: *Draft Environmental Impact Report/Environmental Impact Statement for the Lower Santa Ynez River Fish Management Plan and Cachuma Project Biological Opinion for Southern Steelhead Trout.*

On behalf of Ms. Nancy Crawford-Hall and the San Lucas Ranch, I reviewed the Draft Program and Project Specific Environmental Impact Statement for the Lower Santa Ynez River Fish Management Plan and Cachuma Project Biological Opinion for Southern Steelhead Trout (the "DEIR/DEIS") dated June 2003, and prepared jointly by the Cachuma Operations and Maintenance Board ("COMB") and the U.S. Bureau of Reclamation ("Bureau") (collectively, the "Lead Agencies").

My qualifications to review the DEIR/DEIS include over 26 years of technical and administrative project management experience in a wide range of fisheries-related projects. In addition, I have a Ph.D. in salmonid physiology and have designed and supervised hundreds of impact analyses, studies in fish physiology, toxicology, fish habitat and populations, and water temperature monitoring and modeling (See Appendix A for a complete résumé).

The proposed changes on Lower Hilton Creek and the underlying assumptions on the impact of these changes to a steelhead population are of concern. The following attachment is a review of the DEIR/DEIS based on my professional knowledge and the studies of Upper Hilton Creek undertaken by A.A. Rich and Associates.

Sincerely,

Alice A. Rich / by JPD
Alice A. Rich, Ph.D.

cc: Nancy Crawford-Hall
Andrew Sabey, Esq.
Dan Doport, Esq.
Steve Kirby, Esq.

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I. EXECUTIVE SUMMARY

The DEIR/DEIS is intended to evaluate the impacts of certain actions described in the Lower Santa Ynez River Fish Management Plan (SYRTAC, 2000) (the "FMP") and the National Marine Fisheries Service's ("NMFS") Biological Opinion for the Cachuma Project (NMFS, 2000) (the "BO"). Among the FMP and BO actions the DEIR/DEIS purports to evaluate are projects intended to create access for steelhead trout to the area of Hilton Creek which is upstream of the U.S. Bureau of Reclamation's ("Bureau") property (Upper Hilton Creek¹). It is my professional opinion that any steelhead allowed to migrate to Upper Hilton Creek will be doomed to die from either dessication or predation by mammals, and that the only option to prevent these deaths would be to rescue them on an annual basis. It is my further professional opinion that this is not good fish management, but rather that such actions would be irresponsible and tantamount to "trout murder." This is not in keeping with the Fish Management Plan's (FMP) intent, which is "to benefit steelhead." (page ES-1²)

The DEIR/DEIS states (page ES-2) that the following "management actions" on Upper Hilton Creek would be taken by COMB and the Bureau to implement the FMP and the BO:

- (1) Remove passage impediment on Lower Hilton Creek cascade and bedrock chute;
- (2) Extend Lower Hilton Creek channel to provide more habitat for fish; and,
- (3) Remove fish passage impediment at Route 154 culvert (Caltrans project).

These actions are part of the FMP and the BO. The DEIR/DEIS further states (page 2-23) that, by implementing the above actions on Lower Hilton Creek, the Bureau hoped to:

- (1) "Improve (steelhead) rearing and over-summering habitat ..." on Hilton Creek on the Bureau's property;
- (2) "Provide greater access for spawning and rearing...." from the mouth of Hilton Creek upstream to the Highway 154 culvert"; and,
- (3) "Provide access to upper Hilton Creek for potential spawning and rearing under favorable hydrologic conditions."

As indicated by the above quotes from the DEIR/DEIS, the management actions in the FMP and BO are designed to improve habitat for the steelhead along the Santa Ynez River downstream of Lake Cachuma through, among other things, habitat and passage improvements. One stated goal of the FMP is to:

"identify, evaluate, and recommend potential management actions that will benefit fish and other aquatic resources in the lower Santa Ynez River. The FMP management actions have been designed to benefit steelhead and other aquatic species directly and indirectly by: (1) creating new habitat and improving existing habitat in the lower river and tributaries; (2) improving access to spawning and rearing habitats in the lower river and tributaries; and (3) increasing public awareness and support for beneficial actions on private lands." (Page ES-1)

¹For ease of reference, the term "Upper Hilton Creek" is used to refer to that portion of Hilton Creek, upstream of the U.S. Bureau of Reclamation property, and "Lower Hilton Creek" is used to refer to that portion within the U.S. Bureau of Reclamation property.

²Unless otherwise noted, all references in this document refer to the DEIR/DEIS.

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- Priority 1: Hilton Creek (federal lands), Hilton Creek (above federal lands)
- Priority 2: Quiota Creek, El Jaro Creek, Upper Salsipuedes Creek, Lower Salsipuedes Creek
- Priority 3: Alisal Creek (below the dam), Alisal Creek (above the dam),” (Page 2-49)

“The tributaries of primary interest are Salsipuedes, El Jaro, Hilton, and Quiota creeks, since they have perennial flow in their upper reaches and thus can support spawning and rearing.” (Page 3-36 of FMP)

Response to DEIR/DEIS statement:

Our survey demonstrated that Upper Hilton Creek does not have good habitat for steelhead for the following reasons:

- Lack of water;
- Lack of rearing habitat;
- Lack of spawning habitat;
- High water temperatures; and,
- Low dissolved oxygen in the few pools which last through June.

These factors make Upper Hilton Creek unacceptable as a viable steelhead creek (see Photo Numbers 1-7).

Our surveys revealed that the only area of Hilton Creek containing any habitat for steelhead that might be considered “good quality” or “higher quality” was the reach on Lower Hilton Creek on the Bureau’s property where flows are artificially supplemented by water drawn from lake Cachuma (See Photos Numbers 8, 9). However, even this stretch of the creek would be dry throughout much of the year if the Bureau did not supplement it with flows from Lake Cachuma. This is supported by SYRTAC (2000), which “observed that the lower reach on Reclamation property goes dry in the early summer during both wet and average years (prior to the installation of the supplemental watering system).” (Page 2-22)

3. There is no scientific basis for Upper Hilton Creek being listed as a priority creek.

DEIR/DEIS statement:

“Potential tributary actions were ranked by opportunities for access and long-term maintenance of enhancement projects. ... Currently, reaches on upper Hilton Creek... are generally inaccessible for collecting data and implementing habitat enhancement actions.” (Page C-1-5 of FMP)

“In many cases, access to streams running through private property was not available. In these cases, information may be limited to roadside observations or historical records. Opportunities for implementing enhancement measures will be affected by the willingness of private landowners to

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participate in these activities." (Page C-2-1 of FMP)

"We evaluated the existing tributaries for habitat quantity and quality (composition) data, and data pertaining to fish utilization, prior to assessing potential enhancement actions. Since a majority of the tributary streams flow through private land, fish usage and habitat quality data are limited. Where such data are unavailable, qualitative information was provided by the SYRTAC project biologist and other working group members familiar with the lower Santa Ynez tributaries." (Page C-1-3 of FMP)

Response to DEIR/DEIS statement:

There is a profoundly good reason why there is no evidence that steelhead have used the upper reaches of Hilton Creek for spawning or rearing. Our studies from 2001-2003 demonstrated that, even when flows were present on Upper Hilton Creek, there was extremely limited spawning habitat and very little rearing habitat (See Photo Numbers 1-7). If spawning could occur, the fish would need one to two years of good quality water for rearing. As stated in the NMFS BO (Page 35), "In addition to minimum flows needed in shallow areas, flows must be available long enough for steelhead to complete their journey". Upper Hilton Creek does not provide enough water "long enough for steelhead to complete their journey."

COMB's consultants and biologists had access to other creeks in the watershed and could base their conclusions on scientifically-accurate information regarding habitat and streamflows on those creeks. Instead, they chose Hilton Creek as a "high priority" creek, based on very little qualitative (visual) information and no quantitative data for Upper Hilton Creek. Because of the Bureau's supplemental stream flows, the habitat conditions within the Bureau's property are not at all similar to those upstream. Thus, the DEIR/DEIS should not have assumed that conditions in Upper Hilton Creek were at all similar to those on the Bureau's property.

A very well-known and respected fisheries biologist, Leo Shapovalov, spent decades studying salmonids in central and southern California and studied the Santa Ynez River Watershed during the 1930's and 1940's. I find it of great significance that he, when listing the names of streams below and above what was then the "Cachuma Reservoir Site", never mentioned Hilton Creek (Shapovalov, 1944, 1940).

Because there is no flow much of the year in Upper Hilton Creek, the fish would be left stranded in the few remaining shallow pools where water temperatures would be too high and dissolved oxygen too low (See Photo Numbers 4, 5, 10, 11-20). Ultimately, the fish would die from dessication or predation by mammals or birds.

4. Hilton Creek does not contain suitable steelhead habitat.

DEIR/DEIS statement:

"The major habitat criteria for rainbow trout/steelhead in the tributaries includes stream gradient,

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instream cover, canopy cover, proximity to ocean, and available over-summering habitat. The presence of seed populations within each tributary is an important factor in evaluating the anticipated biological response time for each enhancement action. Seed populations are those where rainbow trout/steelhead are present and reproducing, and adequate over-summering habitat is available. We determined that tributaries with seed populations present would likely exhibit short-term biological responses associated with modifying passage impediments. Quiota, Alisal, Salsipuedes-EI Jaro, and San Miguelito creeks are tributary streams where seed populations currently exist." (Page C-1-3)

Response to DEIR/DEIS statement:

Our studies from 2001-2003 demonstrated that there was extremely limited spawning habitat and, as the creek dried up, virtually no rearing habitat for rainbow trout or steelhead. If spawning were to occur, the trout would need one to two years of good quality water for rearing. As stated in the NMFS BO (Page 35), "In addition to minimum flows needed in shallow areas, flows must be available long enough for steelhead to complete their journey." Upper Hilton Creek does not have "...flows ..available long enough for steelhead to complete their journey" or spawn another generation. Since most, if not all pools dry up by or before June, any trout using Hilton Creek for rearing purposes would be lost to dessication or predation.

Upper Hilton Creek is not a "seed stream," one of the criteria used to designate a high priority creek by COMB. The presence of seed populations within each tributary is an important factor in evaluating the anticipated biological response time for each enhancement action.

There is no evidence that steelhead have used the upper reaches of Hilton Creek area for spawning or rearing.

5. Based on the criteria in the DEIR/DEIS, Upper Hilton Creek should not have been chosen as a high priority creek.

DEIR/DEIS statement:

"The three evaluation criteria for the tributary assessments include: (1) presence or absence of rainbow trout/steelhead; (2) physical habitat conditions including spawning substrate, stream gradient, instream cover, canopy cover, and over-summering habitat; (3) opportunities to maintain or enhance fish habitat." (Page C-1-3 of FMP)

Response to DEIR/DEIS statement:

Physical habitat (i.e., spawning and rearing) conditions are poor to non-existent. During most of the year Upper Hilton Creek dries up.

There is no "...opportunity to maintain or enhance fish habitat" upstream of the Bureau's

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property because the creek dries up and the fish would have no way (short of flying, but these are not flying fish) to descend to the Bureau's property where there would be water. Despite the fact that COMB knew that Upper Hilton Creek was inaccessible in the upper reaches without permission from the owner, they chose Hilton Creek as a high priority creek for habitat improvement. There are no scientific data to support the DEIR/DEIS's contention that Hilton Creek should be identified as a "high priority" creek.

N2-8

CONCLUSION: There is no scientific basis for choosing Hilton Creek, and particularly Upper Hilton Creek as a high priority stream. Further, this designation was based on incomplete information and incorrect assumptions.

B. The interchangeable use of the terms "steelhead" and "rainbow trout" is misleading, as Southern California steelhead are federally-listed as Endangered under the Endangered Species Act (ESA) and the rainbow trout is not listed

1. Special protection is legally required for the steelhead but not for the rainbow trout.

DEIR/DEIS statement:

"Steelhead and rainbow trout juveniles are indistinguishable both in appearance and in habitat use." (Page 5-37)

Response to DEIR/DEIS statement:

The DEIR/DEIS' interchangeable use of the terms "steelhead" and "rainbow trout" is misleading and improper. The steelhead is listed as an endangered species under Section 4 of the Federal Endangered Species Act. The rainbow trout is not a listed species. As such, special protection is legally required for the steelhead but not for the rainbow trout.

The DEIR/DEIS (on pages 10-89 through 10-91) discusses the problems of protecting the genetic integrity of the Southern California Steelhead. However, millions of rainbow trout have been planted in the Santa Ynez River System for over 50 years from a wide variety of egg sources throughout both this state and some other states. As a result the watershed is already "contaminated" with rainbow trout from a variety of geographical areas.

2. Care should be taken when identifying steelhead vs. rainbow trout.

DEIR/DEIS statement:

"It should be noted that the COMB biologist (Scott Engblom, pers. comm.) has observed steelhead migrating past the impediment during optimal hydraulic conditions, and that varying age

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N2-10

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classes of steelhead have been observed in the pool immediately downstream of Highway 154 culvert." (Page 2-24)

"Adults migrating into Hilton Creek are often large and could be anadromous steelhead from the ocean (particularly during wet years), rainbow trout that spilled over from Cachuma Lake, or fish that are resident in the river, its tributaries or the lagoon." (Page 5-40)

"Steelhead and rainbow trout juveniles are indistinguishable, both in appearance and in habitat use. Young-of-the-year often utilize riffle and run habitat during the growing season and move to deeper, slower water during the high flow months. Larger fish (yearlings or older) use heads of pools for feeding. Pools provide over-summer refugia for trout in small streams during low flow conditions. A second strategy is to rear in a lagoon." (Page 5-37)

Response to DEIR/DEIS statement:

Unless genetic studies were undertaken, there is no way to determine whether or not the fish Mr. Engblom saw downstream of the Highway 154 culvert were steelhead or rainbow trout, and certainly no way to determine the age classes of the fish.

The DEIR/DEIS, FMP, and NMFS BO repeatedly state that they don't know whether or not the fish they saw were rainbow trout or steelhead. Millions of hatchery-raised rainbow trout have been planted in the Santa Ynez River, many of its tributaries, and Lake Cachuma during the past five decades. Consequently, there is a very high probability that the trout seen in Hilton Creek were rainbow trout. The Fillmore hatchery records demonstrate that over two million rainbow trout have been planted in the Santa Ynez River watershed. Thus, any trout seen in Upper Hilton Creek are most likely "...rainbow trout that spilled over from Cachuma Lake, or fish that are resident in the river, its tributaries or the lagoon" (Page 5-40), or descendants of rainbow trout which spawned in the Santa Ynez River Watershed.

CONCLUSION: The interchangeable use of the terms "steelhead" and "rainbow trout" is misleading because steelhead are federally-listed under the ESA and rainbow trout are not federally-listed.

C. The DEIR/DEIS' interchangeable use of the terms "steelhead" and "rainbow trout" is misleading, as the steelhead is less thermally tolerant than the rainbow trout.

1. Steelhead have lower temperature thresholds than rainbow trout.

DEIR/DEIS statement:

"A temperature of 20°C (68°F) for daily average water temperatures has been used in central and

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N2-13

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southern California by CDFG to evaluate the suitability of stream temperatures for rainbow trout. This level represents a water temperature below which reasonable growth of rainbow trout may be expected. Data in the literature suggests that temperatures above 21.5° (71°F) result in no net growth, while maximum daily water temperatures greater than 25° (77°F) result in potential lethal conditions." (Page 5-37)

"Temperature thresholds for steelhead indicate that physiological stress and reduced growth rates generally occur at temperatures over 20 degrees Celsius (U.S. Bureau of Reclamation 1999)." (NMFS BO, page 50)

Response to DEIR/DEIS statement:

I have spent over 20 years studying thermal impacts on salmonids, including steelhead and rainbow trout. I have come to the repeated conclusion that thermal requirements and thermal stress are two of the most misunderstood physiological phenomena among fisheries biologists who are not fish physiologists. In addition, throughout the DEIR/DEIS I found erroneous statements concerning the steelhead's thermal requirements and ability to tolerate thermal stress. Study after study has demonstrated that sublethal stress is far more important from the standpoint of long-term survival of a species than lethal temperatures (Brett, 1956; Rich, 2000, 1997; Elliott, 1981).

Physiological stress (e.g., reduced growth rates, increased incidence of disease, decreased survival) has been demonstrated to occur (Rich, 2000, 1997, 1987; Holt et al., 1975). at water temperatures far below the 20°C (68°F) reported in the DEIR/DEIS

Rainbow trout are more thermally tolerant than steelhead (Coutant, 1977; 1973) As such, the DEIR/DEIS's statement that CDFG used 20°C (68°F) for rainbow trout is not the thermal temperature that anyone, including CDFG, should use for steelhead. On numerous occasions, including a number of State Water Quality Control Board hearings, the California Department of Fish and Game used 15C (60°F) as an upper thermal threshold for steelhead rearing (Rich, 2000, 1997, 1987).

There are no data whatsoever to support the DEIR's contention that 20°C (68°F) is suitable for rearing steelhead in the Santa Ynez Watershed, including Hilton Creek. Water temperature requirements and thermal stress and tolerance are all site-specific phenomena and controlled, up to a certain point, by the amount of food present. In addition, studies have demonstrated that fry and juvenile steelhead experience thermal stress at water temperatures above 15°C (60°F) (Holt et al., 1975; Adams et al., 1975, 1973; Zaugg et al., 1973). Water temperatures in the few (eight) pools (Photo Numbers 5, 11, 12, 14) we studied in Upper Hilton Creek in 2002 reached stressful levels (above 65°F) by May and the pools dried up totally by mid-summer. In 2003, by the end of May water temperatures had reached stressful levels (above 60°F) in the 41 pools studied in Upper Hilton Creek; by September, all the pools had disappeared. Given that water temperatures in both Lower and Upper Hilton Creek exceeded thermal optima for steelhead by a far greater amount

N2-13

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than was reported in the DEIR/DEIS, it is of critical importance that the thermal requirements of the steelhead not be confused or equated with those of the more thermally-tolerant rainbow trout which, if there is enough food, can do well at water temperatures of 65°F.

NZ-13

2. Laboratory study temperatures should not be applied to natural habitats.

DEIR/DEIS statement:

"The temperature level of 22°C (71.6°F) daily average temperature was also used to look at relative habitat suitability for sustaining fish. Maximum daily water temperatures ranging between 25°C (incipient lethal temperature [ILT]) and 29.4°C (critical thermal maximum [CTM]) were used to indicate potentially lethal conditions (Raleigh et al., 1984)." (Page C-2-4 from the FMP).

NZ-14

Response to DEIR/DEIS statement:

The terms "incipient lethal temperature" and "critical thermal maximum" are physiological terms used in laboratory studies. These terms have no bearing on naturally occurring habitats such as exist in Hilton Creek.

3. Site-specific data should be obtained before statements are made about thermal requirements of steelhead in the Santa Ynez River system.

DEIR/DEIS statements:

"NMFS believes that data from Pacific Northwest steelhead populations may not always be applicable to steelhead in Southern California. Data available in southern California (Mathews and Berg 1997) and the visual observations of steelhead in the Santa Ynez river watershed feeding, persisting, and appearing to increase in size in habitats with temperatures that periodically exceed 25 degrees Celsius (Santa Ynez River Consensus Committee and Technical Advisory Committee 1997), indicate that these fish are able to survive in relatively high temperatures. Notwithstanding probable higher temperature tolerances, thermally stratified pools are thought to provide important refuge from high temperatures for steelhead in Southern California (Nielsen et al. 1994; Mathews and Berg 1997)." (NMFS BO, page 50)

NZ-15

"As noted above, steelhead are likely to experience stress at water temperatures near and above 25 degrees Celsius. However, Hilton Creek has naturally exceeded 25 degrees Celsius in the past, and steelhead young of the year have been observed to be generally healthy and actively feeding at these high temperatures (Santa Ynez Technical Advisory Committee 1997)." (NMFS BO, page 50)

Response to DEIR/DEIS statements:

There is no physiologically-based evidence demonstrating that steelhead in southern

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California streams and rivers are able to withstand higher water temperatures than those in the northern part of the state. Steelhead are temperate water animals and, as such, intolerant of higher water temperatures (Holt et al., 1975; Adams et al., 1975, 1973; Zaugg et al., 1973; Rich, 2000, 1997, 1987). One cannot determine by simply viewing a rainbow/steelhead juvenile whether it is in a state of stress or not at sublethal water temperatures. The only way to determine whether or not water temperatures are stressful is to conduct thermal bioenergetics studies (Brett and Groves, 1979). No such studies have been conducted for Hilton Creek.

N2-15

Our temperature studies on Hilton Creek demonstrated that no thermally stratified pools existed; water temperatures were the same at the bottom as at the top of the pools. Hence, there were no thermal refugia for steelhead. In fact, the pools totally dried up in the spring during 2002. During 2003, the pools we monitored were not thermally stratified, and by June were completely stranded. By summer, the few pools remaining at the beginning of summer had completely dried up (See Photo Numbers 21-23)

4. Steelhead cannot withstand the same high water temperatures as rainbow trout.

DEIR/DEIS statement

"Steelhead use of southern California streams and rivers with elevated temperatures suggests that populations within this ESU are able to withstand higher temperatures than those to the north. However, relatively little life history information exists for steelhead from this ESU." (NMFS BO, page 17)

Response to DEIR/DEIS statement:

The DEIR/DEIS interchangeable use of the terms "steelhead" and "rainbow trout" is misleading and improper, as steelhead and rainbow trout do not have the same water temperature requirements. Steelhead are less tolerant of higher water temperatures than rainbow trout ((Holt et al., 1975; Adams et al., 1975, 1973; Zaugg et al., 1973; Rich, 2000, 1997, 1987). Upper optimal temperatures for rearing steelhead can be as low as 12°C (54°F) if the steelhead are going through the parr smolt transformation (i.e., getting ready to go to sea) and only about 15°C (60°F) for juvenile rearing (Adams et al., 1975; Zaugg et al., 1973). As water temperatures in Hilton Creek far exceed thermal requirements during the time when the fish would be attempting to migrate, the result would be thermal stress leading to low productivity or even death.

N2-16

CONCLUSION: Water temperatures are potentially far more stressful (and even lethal) to steelhead in Hilton Creek than reported in the DEIR/DEIS.

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D. The unsuitable habitat conditions in Upper Hilton Creek will not support a viable steelhead population.

NZ-17

1. The conclusions drawn by the COMB biologist based on a half day visit to Upper Hilton Creek are flawed.

DEIR/DEIS statements:

"The description of the environmental conditions of Hilton Creek and its watershed on San Lucas Ranch for this EIR/EIS is based on a review of aerial photographs and observations by the COMB biologist during a brief visit to this portion of San Lucas Ranch with the ranch owner in January 2003. ... A summary of the observations by the COMB biologist is provided below." (Page 7-6)

(a) "The Creek was dry except for the reach immediately upstream of Route 154 and at the second road crossing where flow was visible." (Page 7-7)

(b) "Water was flowing at an estimated rate of 5 gallons per minute and disappeared underground approximately 300 yards downstream of the second road crossing." (Page 7-7)

(c) "During the survey of these reaches, the creek was sporadically wetted with minimal flowing water (<2 gallons per minute) followed by long sections of dry creek channel." (Page 7-7)

(d) "Although there were only limited flows in the creek during the survey, it should be noted that the survey was conducted after the third driest year on record. In normal or wet years, the COMB biologist believes that large segments of upper Hilton Creek would provide excellent rearing habitat for steelhead/rainbow trout." (Page 7-8)

(e) "No obvious passage impediments or barriers were observed during the survey." (Page 7-8)

(f) "Pool habitats were present but limited in number" (Page 7-7)

(g) "Dr. Alice Rich indicated that water is expected to be present upstream of the second road crossing into the spring. She also informed the COMB biologist that during a 2002 electrofishing survey, she captured an approximate 3-inch steelhead/rainbow trout immediately upstream of the second road crossing. Because this habitat was dry when she returned several months later, she assumed that fish died." (Page 7-7)

(h) "Excellent rearing habitat was available and a limited amount of spawning locations was observed during the survey." (Page 7-8)

(i) "Although there were only limited flows in the creek during the survey, it should be

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noted that the survey was conducted after the third driest year on record. In normal or wet years, the COMB biologist believes that large segments of upper Hilton Creek would provide excellent rearing habitat for steelhead/rainbow trout" (Page 7-8)

(j) "Based on these observations and his knowledge of other tributaries in the Santa Ynez River and of Hilton Creek downstream of San Lucas Ranch, the COMB biologist concludes that Hilton Creek upstream of the Route 154 culvert provides a substantial amount of rearing habitat and a moderate amount of spawning habitat for rainbow/steelhead trout." (Page 7-8)

Response to DEIR/DEIS statements:

The estimates and habitat characterization of Hilton Creek, upstream of the Bureau's property, discussed in the DEIR/DEIS are not based on any quantifiable data. As a result, the DEIR/DEIS mischaracterizes habitat conditions on Upper Hilton Creek. I accompanied Mr. Engblom on his visit to Upper Hilton Creek. His statements that "Water was flowing at an estimated rate of 5 gallons per minute", or, "...with minimal flowing water (<2 gallons per minute)," are grossly inaccurate, particularly when no instruments were used. Mr. Engblom's comment that "... the creek was sporadically wetted..." is a much more accurate description of those sections of the creek where minimal water did exist. Furthermore, when we conducted surveys of Hilton Creek, upstream of the Bureau's property, both prior to and following the January 27, 2003 "spot check" visit, the pools which existed through May were dry later in the summer.

I do not understand how, prior to the half-day "spot check" visit with Mr. Engblom on January 27, 2003, the habitat of Upper Hilton Creek could have been described with any accuracy, something the Lead Agencies have tried to do. I have seen aerial photos and I have spent many, many days surveying Hilton Creek. Due to canopy, one cannot see this portion of Hilton Creek well enough to characterize it, using either aerial photos or from the Bureau's property. Certainly, one cannot characterize it well enough to describe it as, "Above this open reach to the Highway 154 culvert (about 2,400 feet total), habitat conditions are good to excellent with excellent riparian shading and cover. Pool habitat is greater than those in the Lower Hilton (26%) and old growth sycamore dominate the vegetation providing dense canopy cover. Streamflows persist longer in this reach than farther downstream..." (Page C-2-7 of the FMP). This is pure speculation and is incorrect, based on my own studies of Upper Hilton Creek (See Photo Number 1-7, 10-23).

Regarding Mr. Engblom's statement that "... it appears that the creek may provide perennial pools in certain years that could be suitable for overwintering by rainbow/steelhead trout. Dr. Rich's observations of a trout in the creek indicate that suitable conditions are present." is an exaggeration, at best. We sampled all of the pools (that is, all 8 of them) which existed in 2002. 2002 was the year that we collected the one trout which was the only fish collected anywhere in Upper Hilton Creek. In 2002 Upper Hilton Creek was entirely dry by late May and in 2003, Upper Hilton Creek was dry by the summer months. We did collect one rainbow/steelhead trout in a pool of about 2 feet by 2 feet with about 2 inches depth of water.

N2-13

N2-18a

N2-18
(cont)

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However, not only was this the only fish collected in the few pools that existed in Upper Hilton Creek in 2002, the trout appeared extremely emaciated. As there was no way for the trout to move either upstream (where there was no water anyway) or downstream (where the nearest "pool," also only a couple of inches deep, was over 20 feet away with no connecting water), the fish died. This is hardly an example of "suitable conditions are present". And, improving access upstream of the Bureau's property will not change this situation; it will not provide the flows needed by rainbow or steelhead to sustain a life and live long enough to reproduce, smolt, etc., in the area upstream of the Bureau's property.

N2-18

2. Upper Hilton Creek does not have "good to excellent" habitat nor does it have flows sufficient to support steelhead.

DEIR/DEIS statements:

"Above this open reach [Reclamation property] to the Highway 154 culvert (about 2,400 feet total), habitat conditions are good to excellent (Entrix, 2001) based on observations from adjacent federal property. Pool habitat is greater than those in Lower Hilton and old growth sycamore dominate the vegetation providing dense canopy cover. Streamflows persist longer in this reach than farther downstream." (Page 5-46, Page C-2-7 of FMP)

"A small semi-perennial pool is often present immediately downstream of the outlet concrete apron. Based on observations of the pool by the COMB biologist (Scott Engblom, pers. comm.). Over many years, it appears that the pool contains year-round water in most years." (Page 2-29)

"Natural flows generally diminish during late spring or early summer of wet years in the lower reach downstream of the upper release point. Flows do not persist in the lower reach for more than a few days during average years." (Page 5-46)

"Hilton Creek flows are very sporadic and highly dependent on seasonal rainfall. During wet years, the creek typically flows until late May, sometimes later depending on runoff." (Page 5-46)

N2-19

Response to DEIR/DEIS statements:

The conclusions made in the DEIR/DEIS, regarding trout habitat availability, amount of water, and amount of spawning and rearing are incorrect and baseless. Based on our surveys from 2001-2003 (including both a very dry and an average rainfall year), there was little-to-no water, and certainly no flowing water in early 2002; by May 2003, there was no flowing water. By May of 2002, Upper Hilton Creek had completely dried up, which is hardly a conducive environment for an animal which requires water throughout the year. Water temperatures exceeded stressful levels during March of 2002. By April 2002, water temperatures were lethal in the remaining (4 total) extremely shallow (from damp to less than 1 inch deep) and small (less than 1 foot wide and 1 foot length) stranded "pools". By May of 2002, there were no pools at all. By May of 2003, there was no flowing water, leaving stranded pools, with long stretches between the stranded pools which had no water whatsoever. Water temperatures had reached stressful levels. By summer, the creek had dried up (See photos 21-25)

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Before the stranded pools dried up in 2002, dissolved oxygen concentrations were mostly less than 5 mg/liter, a minimum concentration required for salmonids when water temperatures are low, but 7 mg/liter is preferable when higher water temperatures prevail (Alabaster and Lloyd, 1980; Dandy, 1970; Dorfman and Whitworth, 1969; Dahlbert et al., 1968). By March of 2002, the few shallow and small stranded pools which existed were covered with algae, prior to drying up (See Photo Number 10, 11, 15, 16, 26).

One stranded pool at the Highway 154 Culvert appears to be perennial. However, as with all the other pools, this pool is hardly suitable for rainbow/steelhead. The pool decreases in size after each rain and is very shallow (less than a few inches deep) by spring or summer (see Photos 11, 27, 28). Without fresh water flowing through the pool, algae builds up and dissolved oxygen is very low, conditions which make the pool unsuitable for steelhead. Any rainbow/steelhead which end up in this pool would be stranded and subject to predation by mammals or dessication by spring or summer.

Had there been any flowing water in 2002 and 2003 during the time when fish migrate, there would have been numerous migration barriers (for both upstream and downstream fish) (See Photo Numbers 29-31) Thus, during the time when the steelhead need to immigrate to spawn, there would be no way for them to do so. Similarly, any downstream migration would have been impossible, due to the large amount of dry creekbed throughout the area of the channel in Upper Hilton Creek (See Photo Numbers 1-3, 7, 13, 21-25, 29-31). There would be no way for any trout to remain in the stranded pools and "summer and winter over" until some future hydrological event occurred because the pools dried up.

While flow is important, the quality of the streambed is also important. Steelhead need specific sizes of gravel for spawning, as well as adequate areas for rearing. The substantial volume of data we assembled, based on numerous substrate samples collected, throughout the Upper Hilton Creek channel, demonstrated poor to non-existing spawning conditions. It has been demonstrated repeatedly that there is an inverse relationship between survival of salmonids and fines substrate materials ("fines") (Targart, 1984; Reiser and White, 1988; Waters, 1995). There is little survival beyond 10-20 percent fines less than 0.85 mm and eyed eggs do not survive beyond 20 percent fines level (Reiser and White, 1988; Waters, 1995). The level of 20 percent fines less than 0.85 mm has become well-established and has been accepted by many investigators as the criterion above which significant mortality of embryos can be expected (Waters, 1995). In Upper Hilton Creek, not only did we have to look extremely hard to even find substrate that was not either fine material or cobble/boulder, the average amount of fines was about 40 percent, with a standard deviation of about 16 percent. With such a high degree of fines (together with the large cobble and boulder which predominated in Upper Hilton Creek (See Photo Numbers 2, 13, 14, 21-24, 29-31), there is little spawning habitat which would result in any successful spawning.

3. The characterization of stream bed habitat (re: runs, riffles, and pools) is incorrect and is not based on any scientific basis or long-term observation.

DEIR/DEIS statements:

N2-19

N2-20

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"The majority of the channel appears to be composed of run and riffle habitats. Pool habitats were present but limited in number." (Page 7-7)

"Absent observations from different times of year and from years with different winter runoff conditions, it is not possible to characterize the full range of habitat conditions and the frequency when suitable conditions are present. However, it appears that the creek may provide perennial pools in certain years that could be suitable for oversummering by rainbow/steelhead trout." (Page 7-8).

Response to DEIR/DEIS statement:

The DEIR/DEIS statement, "The majority of the channel appears to be composed of run and riffle habitats" is, again, a mischaracterization of this reach of the stream bed. A "run," by the FMP's own definition (Page 2-34 of the FMP), is:

"Run: generally, moderately deep with swift and straight flowing water; relatively flat with no major obstacles (e.g., boulders) which change flow direction and break surface tension."

A "riffle," again by the FMP's own definition (Page 2-34 of the FMP), is:

"Riffle: generally, shallow to moderately deep with swift flowing, turbulent water; typically contains partially exposed rocks which create shifting flow directions."

Both definitions identify "flowing water" as part of a "riffle" and "run" habitat. Flowing water is not something which occurs in Hilton Creek, upstream of the Bureau's property, throughout the year, regardless of whether or not it is a dry, average, or wet rain year.

Even the FMP's definition of "pool" implies a depth of water which would sustain a trout:

"Pool: generally deeper than riffles with flat, slower flowing water." (Page 2-34 of the FMP)

Mr. Engblom's identification of a dry creek bed as having runs, riffles, and pools to sustain a steelhead population is unfounded and leads the reader to believe that habitat does exist to sustain a steelhead population. Without water during the majority of the year, the concept of runs, riffles, and pools becomes wishful thinking rather than reality.

CONCLUSION: Unsuitable habitat conditions in Hilton Creek, upstream of the Bureau's property, preclude the possibility of supporting a viable steelhead population

NL-20

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- E. The fish passage improvements proposed in the DEIR/DEIS would not result in either improved habitat conditions for steelhead or increased numbers of steelhead in Upper Hilton Creek.

N2-21

1. Favorable conditions do not occur often and long enough for steelhead to move beyond the Bureau's property boundary and flourish.

DEIR/DEIS statements:

"The objectives of the prior and proposed projects on Lower Hilton Creek are to improve spawning and rearing habitat conditions in order to increase steelhead use of this portion of the creek on federal land, as well as to increase the opportunity for steelhead to utilize the creek upstream of federal property when suitable hydrologic conditions are present." (Page 2-22).

"Removing the 154 culvert will "provide access to upper Hilton Creek for potential spawning and rearing under favorable hydrologic conditions...." (Page 2-23)

"The culvert under Highway 154 is a passage barrier. The culvert will be modified to slow down the water velocity and raise the water surface elevation in the culvert. These modifications will allow for fish passage at storm flows. These actions will open the upper reaches of Hilton Creek to rearing and spawning rainbow trout/steelhead." (Page 3-39 of the FMP).

"...completion of the Hilton Creek passage project would not introduce steelhead to upper Hilton Creek above Route 154. However, it will facilitate migration of steelhead/rainbow trout to the reach of Hilton Creek between Route 154 and federal property" (Page 7-4).

"Completion of the proposed modifications to the culvert would improve hydraulic conditions for steelhead passage, allowing passage during both low and high flows. As a result, it is expected that there will be frequent and abundant steelhead on upper Hilton Creek" (Page 7-9).

"Modification of a passage impediment at the cascade and bedrock chute would improve access to approximately 2,800 feet of habitat (approximately 1,600 feet on Reclamation property) up to the Highway 154 Culvert" (Page 3-38 of FMP).

Response to DEIR/DEIS statements:

In order for improvement to be successful, biologists need to know what type of habitat conditions exist before implementing the improvement. The information contained in the DEIR/DEIS, and other reports used by the authors of the DEIR/DEIS, indicate that the authors of these reports are not at all familiar with the unsuitable conditions in Hilton Creek upstream of the Bureau's property.

The idea that modifying the Highway 154 culvert "...will open the upper reaches of Hilton Creek to rearing and spawning trout/steelhead" is absurd. If any trout are able to immigrate under Route 154, they would be stranded in pools upstream early in the year and, ultimately, die of dessication or predation by mammals and/or birds.

The statement that "As a result, it is expected that there will be frequent and abundant

N2-12



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steelhead on upper Hilton Creek" is without merit and has no basis in fact.

The DEIR/DEIS appears to "talk out of both sides of its mouth" by first stating that "These actions will open the upper reaches of Hilton Creek to rearing and spawning trout/steelhead." Then, the DEIR/DEIS states that "...completion of the Hilton Creek passage project would not introduce steelhead to upper Hilton Creek above route 154."

N2-22

2. Encouraging fish to move to Upper Hilton Creek will result in stranding and eventual death.

DEIR/DEIS statements:

"The steelhead is adapted to locating rearing habitat and responding to seasonal changes in rearing habitat. These adaptations have allowed the species to persist despite major drought cycles, unpredictable weather patterns, and predictable seasonal variations in flow. Hence, any mortality associated with steelhead using the reach of Hilton Creek between Route 154 and Reclamation property would be considered a natural outcome of the species exploiting new rearing habitats. The SYRTAC has determined that the benefits of expanding suitable habitat for the species would offset any possible losses due to fish stranding in the summer or during dry years." (Page 7-4)

"Flows in this reach are generally too low or absent by summer, such that steelhead/rainbow trout do not remain in this reach. With the presence of a perennial source of water on Reclamation property, fish that travel to this reach of the creek on private property would most likely move downstream as conditions worsen in the early summer. Hence, the probability and extent of fish stranding along this reach are considered very low." (Page 7-4).

"The increase in the frequency and number of steelhead on upper Hilton Creek on San Lucas Ranch due to both passage impediment projects cannot be accurately predicted." (Page 7-9)

N2-23

"Creation of new, and expansion of existing, rearing habitat along the mainstem of the Santa Ynez River will also increase the number of steelhead predatory fish, and increase predation of steelhead making use of the expanded rearing habitat." No mitigation required. "Reclamation and COMB believe that the rate of predation will not increase above current levels, such that the proposed project will still have a net benefit for steelhead." (Page ES-11)

Response to DEIR/DEIS statements:

With the Bureau's artificial discharges into Lower Hilton Creek, there may be a "perennial source of water on Reclamation property" now, but if the existing passage barriers are removed and steelhead are provided access to Upper Hilton Creek, then when Upper Hilton Creek dries up in the spring or summer the trout will become stranded in the few remaining pools. As stated before, these pools dry up before the end of summer so stranded fish have no survival opportunities. Continuing to provide water to the area within the Bureau's property and providing access to the area upstream of the Bureau's property is not going to change the fact that the fish will become stranded in Upper Hilton Creek. Hence, by "improving" the habitat within the Bureau's property, the fish will be enticed to move upstream into areas where they will become stranded and die.

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I would hardly equate mortality of steelhead associated with natural events (such as "...major drought cycle, unpredictable seasonal variations in flow...") with the proposed plan to entice rainbow/steelhead to Upper Hilton Creek where the fish will die (either on site or later, as a result of "rescuing", a questionable action itself). The former is unavoidable as it is tied to weather events; the latter is not only avoidable, but should not be implemented. Enticing rainbow/steelhead to immigrate to an area of the creek, which does not have year-round flowing water and which dries up at the earliest by spring and latest by summer, will result in more dead rainbow/steelhead, not an increased steelhead population.

There is absolutely no evidence that "With the presence of a perennial source of water on Reclamation property, fish that travel to this reach of creek on private property would most likely move downstream as conditions worsen in the early summer." Any trout stranded in the reach between the 154 culvert and the Bureau's property will either die onsite or need to be "rescued." Fish do not have the capacity to know (any more than we do) when a pool is going to become stranded. The one stranded rainbow/steelhead we collected in Upper Hilton Creek is evidence of that, as are the decades of trout which have been stranded in the Santa Ynez River and required "rescuing" (Shapovolov, 1944).

The DEIR/DEIS's statement that "the rate of predation will not increase above current levels, such that the proposed project will still have a net benefit for steelhead." (Page ES-11) is without basis. Frankly, by enticing fish upstream of the Bureau's property to be stranded and die from predation (from mammals or birds) or dessication does not result in a "net benefit for steelhead."

3. Proximity to the Pacific Ocean is an issue because of conditions in the Santa Ynez River.

DEIR/DEIS statements:

"The proximity of each stream to the Pacific Ocean is also a critical factor for steelhead production. During lower flow years, portions of the mainstem may not be passable, and migrating steelhead may be limited to spawning within tributaries which are connected to the lower mainstem. Access to adequate spawning and rearing habitat within these tributaries is essential during lower flow years." (Page C-15 of the FMP)

"The ramping down of water rights releases would be managed to avoid stranding of steelhead and other fish along the lower Santa Ynez River below Bradbury Dam as water rights releases are returned to the rearing target flows at Highway 154..." (Page 2-14)

Response to the DEIR/DEIS statement:

Hilton Creek is the farthest creek from the ocean of any of the creeks downstream of Bradbury Dam. The habitat of the Santa Ynez River, as stated in the DEIR/DEIS, dries up in large sections and is too hot for the thermally intolerant steelhead. Avoiding stranding of fish in the Santa Ynez River will be impossible. I observed the Santa Ynez River channel earlier this year (2003) when releases from Lake Cachuma were made for the farmers downstream. It was several days before I saw any water at Buellton. Furthermore, there is a long history

N2-23

N2-24

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of rainbow/steelhead being stranded in the Santa Ynez River (Shapovolov, 1944). Thus, I question the DEIR/DEIS's contention that they will be able to prevent stranding of rainbow/steelhead.

Unfortunately, like many other projects, the COMB "passage and flow project" on Hilton Creek is simply playing a game of "Russian Roulette" with the federally-listed steelhead, hardly a suitable management strategy for either improving steelhead habitat or increasing the population. This is a population that cannot withstand being misdirected to unsuitable or inhospitable habitat, as its numbers are already so low.

N2-24

CONCLUSION: The Hilton Creek passage improvement project will neither improve habitat conditions nor increase numbers of steelhead in Hilton Creek, upstream of the Bureau's property.

F. The mitigation measures proposed in the DEIR/DEIS would not increase the steelhead population.

N2-25

1. Rescuing steelhead will do little to support the species and could cause harm.

DEIR/DEIS statements:

"This 'project' consists of fish rescues from Hilton Creek when adverse habitat conditions occur due to drought conditions, i.e., declining water levels, increased water temperatures, or decreased dissolved oxygen levels. The supplemental watering system will provide flow to Hilton Creek in most years - 99%) but would not be able to provide flows in the summer and fall of drought years when lake elevations fall below 660 feet. If flows are shut down due to low lake levels (or to a mechanical failure), steelhead along Hilton Creek on federal property could become stranded in pools where they would be vulnerable to desiccation and predation. In this circumstance, Reclamation and COMB propose to relocate the fish to more suitable habitat to avoid mortality." (Page 2-50)

"The SYRTAC has determined that the benefits of expanding suitable habitat for the species would offset any possible losses due to fish stranding in the summer or during dry years." (Page 7-4)

"Fish rescue and relocation in Hilton Creek, while in general a beneficial action, may adversely affect some steelhead in the action area. The stress caused through capture, handling, and release can easily injure steelhead. Mortalities may also result. These effects may also occur if steelhead are inadvertently captured during proposed predator removal. NMFS notes that electrical burning (from electroshocking equipment) and several mortalities resulted during a recent steelhead rescue effort in the Santa Ynez". (Page 62 of the NMFS BO)

"Rescues are expected to be ultimately beneficial to the population, as steelhead will be relocated to habitats likely to contain water for the rest of the summer." (Page 62 of the NMFS BO)

N2-26

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"NMFS notes that electrical injury greatly decreases a fish's chance of survival (Dalby et al. 1996; Nielsen 1998)." (Page 70 from the NMFS BO)

Response to DEIR/DEIS statements:

There is a long history of the problem with delayed mortality associated with handling, such as done during "rescue operations of salmonids" (Slatick et al., 1975; Wedemeyer, 1972; Bernard et al., 1999; Congleton et al., 1985; Kerstetter, 1988; Schreck et al., 1989; Specker and Schreck, 1980; Rich, 1983, 1979). NMFS noted this in their BO, with regard to electrofishing, a common method used in "fish rescue." In general, handling and capture results in stress and injury and often death. Beach seining, another method used in "fish rescue" can be even more harmful, as the fish are dragged about on the substrate, then handled. Handling and transportation of salmonids has long been known to result in stress (resulting in decreased growth rates, reduced ability to swim and avoid predators, increased susceptibility to disease, and a variety of other stress-induced problems) and high mortalities (Slatick et al., 1975; Wedemeyer, 1972; Bernard et al., 1999; Congleton et al., 1985; Kerstetter, 1988; Schreck et al., 1989; Specker and Schreck, 1980; Rich, 1983, 1979). Given the known inherent problems with "fish rescue" and no follow-up studies of the numerous "fish rescues" in the Santa Ynez River during the past several decades, there is no evidence to suggest that fish rescue resulted in anything but high mortalities. Accordingly, there is no evidence that would provide a basis for the conclusion that fish "Rescues are expected to be ultimately beneficial to the population." (Page 62 of the NMFS BO)

N2-26

2. The DEIR/DEIS admits that many of their proposed management actions are experimental in nature. This is inappropriate for a declining species.

DEIR/DEIS statement:

"A substantial monitoring and adaptive management component was built into the program to address the uncertainties inherent in the experimental nature of this program" (Page 1-4).

Response to DEIR/DEIS statement:

The DEIR/DEIS states that it really does not know how their "passage project" or habitat improvement project, will work. They mention that "a substantial monitoring and adaptive management component was built into the program to address certain uncertainties inherent in the experimental nature of this program." I have been involved with a number of "adaptive management" projects, including monitoring. Adaptive management is undertaken when fisheries biologists do not know how a project will affect the fishes and want to "play with nature" to find out.

N2-27

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Mr. David Young, U.S. Bureau of Reclamation
September 29, 2003
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Appendix A

Résumé of Dr. Alice A. Rich

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A.A. RICH AND ASSOCIATES

ALICE A. RICH, PH.D., PRINCIPAL

RÉSUMÉ

Dr. Rich, who founded *AAR* in 1983, has had over 26 years of technical and administrative project management experience in a wide range of fisheries-related projects. Dr. Rich's professional experience encompasses work as a fisheries consultant, fisheries biologist, fish physiologist/toxicologist, analytical chemist, and university lecturer. Dr. Rich has supervised hundreds of impact analyses, studies in fish physiology, toxicology, fish habitat and population, temperature monitoring and modeling. In addition, Dr. Rich is an expert in fish physiology and toxicology and has been called upon as an expert witness on the stressful impacts of water temperature, pollutants, water diversions, migration barriers, timber harvest practices, catch-and-release fishing, and transportation and handling on fishes.

REPRESENTATIVE EXPERIENCE

- Supervised multi-year fish habitat and population studies, water temperature modeling and monitoring, and hydrological studies on the impacts of timber harvest practices
- Supervised fish toxicology and risk assessment studies in connection with mining activities
- Provided expert witness testimony on the effects of water quality, water temperature, growth rates, siltation, streamflows, catch-and-release fishing, and transportation on fishes
- Designed and conducted field and laboratory physiology studies to determine the relationship between instream flow levels, water temperatures, and the growth and well-being of chinook salmon and steelhead trout
- Designed and conducted physiology studies to assess impacts of water diversions on fishes
- Supervised studies on age determination (scales, otoliths, fin rays) on numerous freshwater and marine fish species
- Designed fish bioenergetics studies to assess growth-water quality relationships
- Conducted several hundred fish population and habitat surveys
- Supervised studies on the impacts of livestock on fishery resources
- Provided trout and salmon enhancement and rehabilitation plans
- Specialized training in Instream Flow Incremental Methodology (IFIM) and Habitat Evaluation Procedures (HEP)
- Prepared over 100 technical papers and presentations on fishery resources issues

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RÉSUMÉ

EXPERT WITNESS TESTIMONY

- Thermal Impacts of Delta Wetlands Project on chinook Salmon and other Fishes of the Sacramento-San Joaquin River System (*Central Delta Water District, Stockton, California*)
- Impacts of proposed Board of Forestry's Amendment to the Board of Forestry Rules on Salmon and Trout (*California Forestry Association, Sacramento, California*)
- Thermal Impacts of Yuba County Water Agency's Proposal to Reduce Flows in the Lower Yuba River on Chinook Salmon and Steelhead Trout in the Yuba River (*California Department of Fish and Game, Sacramento, California*)
- Thermal Impacts of Delta Wetlands Project on Chinook Salmon and other Fishes of the Sacramento-San Joaquin River System (*California Department of Fish and Game, Sacramento, California*)
- Fishery Resources of the Lower American River (*County of Sacramento, California*)
- Thermal Impacts of Altered Stream Flows on the Fishery Resources of the Lower American River (*County of Sacramento, California*)
- Impacts of Streamflow Alterations on Emigrating Salmonids (*North Marin County Water District, Novato, California*)
- Impacts of Streamflow Alterations on Emigrating and Resident Salmonids (*Casa de Fruta, Hollister, California*)
- Impacts of Summer Dams on Aquatic Species (*North Marin Water District, Novato, California*)
- Impacts of Handling and Transportation on Fresh Salmon (*Alaska Airlines, Seattle, Washington*)
- Stressful Impacts of Handling and Transportation on Salmonids (*Bangor Hydro-Electric Company, Bangor, Maine*)
- Impacts of Timber Harvest Practices on Trout (*East Bay Municipal Water District, Oakland, California*)
- Impacts of Timber Harvest Practices on Salmonids (*Barnum Timber Company, Eureka, California*)
- Impacts of Roads, Bridge, and Vineyard on Salmonids (*Friends of West Union Creek, Woodside, California*)
- Impacts of Construction of an Oil Rig Platform on the Fishery Resources of Northern Puget Sound (*Kiewit Construction Company, Bellingham, Washington*)

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CERTIFICATIONS

- IFG 200-Designing and Conducting Studies Using IFIM. Instream Flow Group, U. S. Fish and Wildlife Service, West Virginia, 1984.
- IFG 205-Field Techniques for Instream Analysis. U. S. Fish and Wildlife Service, West Virginia, 1984.
- IFG-210-PHABSIM-Using the Computer-Based Physical Habitat Simulation System. U. S. Fish and Wildlife Service, Colorado, 1984.
- Habitat Evaluation Procedures (HEP), Colorado, 1985.
- Fish Bioenergetics Growth Models, Toronto, Canada, 1988.
- SCUBA, N.A.U.I.

PROFESSIONAL HISTORY

- A. A. Rich and Associates/Principal (1983-present)
- University of Washington, School of Fisheries/Lecturer (1982-1983)
- University of Washington, School of Fisheries/Teaching Assistant (1976-1983)
- University of Washington, School of Fisheries, Laboratory of Radiation Ecology/Analytical Chemist (1977-1980)
- U.S. Forest Service, Seattle/Fisheries Consultant (1980)
- U.S. Bureau of Reclamation, Sacramento, California/Fisheries Biologist (1975)
- California Department of Fish and Game, Sacramento/Fisheries Biologist (1973-1975)

EDUCATION

- Ph.D., 1983. Fisheries, University of Washington, Seattle
- M.S., 1979. Fisheries, University of Washington, Seattle
- B.S., 1973. Zoology, University of California, Davis

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PROFESSIONAL AFFILIATIONS

- American Association for the Advancement of Science
- American Fisheries Society
- American Institute of Fishery Research Biologists
- American Society of Zoologists
- Association of Environmental Professionals
- Association for Women in Science
- Committee Member Coastal DTAC, Appointed by California Board of Forestry
- Society for protection of Old Fishes
- Watershed Protection and Restoration Council (WPRC) Science Panel
- San Francisco Estuary Project, Team Member-Fishery Resources Section

REPRESENTATIVE PUBLICATIONS AND PAPERS PRESENTED

Dr. Rich has published and presented papers on a number of fishery resources topics including: the thermal impacts of flow alterations on salmonids; impacts of logging on salmon and trout habitat and populations; water quality requirements for fishes; impacts of catch-and-release fishing on salmonids; smoltification of salmonids; enhancement strategies of salmonids in urban and rural areas; impacts of rotenone on lake fishery resources; domestication of salmonids; preferred herring spawning substrates; and, exercise physiology of trout. Following is a list of representative publications and papers presented.

Rich, A. A. 2003. Fishery Resources Conditions of Suscol Creek, Napa County, California. Prep. for Friends of the Napa River. April 21, 2003. 68 pp + Appendices

Rich, A. A. 2003. Long-term Water quality and Temperature Monitoring for Boat Dock Copnstruction at the Brookside Estates in Stockton, California. Summary of Results of 2002 Data. Prep. For Brookside Development Associates, Stockton. April 4, 2003. 25 pp + Appendices.

Rich, A. A. 2002. Results of Presence/Absence Fishery Resources Electrofishing Survey within the North Branch of the South Fork Littlejohns Creek, San Joaquin County. Prep. for Forward Inc., Manteca, California. June 25, 2002. 9 pp + Appendices.

Rich, A. A. 2002. On-Site Biological Monitoring for Boat Dock Installation and Construction at Brookside Estates in Stockton, California. Prep. for Brookside Development Associates, Stockton, April 19, 2002. 22 pp + Appendices.

Rich, A. A. 2002. Bahia Dredging and Lock Project Environmental Assessment for Fishery Resources. Prep. for Bahia Homeowners' Association, Novato, California. February 22, 2002. 62 pp + Appendices.

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REPRESENTATIVE PUBLICATIONS AND PAPERS PRESENTED (CONT.)

Rich, A. A. 2002. Environmental Assessment for the Chaplinsky Boat Ramp to Pier Conversion at 93 Shoreline Circle, Incline Village, Lake Tahoe, Nevada. Prep. for R. Chaplinsky, January 18, 2002. 36 pp + Appendices.

Rich, A. A. 2001. Noyo River Fish Monitoring 2000 Summary Report. Prep. for the City of Fort Bragg, Fort Bragg, California. April 25, 2001. 25 pp + Appendices

Rich, A. A. 2001. Response to the California Department of Fish and Game's February 2, 2001 Testimony presented to the California Fish and Game Commission with regard to listing coho salmon (*Oncorhynchus kisutch*) as an endangered species. Testimony submitted to the California Fish and Game Commission. April 3, 2001. 26 pp.

Rich, A. A. 2001. Response to the Salmon and Steelhead Recovery Coalition Petition submitted to the California Fish and Game Commission to list coho salmon (*Oncorhynchus kisutch*) as an endangered species. Testimony submitted to the California Fish and Game Commission. January 31, 2001.

Rich, A. A. 2000. Fishery resources conditions of the Corte Madera Creek Watershed, Marin County, California. Prep. for Friends of Corte Madera Creek Watershed, Larkspur, California. November 10, 2000. 120 pp. + Appendices.

Rich, A. A. 2000. Aquas Frias Road Bridges-Impacts on fishery resources, Chico, Butte County, California. Prep. for Eco-Analysts, Chico, California. October 25, 2000. 29 pp.

Rich, A. A. 2000. Brookside Dock Expansion Environmental Assessment for Fishery Resources-Addendum. Prep. for Brookside Development Associates, Stockton, September 4, 2000. 67 pp. + Appendices

Rich, A. A. 2000. Brookside Dock Expansion Environmental Assessment for Fishery Resources. Prep. for Brookside Development Associates, Stockton, July 10, 2000. 6 pp. + Appendices

Rich, A. A. 2000. Potential impacts of the proposed Congregation Beth El Synagogue and School on the fishery resources of the Codornices Creek Watershed, Alameda County, California. Prep. for the City of Berkeley, June 26, 2000. 50 pp. + Appendix

Rich, A. A. 2000. The potential impacts of the emergency work performed at the Kendall Ranch on the fishery resources of the Garcia River, Mendocino County. Prep. for Rawles, Hinkle, Carter, Behnke & Oglesby, Attorneys, Ukiah. February 9, 2000.

Scientific Review Panel. 1999. Report of the Scientific Review Panel on California Forest Practice Rules and Salmonid Habitat. Prepared for The Resources Agency of California and the National Marine Fisheries Service, Sacramento, California, June, 1999. 92 pp + Appendices.

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REPRESENTATIVE PUBLICATIONS AND PAPERS PRESENTED (CONT.)

Rich, A. A. 1999. FMC Phosphate Mine Expansion, Fishery Resources Technical Report. Prepared for FMC Phosphate Mine, Soda Springs, Idaho. February 5, 1999. 100 pages + Appendices.

Rich, A. A. 1999. Fishery Resources Conditions in Pine and Mill Creek Watersheds, Rovana, Inyo County, California. Prepared for Inyo County, January 11, 1999. 48 pp + Appendices.

Rich, A. A. 1999. Ventura River Fish Survey and Fish Relocation Results. Submitted to the National Marine Fisheries Service as part of Section 7 Consultation. January 4, 1999.

Rich, A. A. 1999. Leeville Gold Mine Expansion Project, Carlin, Nevada. Fishery Resources Technical Report. Prepared for Newmont Gold Company, Carlin, Nevada, January, 1999.

Rich, A. A. 1998. Fishery Resources Conditions of Adobe Creek, Petaluma, Sonoma County, California. Prepared for the Petaluma Planning Department, December 8, 1998. 46 pp.

Rich, A. A. 1998. Assessment Plan for the Talache Mine Mill Tailings Site, Atlanta, Idaho. Prep. for Monarch Greenback, Boise, Idaho, April 14, 1998. 36 pp + Appendix.

Rich, A. A. 1998. Talache Mine Tailings Project, Preliminary Review of Existing Information on Fishery Resources Conditions. Prep. for Monarch Greenback, Boise, Idaho, April 24, 1998. 71 pp + Appendices.

Rich, A. A. 1997. Noyo River Fish Monitoring 1997 Summary Report. Prep. for the City of Fort Bragg, Fort Bragg, Mendocino, California. December 30, 1997. 36 pp + Appendix.

Rich, A. A. 1997. Ord Ferry Road Bridge Seismic Retrofit Project, Impacts on Fishery Resources, Butte County, California. Prep. For Butte County, November 25, 1997. 27 pp + Appendix.

Rich, A. A. 1997. Testimony of Alice A. Rich, Ph.D., Submitted to the State Water Resources Control Board, Regarding Water Rights Applications for the Delta Wetlands Project. July 1997, on behalf of California Department of Fish and Game, Exhibit 7, 88 pp + Appendix.

Rich, A. A. 1997. Novato Creek Flood Control Project, Marin County. Fishery Resources Conditions. Prep. For ESA, San Francisco, California. June 19, 1997. 23 pp + Appendices.

Rich, A. A. 1997. Stibnite Mine Expansion Payette National Forest Draft Fishery Resources Technical Report. Prep. for U.S.F.S., Payette National Forest, McCall, Idaho. April 25, 1997. 172 pp + Appendices.

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REPRESENTATIVE PUBLICATIONS AND PAPERS PRESENTED (CONT.)

Rich, A. A. 1997. Aggregate resources management Plan for the Upper Russian River-Status of Fishery Resources. Prepared for Philip Williams & Associates, San Francisco, February, 1997. 98 pp + Appendices.

Rich, A. A. and S. Li. 1997. Fishery Resources Assessment for a project to assign 15,000 acre-feet per year of Sacramento Municipal Utility District's (SMUD) American River water entitlement to Sacramento County. Prep. for ESA, Sacramento, 1997.

Rich, A. A. 1995. Results of age analysis of fishes (English sole) from the Yukon and British Columbia. Prep. for Norecol Dames & Moore, British Columbia, Canada, December 19, 1995. 30 pp.

Rich, A. A. 1995. The potential impacts of the Serra Estrellada Project on the Fishery resources of the Redwood Creek Drainage, Alameda County. Prep. for Alameda County Planning Department, Hayward, California, October 2, 1995. 34 pp.

Rich, A. A. 1995. Mitigation measures and habitat analysis for fishery resources of San Joaquin County-Habitat Conservation Plan. Prepared for Toyon Environmental Consultants, Kentfield, California. September 15, 1995. 12 pp.

Rich, A. A. 1995. The potential impacts of the Pearson Project on the fishery resources of West Union Creek, San Mateo County. Prepared for Friends of West Union Creek, Woodside, California. September 5, 1995. 43 pp + Appendix.

Rich, A. A. 1995. Potential impacts of the Klyce Project on the fishery resources of Slide Gulch Creek in Mill Valley, Marin County. Prepared for the Babcock Family, Mill Valley, California. August 14, 1995. 23 pp + Appendix.

Rich, A. A. 1995. Feasibility study to rehabilitate the fishery resources of the Arroyo Corte Madera del Presidio Watershed, Mill Valley, California. A. A. Rich and Associates, May 31, 1995. 74 pp + Appendices.

Rich, A. A. 1994. West Lathrop Specific Plan Fishery Resources Assessment. Prep. for Sycamore Environmental Consultants, Sacramento, California. September 30, 1994. 61 pp.

Rich, A. A. 1994. Central Valley Project Improvement Act Programmatic EIS: Anadromous Fish Restoration Projects. Prep. for Jones & Stokes Associates, Sacramento, California, August 31, 1994. 96 pp + Appendices.

Rich, A. A. 1994. A reconnaissance-level study of the fishery resources of the Pilarcitos Creek Watershed. Prep. for the San Francisco Water Department, Millbrae, California, May 20, 1994. 49 pp + Appendices.

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Rich, A. A. 1994. The potential impacts of the Fort Bragg Water Resources Development Project on the fishery resources of the Noyo River, Mendocino County. Prep. for the City of Fort Bragg, May 4, 1994. 54 pp + Appendices.

Rich, A. A. 1993. State of California Wildlife Conservation Board Boat Ramp Renovation Project-Fishery Resources. Prep. for Harland Bartholomew & Associates, Sacramento, California, December 3, 1993.

Rich, A. A. 1996. Novato Creek Flood Control Project, Marin County. Fishery Resources Conditions from Diablo Avenue to Grant Avenue-Reconnaissance-level Survey. May 31, 1996. 19 pp.

Rich, A. A. 1995. Results of age analysis of fishes (English sole) from the Yukon and British Columbia. Prep. for Norecol Dames & Moore, British Columbia, Canada, December 19, 1995. 30 pp.

Rich, A. A. 1993. Vallejo fishing pier replacement fishery resources assessment. Prep. for Greiner, San Ramon, November 26, 1993. 10 pp.

Rich, A. A. 1993. A Reconnaissance-level survey of existing fishery resources habitat conditions on the Lemelson property, Incline Village, Nevada. Prep. for Jerome Lemelson, Incline Village, Nevada, September 29, 1993. 28 pp + Appendices

Rich, A. A. 1993. Fishery resources of Auburn Ravine and Pleasant Grove creeks, Roseville, California. Prep. for ESA, San Francisco, February 16, 1993. 14 pp.

Rich, A. A. 1993. Alameda Watershed fishery resources-evaluation of existing data. Prepared for ESA, San Francisco, August, 1993.

Rich, A. A. 1993. Peninsula Watershed fishery resources-evaluation of existing data. Prepared for ESA, San Francisco, August, 1993.

Rich, A. A. 1993. Weber Creek fishery resources-evaluation of existing data. Prepared for ESA, Sacramento, February 5, 1993. 27 pp.

Rich, A. A. 1993. Technical Memorandum on the impacts of the implementation of the Reclamation Reform Act on aquatic resources in the Central Valley. Prep. for the U.S. Bureau of Reclamation, Denver, Colorado, January, 1993. 71 pp + Appendix.

Rich, A. A. 1992. Biological assessment for proposed sewer pipeline, City of Sutter Creek, Amador, California. Prep. for Baracco and Associates, Sutter Creek, October 31, 1992. 26 pp + Appendix.

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REPRESENTATIVE PUBLICATIONS AND PAPERS PRESENTED (CONT.)

Rich, A. A. 1992. Feasibility study to rehabilitate the fishery resources of Easkoot Creek, Marin County. Prep. for the Environmental Action Committee of West Marin, Point Reyes Station, May, 1992. 47 pp. + Appendices.

Rich, A. A. 1992. Fishery Resources of Dry Creek and Pleasant Grove Creek, Roseville, California. Prep. for James M. Montgomery Consulting Engineers, Walnut Creek, January 6, 1992. 35 pp.

Rich, A. A. 1991. Salmonid habitat conditions and population estimates in Forest Creek and the Middle Fork of the Mokelumne River, California. Prep. for East Bay Municipal Utility District, November 14, 1991. 55 pp. + Appendices.

Rich, A. A. 1991. Pieta Creek Basin Stream Assessment: 1989-1991. Prep. for the Mendocino County Resource Conservation District, Ukiah, California, October 4, 1991. 52 pp + Appendices.

Rich, A. A. 1991. Mortality and stress on salmonids as a result of fishery resources management actions. Part 1: The stressful effects of catch-and-release fishing on salmonids. Prep. for Bangor Hydro-Electric Company, Bangor, Maine, May 31, 1991. 57 pp.

Rich, A. A. 1991. The impacts of stress on salmonids as a result of fishery resources management actions. Part 2: The stressful effects of handling, transportation and tagging on salmonids. Prep. for Bangor Hydro-Electric Company, Bangor, Maine, August, 1991. 67 pp.

Rich, A. A. and W. E. Loudermilk. 1991. Preliminary evaluation of chinook salmon smolt quality in the San Joaquin Drainage. Prep. for the Calif. Dept. Fish and Game, Region 4, Fresno, California, February 18, 1991. 76 pp.

Rich, A. A. 1991. The impacts of timber harvest practices on the fishery resources of the Navarro River Watershed, Mendocino County, California. Phase III: Fishery resources baseline surveys. Annual Report. Prep. for Louisiana-Pacific Corporation, Samoa, California, July 7, 1991. 109 pp. + Appendices.

Rich, A. A. 1991. Potential impacts of the Casa de Fruta expansion on the fishery resources in Pacheco Creek, Santa Clara County, California. Prep. for David Powers & Associates, San Jose, February 15, 1991. 14 pp + Appendix.

Rich, A. A. 1990. Pieta Creek Basin Stream Assessment: 1989-1990. Prep. for the Mendocino County Resource Conservation District, Ukiah, California, October 1, 1990. 52 pp. + Appendices.

Rich, A. A. 1990. Restoration of coho salmon and steelhead trout stocks in the Walker Creek Watershed, Marin County, California. Prep. for the California Coastal Conservancy, October, 1990.

A.A. RICH AND ASSOCIATES

ALICE A. RICH, PH.D., PRINCIPAL

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REPRESENTATIVE PUBLICATIONS AND PAPERS PRESENTED (CONT.)

Rich, A. A. 1990. The use of smolt and stress indicators as management tools in the San Joaquin Drainage, California. Amer. Fish. Soc. Symposium Proceedings, September 18-22, 1990, Humboldt State University, Arcata, California.

Rich, A. A. 1990. Salmonid habitat conditions in Sproul Creek, Humboldt County, California. Prep. for Barnum Timber Company, Eureka, California, August 31, 1990. 19 pp + Appendices.

Rich, A. A. 1990. Route 85-Coyote Creek mitigation site conceptual revegetation plan: fishery resources conditions. Prep. for H. T. Harvey and Associates, Alviso, California, August 8, 1990. 26 pp + Appendix

Rich, A. A. 1990. Salmonid habitat conditions in Baker Creek, Humboldt County, California. Prep. for Barnum Timber Company, Eureka, California, July 17, 1990. 41 pp + Appendices.

Rich, A. A. 1990. Environmental assessment for the extension of an existing pier at the Croom Family residence, Crystal Bay, Lake Tahoe, Nevada. Prep. for Brisco Enterprises, May 2, 1990. 17 pp + Appendices.

Rich, A. A. 1990. Environmental assessment for the extension of an existing pier at the McClean Family residence, Meeks Bay, Lake Tahoe, California. Prep. for Brisco Enterprises, May 2, 1990. 16 pp + Appendices.

Rich, A. A. 1990. The impacts of timber harvest practices on the fishery resources of the Navarro River Watershed, Mendocino County, California. Phase III: Fishery resources-1989-1990 baseline surveys. Prep. for Louisiana-Pacific Corporation, April 19, 1990. 66 pp + Appendices.

Rich, A. A. 1990. Codornices Creek fishery resources habitat survey and enhancement feasibility study. Prep. for the Department of Water Resources, Sacramento, California, February 28, 1990

Rich, A. A. 1989. How does one assess the impacts of water temperatures on salmonids? Fifteenth Annual Conference of the Humboldt Chapter of the American Fisheries Society, April 22, 1989, Scotia, California.

Rich, A. A. 1989. The cumulative impacts of timber harvest practices on the fishery resources of the Navarro River Watershed, Mendocino County, California. Phase I: Development of a methodology to be used to determine the existing fishery resource conditions in the Navarro River Watershed. Prep. for Louisiana-Pacific Corporation, February 15, 1989. 72 pp + Appendices.

Rich, A. A. 1988. The Giacomini Summer Dam Environmental Assessment. Prep. for Richard Giacomini, Point Reyes Station, California, November 6, 1988. 24 pp + Appendix.

A.A. RICH AND ASSOCIATES

ALICE A. RICH, PH.D., PRINCIPAL

RÉSUMÉ

REPRESENTATIVE PUBLICATIONS AND PAPERS PRESENTED (CONT.)

- Rich, A. A. 1988. A qualitative assessment of the salmonid habitat in Pilarcitos Creek from Main Street to the mouth of the creek, Half Moon Bay, California. Prep. for Bay Farms, San Ramon, California, July 20, 1988. 7 pp.
- Rich, A. A. 1988. A qualitative assessment of the proposed Stone Pine Center on the fishery resources of Pilarcitos Creek, Half Moon Bay, California. Prep. for Inwood Corporation, Woodside, California, July 18, 1988. 7 pp.
- Rich, A. A. 1988. A qualitative fisheries survey of Pacheco Creek, Novato, California. Prep. for EIP Associates, San Francisco, California, April 10, 1988. 9 pp.
- Rich, A. A. 1988. Results of a fisheries survey in the tidal embayment adjacent to Coyote Creek, Alameda County, California. Prep. for Zentner and Zentner, San Francisco, California, March 15, 1988. 13 pp.
- Rich, A. A. 1988. Assessment of water availability and potential conflicts of streamflow withdrawals on rainbow and brown trout in Canyon Creek, El Dorado County, California. Prep. for Eagle Hydro Partners, Millbrae, California, February 29, 1988. 14 pp + Appendix.
- Rich, A. A. 1988. Growth and food conversion efficiency of American River juvenile salmon at different temperatures. Twenty-Third Annual Cal-Neva American Fisheries Conference, February 5-6, 1988, Ventura, California.
- Rich, A. A. 1988. Qualitative fisheries survey in Richardson Bay, California. Prep. for Martin Jarvis, Attorney, San Francisco, California, February 2, 1988. 8 pp.
- Rich, A. A. 1987. The status of knowledge of the steelhead trout, coho salmon, the white sturgeon, the tidewater goby and the opossum shrimp in Lagunitas Creek and its estuary. Prep. for North Marin Water District, Novato, California, November 25, 1987. 62 pp + Appendices.
- Rich, A. A. 1987. Report on studies conducted by Sacramento County to determine the temperatures which optimize growth and survival in juvenile chinook salmon (*Oncorhynchus tshawytscha*). Prep. for the County of Sacramento, California, April, 1987. 52 pp + Appendices.
- Rich, A. A. 1986. Fishery issues associated with water diversions: the American River versus the Sacramento-San Joaquin Delta. Prep. for the County of Sacramento, California, February, 1986. 26 pp.
- Rich, A. A. 1987. Water temperatures which optimize growth and survival of the anadromous fishery resources of the Lower American River. Prep. for McDonough, Holland & Allen, Sacramento, California. April, 1987. 24 pp.

A.A. RICH AND ASSOCIATES

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RÉSUMÉ

REPRESENTATIVE PUBLICATIONS AND PAPERS PRESENTED (CONT.)

Rich, A. A. 1986. Fishery resource habitat assessment in the watersheds of Salmon Creek, Willow Creek, the Estero Americano, and Cheney Gulch in Sonoma County, California. Prep. for Circuit Rider Productions, Windsor, California, November 17, 1986.

Rich, A. A. 1986. The potential impact of rubber tires on the fishery resources of Phoenix Lake, Marin County, California. Prep. for Marin Municipal Water District, Corte Madera, California, October 24, 1986. 16 pp.

Rich, A. A. 1986. The potential role of the lunar cycle and photoperiod in the stranding of juvenile chinook salmon (*Oncorhynchus tshawytscha*) in the Skagit River, Washington. Prep. for R. W. Beck and Associates, Seattle, Washington, July 8, 1986. 20 pp.

Rich, A. A. 1985. Supplemental temperatures analysis. Prep. for the County of Sacramento, California, May 17, 1985. 24 pp + Appendices.

Rich, A. A. 1985. Re-evaluation of fall chinook salmon spawning escapement estimates in the lower American River. Prep. for the County of Sacramento, California, March 31, 1985. 17 pp.

Rich, A. A. 1985. Finfishery resources off Grays Harbor, Washington. Prep. for Shapiro and Associates, Seattle, Washington, December 3, 1985. 43 pp.

Rich, A. A. 1985. Fishery resources of Willapa Bay, Washington. Prep. for Shapiro and Associates, Seattle, Washington, July 15, 1985. 29 pp.

Rich, A. A. 1985. Existing finfishery resources in the water adjacent to Eagle Harbor, Cypress Island, Washington. Prep. for Shapiro and Associates, Seattle. February 21, 1985. 22 pp.

Rich, A. A. 1984. Big Soos Creek fishery resource inventory, analysis, and enhancement plan. Prep. for Richard Carothers Associates, Landscape Architects, Seattle, Washington, September, 1984. 35 pp.

Rich, A. A. 1984. Herring spawn adjacent to the proposed Kiewit Marine Facility, Whatcom County, Washington. Prep. for Kiewit Construction Company, Bellingham, Washington, February, 1984. 59 pp.

Rich, A. A. 1984. Evaluation of existing water quality conditions in Whatcom Creek and recommendations for the design of a water treatment facility at the Maritime Heritage Center in Bellingham, Washington. Prep. for Callen Construction Company, Custer, Washington, July, 1984. 59 pp.

Rich, A. A. 1984. Herring spawn adjacent to the proposed Kiewit Marine Facility, Whatcom County, Washington. Prep. for Kiewit Construction Company, Bellingham, Washington, February, 1984. 59 pp.

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REPRESENTATIVE PUBLICATIONS AND PAPERS PRESENTED (CONT.)

Rich, A. A. 1983. Smolting: circulating catecholamine and thyroxine levels in coho salmon (*Oncorhynchus kisutch*). Ph.D. Dissertation, University of Washington, Seattle. 97 pp.

Plisetskaya, E., A. A. Rich, W. W. Dickhoff, and A. Gorbman. 1982. A study of triiodothyronine-catecholamine interactions: their effect on plasma fatty acids in Pacific hagfish, *Eptatretus stoutii*. Comp. Biochem. Physio. 1982.

Rich, A. A. 1980. The effects of domestication upon the levels of noradrenaline, glucose and lactate dehydrogenase in resting and exercised rainbow trout. Amer. Zool. 20(4): 800.

Rich, A. A. 1980. Feasibility of managing resident trout in Williamson Creek, Washington. Prep. for the U. S. D. A., Forest Service, September 18, 1980. 44 pp + Appendices.

Rich, A. A. 1979. The use of stress to quantitate the survival potential of three strains of trout. M. S. Thesis, University of Washington, Seattle. 65 pp.

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Alice A. Rich, Ph.D.
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Appendix B

Photographs Cited in the Comment Letter

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A.A. RICH AND ASSOCIATES

PHOTOGRAPHS OF HILTON CREEK

Photo No	Description
1	Taken April 18, 2002: Between Bureau's upstream boundary and Highway 154 culvert
2	Taken April 16, 2002: Typical substrate between Bureau's upstream boundary and Highway 154 culvert
3	Taken April 16, 2002: Typical pool upstream of Highway 154 culvert
4	Taken May 21, 2003: 350 feet upstream of Highway 154 culvert
5	Taken April 16, 2002: Facing upstream from 1 st dirt road on San Lucas Ranch upstream of the Highway 154 culvert
6	Taken April 17, 2002: Facing downstream from 1 st dirt road upstream of the Highway 154 culvert on San Lucas Ranch
7	Taken January 6, 2003: 1300 feet upstream of 2 nd dirt road upstream of the Highway 154 culvert on San Lucas Ranch (i.e., upper end of drainage)
8	Taken August 8, 2002: Lower Hilton Creek - Bureau's property - riffle/run habitat
9	Taken August 8, 2002: Lower Hilton Creek - Bureau's property - pool habitat near confluence with the Santa Ynez River
10	Taken December 19, 2001: Typical algae pool between Bureau's upstream property boundary and Highway 154 culvert
11	Taken April 17, 2002: Algae pool directly below of Highway 154 culvert
12	Taken September 20, 2002: Pool about 200 feet upstream of Highway 154 culvert
13	Taken April 16, 2002: 100 feet upstream of 1 st dirt road upstream of the Highway 154 culvert on San Lucas Ranch
14	Taken April 17, 2002: Upstream of 1 st dirt road upstream of the Highway 154 culvert on San Lucas Ranch
15	Taken April 17, 2002: Upstream of 1 st dirt road upstream of the Highway 154 culvert on San Lucas Ranch
16	Taken April 17, 2002: Upstream of 1 st dirt road on upstream of the Highway 154 culvert San Lucas Ranch
17	Taken February 20, 2003: 950 feet upstream of 1 st dirt road upstream of the Highway 154 culvert on San Lucas Ranch
18	Taken February 20, 2003: 1450 feet upstream of 1 st dirt road on San Lucas Ranch upstream of the Highway 154 culvert
19	Taken May 23, 2003: 2660 feet upstream of 2 nd dirt road upstream of the Highway 154 culvert on San Lucas Ranch (i.e., upper end of drainage)
20	Taken September 17, 2003: Facing upstream from 154 culvert (source: Dr. Phil Hall)
21	Taken September 17, 2003: Facing downstream from first dirt road upstream of Highway 154 (source: Dr. Phil Hall)

A.A. RICH AND ASSOCIATES

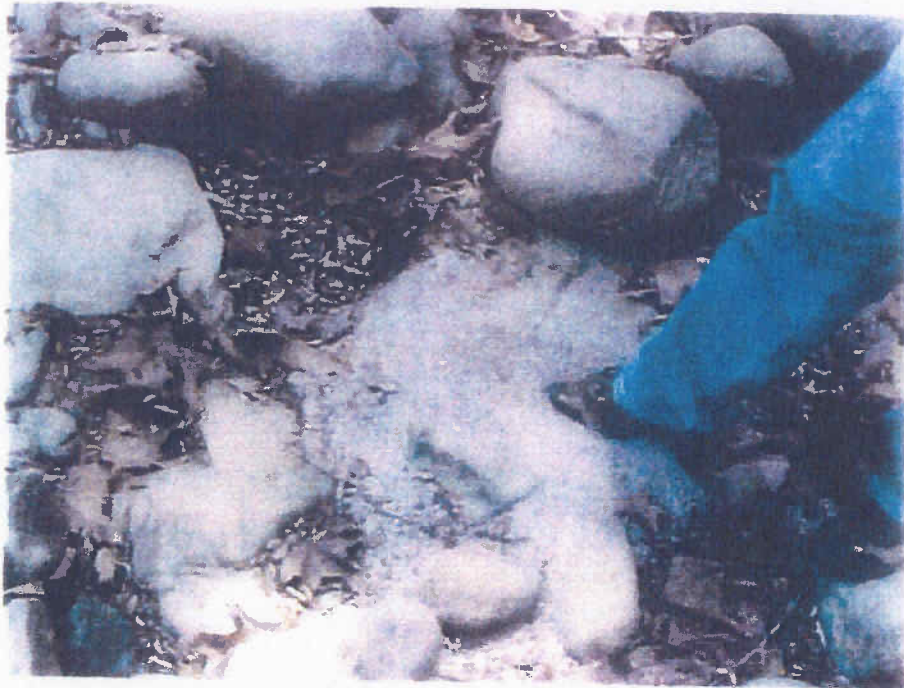
PHOTOGRAPHS OF HILTON CREEK (CONT.)

Photo No	Description
22	Taken September 17, 2003: Uppermost section of Hilton Creek on San Lucas Ranch property (source: Dr. Phil Hall)
23	Taken September 17, 2003: Facing upstream from Highway 154 culvert (source: Dr. Phil Hall)
24	Taken August 8, 2002: Shallow pool directly below of the Highway 154 culvert
25	Taken September 17, 2003: Shallow pool directly below of the Highway 154 culvert, facing upstream (source: Dr. Phil Hall)
26	Taken April 16, 2002: Migration barriers several hundred feet downstream of 1 st dirt road upstream of the Highway 154 culvert on San Lucas Ranch
27	Taken February 19, 2003: Migration barriers 200 feet downstream of 1 st dirt road upstream of the Highway 154 culvert on San Lucas Ranch
28	Taken April 16, 2002: Migration barriers 100 feet downstream of 1 st dirt road upstream of the Highway 154 culvert on San Lucas Ranch

Upper Hilton Creek



1



2

Upper Hilton Creek



3



4

Upper Hilton Creek



5



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Upper Hilton Creek



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Lower Hilton Creek

Lower Hilton Creek



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Upper Hilton Creek

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Upper Hilton Creek



11



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Upper Hilton Creek



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Upper Hilton Creek

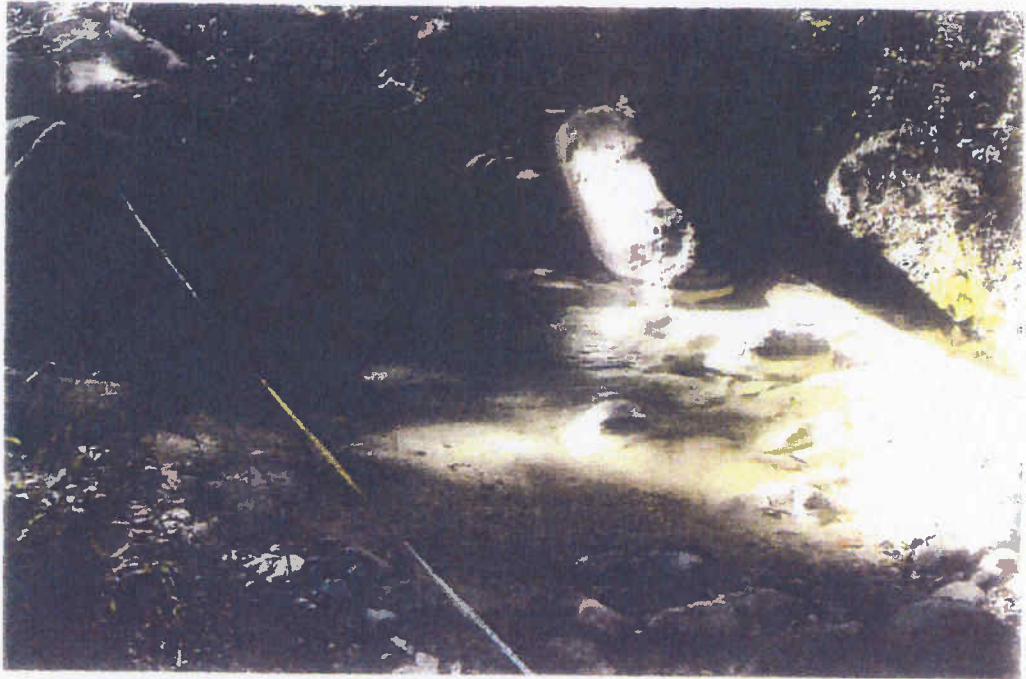


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Upper Hilton Creek



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Upper Hilton Creek



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Upper Hilton Creek



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Upper Hilton Creek



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Upper Hilton Creek



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Upper Hilton Creek



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