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John McCamman, Chief Deputy Director
California Department of Fish and Game
1416 Ninth St.
Sacramento, CA 95814

Re: *California Hatchery Operations Environmental Impact Report (EIR) / Environmental Impact Statement (EIS)*

Dear Mr. McCamman,

Thank you for the opportunity to comment on the *California Hatchery Operations Environmental Impact Report (EIR) Environmental Impact Statement (EIS)*. I have chosen to comment on this document because I have grave concerns about your stock transfer of hatchery juveniles off-site and the implications for the long term survival of wild Pacific salmon populations throughout the State, but especially in the Central Valley. The evidence presented in the EIS/EIR demonstrates that California Department of Fish and Game (CDFG) and U.S. Fish and Wildlife Service (USFWS) stock transfer of millions of Chinook salmon juveniles annually to the Delta is causing a swamping of wild population gene resources and is a major contributor to the on-going stock collapse. This should precipitate immediate action to stop Delta out-planting but instead the EIR/EIS calls for yet another study leading up to "Hatchery Genetic Management Plans." The failure to explicitly frame cessation of stock transfer of Central Valley hatchery Chinook salmon as an alternative is negligent and fails sufficiency under both the California Environmental Quality Act (CEQA) and the National environmental Policy Act (NEPA).

The EIR/EIS fails to note that appropriate action was taken in the Klamath-Trinity Basin to cease off-site hatchery plants after they were found to cause a high stray rate, potential for loss of genetic diversity and problems with competition for wild fish (Kier Associates 1999). Klamath-Trinity basin Tribal leaders and heads of agencies subsequently set limits on hatchery releases (CDFG 1992). Similar action is needed immediately in the Central Valley and is decades overdue. While the main body of my comments is regarding Central Valley stock transfers, I also touch on other hatchery issues such as competition in the Klamath-Trinity between wild and hatchery fish and small scale culture by grass-roots restoration groups.

My Qualifications

I have been a consulting fisheries biologist with an office in Arcata, California since 1989 and my specialty is salmon and steelhead restoration. I authored fisheries elements for several large northern California fisheries and watershed restoration plans (Kier Associates 1991, Pacific Watershed Associates 1994, Mendocino Resource Conservation District 1992) and co-authored the northwestern California status review of Pacific salmon species on behalf of the American Fisheries Society (Higgins et al. 1992). I have a broad background in assessing hatchery operation and issues such as competition between hatchery and wild fish and genetic preservation in native populations, which I will recap briefly below.

In 1986, I assisted the Humboldt Chapter of the American Fisheries Society (Humboldt AFS, 1986) in preparation of a stock transfer policy resolution that was sent to the California Department of Fish and Game. The resolution called for a cessation of inter-basin transfers of north coast steelhead that was common at the time and was subsequently curtailed. I wrote chapters on the use large and small scale fish hatcheries in restoration in addition to addressing compatibility of stocking levels with maintenance of wild Pacific salmon populations and their gene resources. When fall Chinook salmon escapement failed to meet Pacific Fisheries Management Council (PFMC 1994) floor population levels (35,000 wild fish) from 1990-1993, I participated on a committee to discern causality of under-escapement. The committee ultimately recognized the relationship between over-planting at Iron Gate and Trinity River Hatchery in severe drought years and the Klamath-Trinity stock collapse (PFMC 1994).

Since 1994 I have been working on a regional fisheries, water quality and watershed information database system, known as the Klamath Resource Information System or KRIS (www.krisweb.com). This custom program was originally devised to track restoration success in the Klamath and Trinity River basins, but has been applied to another dozen watersheds in northwestern California and includes hatchery data where it is available.

Problems with California Central Valley Stock Transfers and Loss of Wild Stocks

Planting hatchery fish away from the hatchery has well recognized side effects on straying and subsequent impacts on wild fish populations. The CDFG and USFWS practice of taking millions of Central Valley hatchery Chinook salmon down river or to the SF Bay-Delta for planting is having a disastrous effect in this regard. Planting juvenile fish away from the hatchery instead of releasing fish on site causes increased adult straying when fish return from the ocean to spawn (Royal 1972). The number of hatchery fish spawning with a wild population and the number of years the straying occurs is a key determinant of whether genetic damage will occur (Riggs 1990). Riggs (1990) studied hatchery practices needed for conservation of wild fish stocks in the Columbia River basin and the following excerpts reflect findings regarding the effects of outplanting smolts:

> "Straying of wild fish was the means of colonizing most drainages in the Columbia River basin covered by the last ice sheet and still represents a potential source of new genetic material. Straying by hatchery fish, however, may be a detrimental infusion of genes into wild stocks if large numbers of hatchery fish stray and if their genetics makeup is significantly different from the wild stocks.
>
> The accuracy with which hatchery fish return to the hatchery or stream into which they are stocked is influenced by stocking and transportation practices. Straying rates increase if…..portions of the downstream migration route are bypassed (Hansen et al. 1989), and as the distance from between the hatchery or parental stream and release sites increases (Lister et al. 1981, Gunnerod et al. 1988). A high incidence of straying is generally unacceptable because wild stocks are adversely affected (Evans and Smith 1986)."

The state of scientific knowledge as of 1990, near the time when the off-site releases of Central Valley hatchery fall Chinook began, indicated that there would be significant adverse affects. Because the number of fish planted is huge and the practice has now gone on for four or five fall Chinook life cycles, loss of genetic diversity is likely significant.

The EIR/EIS recognizes problems with hatchery fish and wild fish, but fails to recommend appropriate action. Hatchery-wild problems acknowledged include competition, straying, hybridization with wild

fish, reduction of fitness including potential for domestication, decreased disease resistance, accumulation of deleterious mutations, and loss of genetic diversity. The EIR/EIS also states that "The potential magnitude of genetic effects depends on the species, number, size, and location of the hatchery fish released, as well as the potential overlap in spawn timing and habitat preferences between hatchery and native salmonid populations." Central Valley hatchery Chinook juvenile stock transfers constitute high risk on all counts:

1) The species transplanted include at-risk stocks of Pacific salmon, such as spring Chinook, and there is a high potential for genetic introgression as hatchery stocks released might spawn at the same place and time as wild stocks.
2) The number of fish transplanted has been in the tens of millions, which is a huge number of fish.
3) The size of fish planted is often larger than wild fish with which hatchery fish might be competing.
4) The location of the release is often far distant from the hatchery and data below from the EIR/EIS show that related straying is high.

A criteria not listed in the EIR/EIS is the duration of stock transfers and they have now been going on for nearly 20 years in the Central Valley. This is 4-6 Chinook salmon life cycles and this long term selection pressure has likely substantially compromised genetic diversity, but as the EIR/EIS points out there may be little sign until stochastic events put pressure on the populations.

Out-Planting and Stray Rates: The EIR/EIS cites data that indicates unacceptably high straying rates for hatchery Chinook salmon planted offsite down-river or in the SF Bay-Delta:

- "Stray rates for all Chinook released from the Feather River Hatchery were estimated to be 54% for those released in the Sacramento/San Joaquin River Delta as opposed to 8% for those released near the hatchery.
- On-site releases typically result in stray indices on the order of 5% to 10% while off−site releases result in straying indices as high as 90%, with higher indices as the distance from release point to hatchery increases.
- Mokelumne Hatchery fall-run Chinook released off-site (San Francisco Bay) strayed at higher rates than fish released on site. Only 6.5% of the tags from San Francisco Bay releases were recovered in the Mokelumne River, and only half of these fish were recovered at the hatchery. Other watersheds receiving strays from included the American River (31%), the Merced River (20%), the Stanislaus River (15%), the Tuolumne River (11%), the Feather River (10%), Clear Creek (4%), Battle Creek (2%), and Butte Creek (1%).
- Less than half (48%) of the tagged Merced River Fish Facility fall-run Chinook released into the San Joaquin River were recovered in the Merced River, with sizeable recoveries occurring in the Tuolumne River (22%), the Stanislaus River (10%), the American River (8%), the Feather River (8%), the Sacramento River (2%), the Mokelumne River (2%), and Butte Creek (1%)."

In fact the EIR/EIS readily admits that there has been a very significant loss of fall Chinook salmon diversity:

> "Williamson and May (2005) and Lindley et al. (2009) suggested hatchery fall-run Chinook have 'replaced' locally adapted populations. The stray indices reported here would suggest a significant gene flow from the hatchery stocking programs to the wild, as would reduced

abundance of less productive wild fish under a mixed stock harvest rate that exceeded 60% until the 1990s (Myers at al. 1998)."

The EIR/EIS also notes that a previous Joint Hatchery Review Committee (2001) "concluded that the only way to reduce the risk of fitness loss to existing spring-run Chinook salmon is 'to minimize interactions between hatchery and wild populations,' either by 'decreased hatchery production or selective harvest strategies,' or "by reducing the numbers of fish released off-site." Thus, the appropriate solution was recommended in a prior study, problems since release of that study have increased and still no appropriate action in recommended in the EIR/EIS.

Genetic Diversity: Acceptable Hatchery:Wild Ratio: The EIR/EIS states than an optimal hatchery:wild ratio is one where wild fish predominate (PNI >50%) and "for populations of high biological significance, the a PNI of 0.67 is desirable to ensure the long−term fitness of the population. These two reference points (0.5 and 0.67) for PNI are used here to index differences in the fitness impacts of integrated programs on wild populations with which they are associated."

The EIR/EIS then acknowledges that coded wire tag harvest studies of coastal California Chinook salmon catches indicate that "currently ~90% of the return could consist of hatchery fish. This is far more than the 33% estimated by Cramer (1989) for brood years 1978–1987, or the 10% to 65% estimated by Fisher et al. (1991) for brood years 1970–1984. However, the study by Barnett Johnson et al. (2007) was based on a small sample size in a single year of harvest, so results may not be representative of hatchery composition in all years. Better estimates will be available in the coming years from a recently implemented, more extensive CWT tagging program of fall-run Chinook."

Despite the latter disclaimer, Central Valley escapement data not cited in the EIR/EIS confirm the 90:10 hatchery to wild fish ratio (Figure 1). Long term datasets for escapement 1952-2008 show not only a dramatic increase in hatchery returns but also a major shift from wild mainstem and tributary spawners to extremely high Battle Creek returns driven by Coleman National Fish Hatchery. For example, in 2003 over 450,000 adult Chinook salmon crowded into Battle Creek (Figure 2) far greater than the carrying capacity. Guides with whom I am acquainted (Kirk Portocarrero, personal communication) say that the fishing above Battle Creek is no longer productive, which I ascribe to loss of wild fish production in the mainstem and tributaries further upstream.

Thus, the ratio of hatchery fish to wild fish far exceeds recognized danger levels for maintaining wild stocks yet the action most needed to reverse this problem and allow wild fish to rebound is not recommended, that is to reduce hatchery planting levels and discontinue out-planting. It is highly likely that the decrease ion genetic diversity is causing Central Valley salmon stocks to approach "monoculture" status found in industrial agriculture and which is incompatible with long term survival.

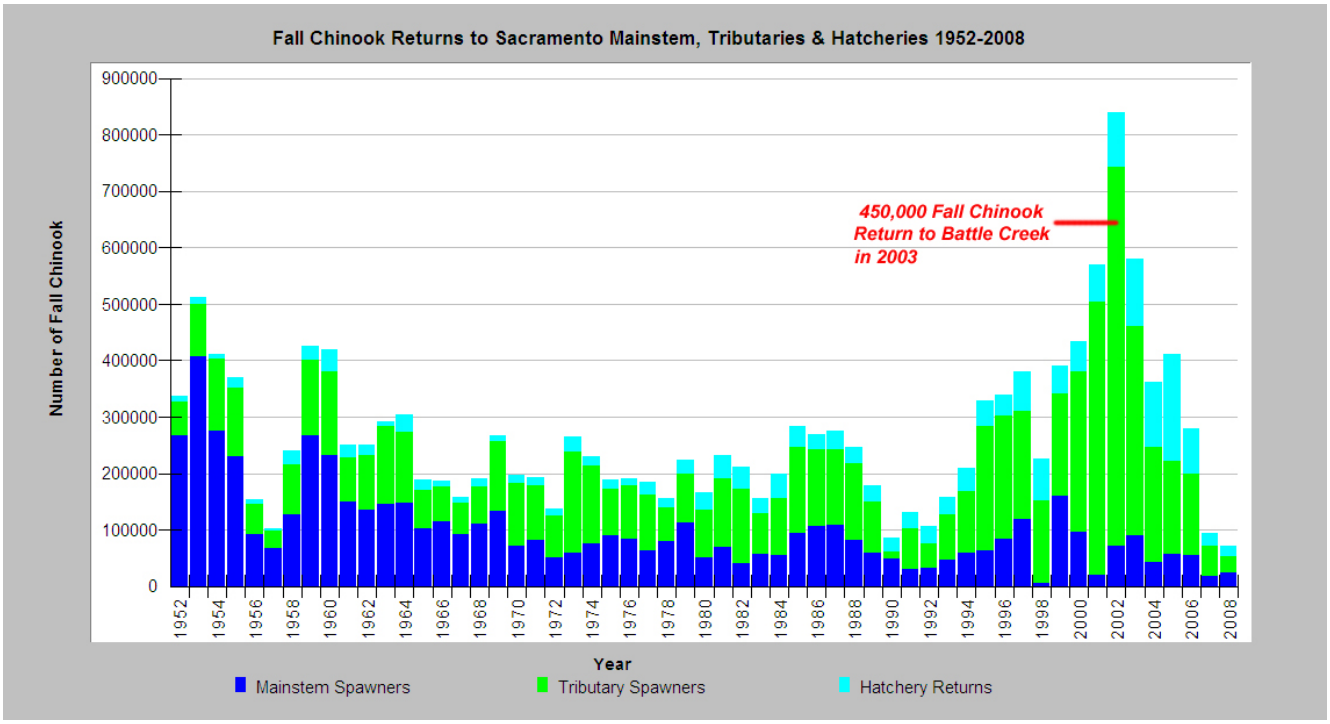

Figure 1. Fall Chinook escapement trends for the Sacramento show a major shift towards hatchery fish after 1995 and straying in this period has caused a decline in wild stocks to 10% of the run or less. Battle Creek spawners that make up the bulk of tributary returns are mostly Coleman Hatchery fish.

Figure 2. Thousands of hatchery fall Chinook salmon crowd Battle Creek near the Coleman Hatchery fish ladder.

Unacceptable Solution: As a solution to stock transfer problems the EIR/EIS offers only measure BIO139, which is to complete Hatchery Genetic Management Plans. In fact the evidence is clear that current practices are extremely deleterious to wild fish and caused a significant and possibly irretrievable loss of wild Central Valley Chinook salmon genetic diversity. The study amounts to "foot dragging" as does the appointment of yet another independent hatchery scientific review panel (HSRP). As noted above, the previously constituted committee given this charge told them to reduce or eliminate out-planting, which is the only responsible policy at present.

Central Valley Stock Collapse, Ocean Conditions and Chinook Salmon Escapement Trends

The EIR/EIS cites Hare et al. (1999) but fails to properly recognize the interaction of ocean productivity cycles such as the Pacific Decadal Oscillation (PDO) and the relationship to Central Valley hatchery returns. Collison et al. (2003) point out that Pacific salmon follow climatic and oceanic cycles associated with the PDO (Hare, 1998, Hare et al., 1999) where positive ocean cycles coincide with wet on-land conditions for a period of about 25 years, then alternate with ocean conditions prone to warm El Nino conditions and periods of lesser rainfall. Positive PDO conditions prevailed from 1950-1975 and negative ocean and dry on-land conditions prevailed between 1975-1998.

CDFG and USFWS continued high levels of smolt planting despite a switch from negative PDO conditions to productive ocean and wet on-land conditions after 1998 (Collison et al. 2003). The result of more favorable ocean conditions was very high survival rates for hatchery Chinook salmon, especially those planted in the SF Bay-Delta (Figure1). The result was a virtual plague of hatchery fish with a propensity to stray into all watersheds harboring wild fish. Upwelling failures in 2004 and 2005 contributed to the stock collapse in 2007 and 2008, but stocks failed to rebound once ocean conditions returned to productive (Lindley et al. 2009).

The take home message on potential for rebuilding Central Valley Chinook stocks is that there is a much better chance of restoring wild runs, if actions are taken before a switch in the PDO to poor ocean productivity and dry on-land conditions that will occur sometime between 2015 to 2025. If CDFG and USFWS delay action for several more years, the ability of wild fish to rebound will be much diminished.

Reduce Klamath-Trinity Hatchery Fish Competition

Kier Associates (1999) documents efforts in the Klamath-Trinity basin to lessen the impact on wild fish of competition with hatchery fish and to control hatchery outputs to avoid over-planting that contributed to the 1990-1993 stock collapse (PFMC 1994). None the less, hatchery:wild ratios of fall and spring Chinook salmon in the Klamath-Trinity basin are trending more towards hatchery dominance, although they remain healthier than those described above for the Central Valley. As an angler, I have been an eye witness to the amount of competition exerted on wild fish juveniles, especially when the 2 million spring and fall Chinook yearlings are released in October. Hatcheries make ideal sites for controlled experiments and it is time that releases were adjusted to water years and carrying capacity and that lower levels of releases be tested to see if similar or even greater smolt survival and adult returns result, as well as substantially reduced competition for wild fish.

Small Scale Hatcheries/Ocean Net-Pens

Results from Noyo River and Upper Eel Missing: The EIR/EIS addressed small scale rearing facilities, but failed to mention the Noyo River hatchery operation targeting coho salmon operated by CDFG at least through 1999 (Figures 3 & 4). Brown et al. (1994) recognized the Noyo River as having one of the last populations of coho salmon in the hundreds in northwestern California. The EIR/EIS needs to include discussion of this facility, whether CDFG is considering re-opening it and information on why such actions were taken. Similarly, small scale rearing has been on-going on the upper Eel River with adult fish collection at Van Arsdale Dam. Again, this facility was considered critical for maintaining upper Eel River salmon and steelhead populations and if cultural operations are being discontinued, the final EIR/EIS should include a discussion of why. Data regarding final hatchery releases and adult

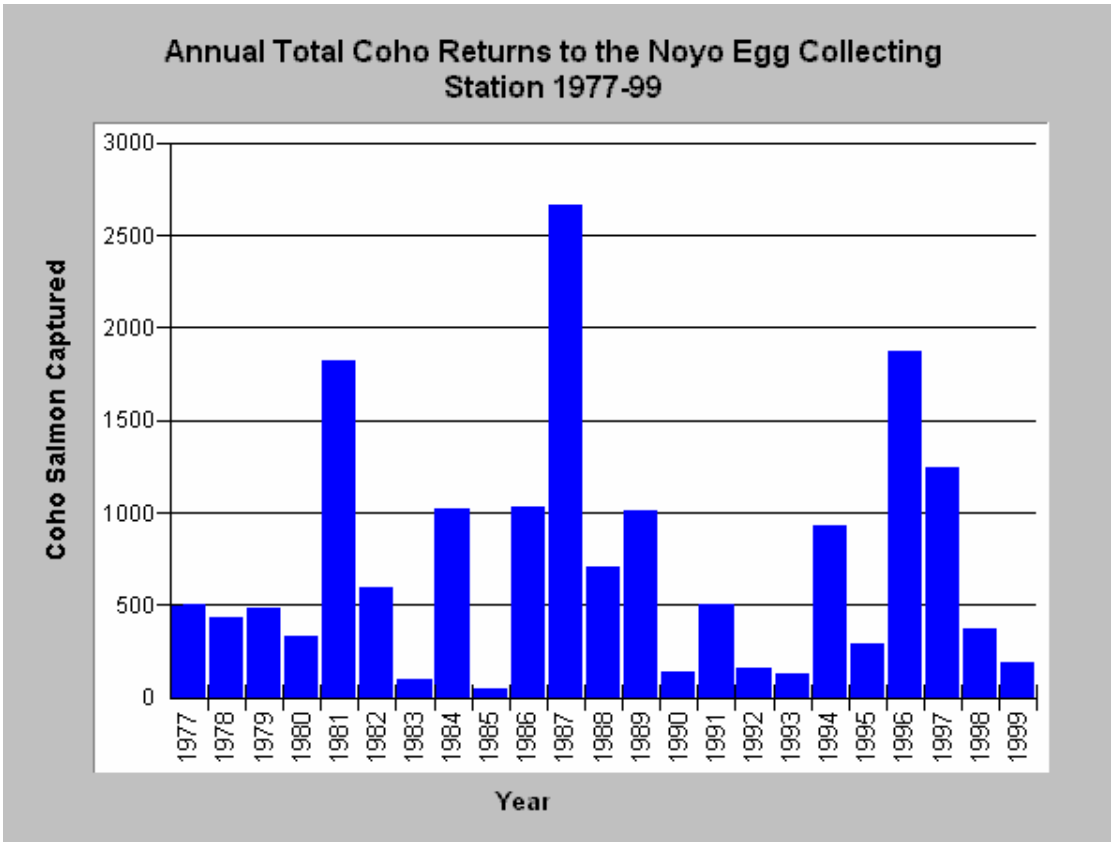

Figure 3. Coho salmon adult returns to Noyo River small scale egg collecting facility show problems with very low returns following the drought years of 1986-1990. Data from KRIS Noyo.

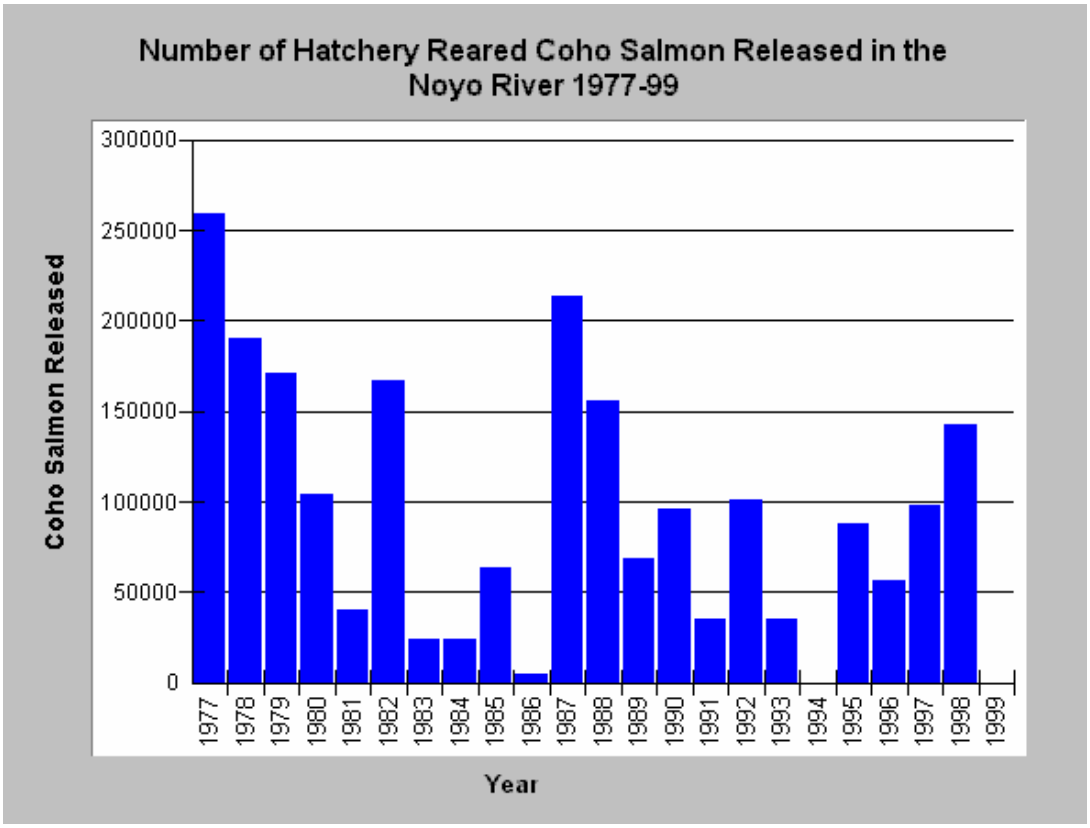

Figure 4. Coho salmon planted in the Noyo River by CDFG from 1977-1998. Chart from KRIS Noyo.

returns for both the Noyo River and Van Arsdale Hatcheries needs to be released and included so that the public can assess ultimate success or failure of these operations.

Small Scale Rearing Assumptions Not Met: CDFG needs to do a full genetic review of small scale hatcheries to make sure that genetic drift due to small population size is not occurring (PWA 1994). When brood size of adults available for culture drops to a low level inbreeding depression may occur that causes a loss of fitness even when numbers of returning fish are stable or increasing. Discussions of related problems in the EIR/EIS are lacking.

Net-Pen Rearing: The EIR/EIS is also found wanting in terms of dealing with straying of Chinook salmon from central coast net-pen ocean rearing facilities. Excess fingerlings from Central Valley hatcheries are used to supply net-pens and the smolts are fed and then released to the ocean. Although this provides for a sport fishery in areas that would not otherwise have one, it creates the potential for ecological havoc when Chinook return to small streams, such as San Luis Obispo Creek where they never occurred naturally. Problems include competition and potential for horizontal transmission of disease to at-risk central coast steelhead populations. Such transplanting is reckless and should not be continued.

Conclusion

The *California Hatchery Operations Environmental Impact Report (EIR) / Environmental Impact Statement (EIS)* is very disappointing and is not sufficient to meet CEQA and NEPA requirements. Two stated criteria for alternative development are not met and demonstrate this lack of sufficiency. 1) The alternatives presented will not "avoid or minimize potential significant effects on native, sensitive, or legally protected fish and wildlife species" and instead will cause fall Chinook salmon to further decline. Instead of allowing for "long-term recovery and survival of native fish stocks in California waters," lack of action to cease stock transfers of hatchery Chinook to the SF Bay-Delta and failure to increase flows will hasten their extinction.

CDFG and USFWS do not want to plant fish at their hatcheries of origin because survival through the Delta is so low. There is an urgent need to increase flow low levels for juvenile survival and San Francisco Bay-Delta function, but CDFG is failing to press for this action from the California Department of Water Resources (CDWR) and the U.S. Bureau of Reclamation (BOR) and USFWS has no authority. It is clear that transplanting hatchery fish has been used to mask the decline of wild salmon and that decades of this practice have caused a shift from a 90:10 wild fish to hatchery fish ration in 1958 to the reverse at present. Continuing out-planting of millions of juvenile salmon annually, while not increasing flows, poses risk of irretrievable and irreversible loss of Pacific salmon genetic resources and the availability of salmon as a food source for all generations of Californians going forward.

Sincerely,

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