Hoopa Valley Tribe's
Fishery Harvest and Conservation Plan
For
Trinity River Coho Salmon
Summer 2015

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I. INTRODUCTION

This harvest plan is under authority of the Hoopa Valley Tribal Council (HVTC) who exerts both regulatory and enforcement jurisdiction on the Hoopa Valley Reservation.

This plan sets forth specific concepts and constraints for managing a selective fishery for hatchery-origin ("hatchery") Coho salmon (*Oncorhynchus kisutch*) on the Hoopa Valley Reservation which contains the lower 26 km of the Trinity River. The plan anticipates full mitigation at Trinity River Hatchery (TRH) and near full exploitation of hatchery Coho salmon. Conservation of non-hatchery-origin ("natural") Coho is affected through (1) selective removal of hatchery adults while passing natural Coho salmon upstream, and (2) a sorting weir in vicinity of Lewiston for regulating presence of hatchery spawners and collecting natural broodstock for use at TRH. Complementary hatchery practices such as envisioned in the California Hatchery Scientific Review Group (CAHSRG) recommendations for the Coho program at TRH are also discussed.

The HVT will conduct a selective fishery using a weir and targeting Trinity River Hatchery (TRH) Coho salmon commencing in mid-October through November of 2015. The selective fishery will occur within the exterior boundaries of the Hoopa Valley Reservation with an overall harvest impact of no more than 10,000 adult hatchery Coho salmon identified by the absence of the right maxillary bone[1]. The fish harvest weir shall be deployed in the main-stem Trinity River at or near the southern boundary of the Hoopa Valley Reservation (HVR). The HVT will determine how harvested fish will be allocated among ceremonial, commercial, and subsistence uses.

Trinity River Coho salmon are a part of the Southern Oregon and Northern California Coastal (SONCC) Evolutionarily Significant Unit (ESU) which were federally listed as "Threatened" under the Endangered Species Act (ESA) in 1997. The selective weir fishery shall be managed to pass natural Coho salmon above the facility unharmed. The HVT Fisheries Department shall provide extensive monitoring of the fishery to estimate total encounters with and harvest of Coho salmon. The fishery will be managed by guidelines of this plan and regulated by preseason amendment and in-season adjustments to Tribal fishing regulations as promulgated by HVTC.

II. Biological Basis of Plan

(a) Available Data

Annual estimates of Trinity River run-size of both Trinity River Hatchery and natural adults escaping to areas above Willow Creek Weir (typically sited within a few miles of the town of Willow Creek) have been compiled by the California Department of Fish and Wildlife, Arcata since 1978. Run size information above Willow Creek Weir (WCW, location indicated on Figure 1) may be enhanced by adding estimated harvest by tribal and non-tribal fisheries occurring in the Klamath and Trinity rivers below the weir site to estimate total river run. Seth Naman of NOAA Fisheries, Arcata, has

1 100% of all Coho salmon released from TRH have been marked with the removal of the right maxillary bone by CDFW staff since 1997.

tabulated annual harvest estimates for tribal and non-tribal fisheries in Klamath and Trinity Rivers, presumed ocean exploitation in non-directed fisheries, and annual WCW estimates for years 1997 through 2010 (Table 1). Mr. Naman has also attempted to estimate the ocean abundance for these run years. The combined ocean population of TRH and natural adult Coho salmon averaged 14,193 over this period. TRH adult Coho salmon represented an average 88% of the estimated total run size.

Present levels of exploitation of Trinity River Coho (natural and hatchery) are estimated from Table 1 and range from 8% to 14% with an average harvest rate of 11% across tribal and non-tribal fisheries for the period 1997-2010.

(b) Trinity Coho Natural Populations

The Trinity River is recognized as having three distinct sub-populations of Coho salmon, including (1) the Upper Trinity (North Fork Trinity River to Ramshorn Creek inclusive), (2) the Lower Trinity (Weitchpec to just below North Fork Trinity River confluence and tributaries excluding South Fork Trinity River), and (3) the South Fork Trinity sub-population (NMFS 2012). Together these sub-populations comprise the Interior-Trinity Diversity Stratum in the Central Coastal Diversity Stratum within the SONCC coho salmon ESU (Figure 1). The majority of high intrinsic potential habitat for Coho in Trinity River historically occurred in the upper reaches of the Upper Trinity Population. However, the spatial distribution of this population segment was much reduced with the construction of the Trinity River Division of the Central Valley Project (TRD-CVP) in 1963 which removed 109 miles of anadromy.

Preliminary ESA recovery objectives as expressed in minimum numbers of spawners for Trinity River Coho salmon have been proposed as 7,300, 3,900, and 970 adults for the Upper, Lower, and South Fork populations respectively (NMFS 2012). In contrast, the Trinity River Restoration Program (TRRP) cites a restoration goal of 1,400 adult naturally produced Coho for the entire Trinity Basin (USFWS 1980).

The WCW total run estimates for adult Coho salmon (e.g. Sinnen et al 2013) are inclusive of portions of all three sub-populations proposed by NOAA's 2012 recovery plan for SONCC Coho salmon. Notably, these estimates exclude natural Coho escapement to tributaries below the tagging/counting facility. The majority of potential Coho habitat below WCW lies within the Hoopa Valley Reservation (HVR) which is within the Lower Trinity River sub-population unit identified in NOAA 2012. Coho salmon monitoring data are limited for the HVR watersheds; where available, data are inconsistent across years. However, the Intrinsic Potential habitat for Coho salmon in Hoopa tributaries represents approximately 0.6% of the total IP across the SONCC ESU (NOAA 2012).

For purposes of discriminating natural Coho in Trinity Basin, all TRH Coho salmon have been marked with a right maxillary bone abscission since the 1997 release year (1994 brood year). Above WCW, an average 88% of the total run estimate for adult Coho were of hatchery origin for years 1997-2010 based upon recovery rates of hatchery marked fish. The large proportion of hatchery fish in annual river run estimates appears to influence the presence of hatchery fish in natural spawning areas. Sinnen et al. (2013), concluded that the proportion of hatchery adults spawning outside of TRH surpassed

the proportion returning to the facility in all but four years for the 1997-2010 period of record.

For the 1997-2010 period, an average of approximately 1,900 naturally produced adult Coho returned to Trinity River above the WCW (estimated by deducting the average 88% hatchery proportion from average total return). This value compares favorably with the TRRP objective of an average naturally produced adult return of 1,400 Coho salmon while falling well short of the aggregate Upper, Lower, and South Fork sub-population minimum numbers of natural adults anticipated in NOAA's recovery plan.

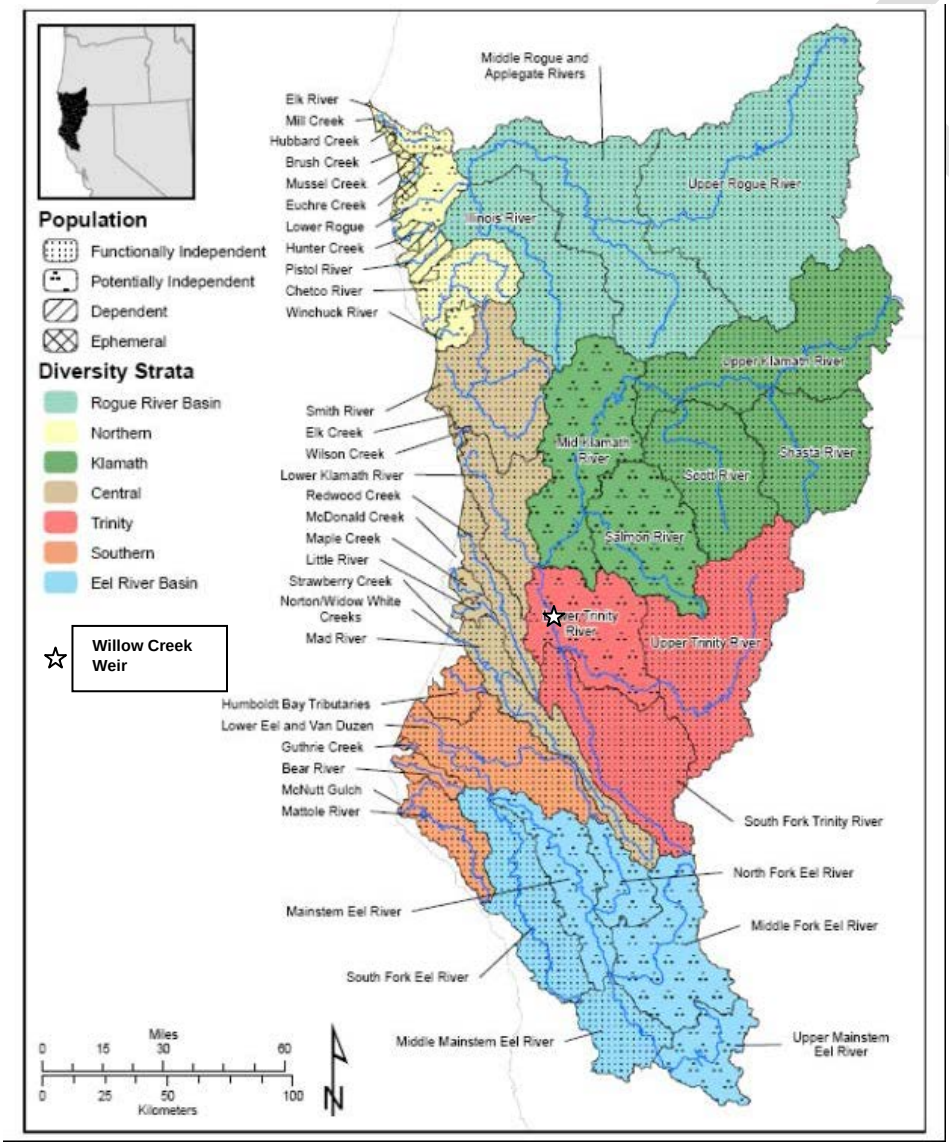

Figure 1. Diversity strata for populations of coho salmon in the SONCC ESU. From Williams et al. (2008), which cited Williams et al. (2006).

Table 1. Willow Creek (WC) Weir Run Size estimate of adult Trinity River hatchery and natural origin Coho salmon, estimated harvest by tribal and non-tribal fisheries, and Hoopa Valley Tribal net fishery harvest rate for return years 1997 through 2010. Ocean mortality and abundance as estimated by Naman, 2011 (personal communication).

Run Year	Marked and Unmarked adult estimated run size at WC weir	Proportion hatchery	Estimated Yurok harvest	Estimated Hoopa harvest	Recreational harvest upstream of WC weir	Recreational harvest downstream of WC weir	Ocean incidental	Ocean incidental mortality	Ocean abundance	Total adult harvest	Tribal and non-Tribal Fishing %	HVT harvest rate
1997	1,984	0.87	24	42	0	0	0.050	108	2158	174	8%	0.020
1998	10,109	0.89	130	142	0	0	0.117	1375	11756	1647	14%	0.014
1999	4,912	0.89	134	101	98	0	0.049	270	5515	604	11%	0.019
2000	10,046	0.97	73	233	0	0	0.060	657	11009	963	9%	0.023
2001	28,470	0.89	1356	606	0	20	0.030	952	31404	2934	9%	0.020
2002	14,307	0.97	340	347	0	40	0.077	1254	16288	1981	12%	0.023
2003	24,651	0.84	142	102	0	25	0.096	2646	27566	2915	11%	0.004
2004	33,063	0.73	721	392	40	10	0.086	3220	37446	4383	12%	0.011
2005	28,337	0.91	701	174	0	8	0.055	1701	30921	2584	8%	0.006
2006	18,709	0.92	262	480	0	0	0.052	1067	20518	1809	9%	0.025
2007	5,205	0.78	77	82	0	0	0.058	330	5694	489	9%	0.015
2008	7,604	0.84	543	315	0	6	0.010	86	8554	950	11%	0.037
2009	4,633	0.89	147	141	0	0	0.028	142	5062	430	8%	0.029
2010	6,669	0.88	237	302	0	0	0.100	801	8008	1340	17%	0.042
Average	14,193	0.88	349	247	10	8	6%	1,044	15,850	1,657	11%	2%

c. Trinity River Hatchery Coho Salmon

c.1. Hatchery Mitigation

The need for mitigation at TRH arose with creation of the Trinity River Division (TRD) of the Central Valley Project in California including construction of the Trinity and Lewiston dams that divert a substantial portion of the river's flow to the Central Valley of California for agricultural, and municipal and industrial uses. Lewiston Dam, completed in 1963, is the upstream limit of anadromy, blocking access to 109 miles of salmon and steelhead spawning and rearing habitat in the upper river (including significant reaches of Coho salmon habitat rated with high intrinsic potential by NOAA 2012). The Trinity River Hatchery (TRH) was constructed at the base of Lewiston Dam to mitigate for the loss of anadromous fish habitat above TRD. TRH is located at river mile 110 near the town of Lewiston in Trinity County.

Mitigation goals for lost adult production were determined from pre-project studies of anadromous fish populations in the basin which estimated that 5,000 coho passed above the Lewiston Dam site (USFWS and CDFG 1956). Escapement goals to Trinity River Hatchery were described as 2,100 Coho (USFWS 1980).

Only endemic Trinity River broodstock has been used at TRH since 1970 (CDFG 2002). Currently, the TRH annually releases approximately 500,000 yearling coho salmon at 10 to 20 fish per pound from March 15 to May 15. All are marked by a right maxillary clip. TRH collects 500 adult male and 500 adult female coho salmon to generate approximately 1,200,000 coho eggs annually.

c.2.Recommended future hatchery practices to complement this harvest management plan:

This harvest management plan anticipates integration with complementary hatchery management actions. A primary assumption is that TRH would continue to release 500,000 Coho salmon yearlings annually to meet mandated mitigation. TRH Coho broodstock selection should include a minimum of 10% (preferably 50%) natural spawners, consistent with CA HSRG Report (2012). Off-site capture of supplemental natural spawners would ensure adequate natural broodstock. We recommend that a fish sorting weir be cited within the first 4-6 river kilometers of Lewiston Dam for removal of hatchery adult coho and collection of natural coho broodstock. Natural adults not required for broodstock should be allowed to spawn above the weir in Trinity River.

d. Discussion

The prevalence of hatchery fish in natural spawning areas recorded in the past decade (Sinnen et al 2013) has a strong likelihood of reducing the reproductive success of individuals and fitness of the population at large (Christie et al 2014, Ve'Ronique et al 2011). This selective fishery is expected to lessen the probability of hatchery fish mating in the wild by reducing their overall proportion in the run, at a location downstream of the majority of natural spawner habitat. The plan is intended to maximize opportunity to the HVT fishery by accessing hatchery Coho through selective harvest.

This harvest and conservation plan provides benefit to natural Coho recovery in

Trinity River. Complimentary efforts which should be undertaken at TRH to encourage viability of an integrated hatchery/natural population through selective breeding practices are strongly encouraged. For example, we anticipate that TRH will be managed in a manner consistent with CA HSRG recommendations including incorporation of a high proportion of natural adults as broodstock utilizing off-site collection as needed.

Encouraging natural processes of selection on the integrated population is especially desirable in systems where investments are made to preserve or conserve natural fish habitat such as Trinity River (e.g. US DOI 2000). One method of measuring the degree to which natural selective processes are contributing to the integrated population was developed by Ford (2002). This metric is known as the "Proportion of Natural Influence" or pNI, a value between 0 and 1 that indicates the degree to which the integrated population is adapting to the natural environment (as opposed to hatchery selective forces). The greater the pNI, the less the potentially deleterious effects of hatchery selection on population fitness. A higher pNI is generally desirable, particularly in the case of protecting federally listed natural populations such as Trinity River Coho, a component of the Southern Oregon and Northern California Coast Evolutionarily Significant Unit (SONCC ESU) coho salmon. For example, the Fish Work Group of TRRP has recommended an interim pNI of ≥0.50 for all hatchery production at TRH.[2] The CA HSRG (2012) has recommended integrated populations achieve a pNI on the order of 0.70.

In the case of Trinity Coho, where the hatchery facility is at the terminus of anadromy, the trajectory of pNI is affected by two simultaneous processes. First, hatchery fish migrate the entire length of the system to reach their natal hatchery. In the course of migration, these fish have the opportunity to stray into adjacent tributaries and/or may spawn with other hatchery fish or natural fish outside of the hatchery. Second, natural fish enter TRH, albeit in fairly low proportion to the hatchery fish. The degree to which management may manipulate these processes determines the resulting pNI.

One approach recommended by the CA Ad Hoc Group (Naman 2009) to increase pNI was to reduce overall production at TRH from a release objective of 500,000 to 200,000 yearlings in concert with integrating natural adults into the hatchery broodstock. This approach is infeasible due to the departure from mandatory mitigation associated with the TRD of CVP requiring the release of 500,000 Coho yearlings annually from TRH. Therefore, this management plan seeks to increase pNI by limiting hatchery parents from invading natural spawning areas.

This management plan seeks to remove surplus hatchery spawners at a point low in the Trinity watershed to lessen the prevalence of hatchery fish mating in natural areas thereby increasing pNI. A selective capture weir shall be positioned within the boundaries of the Hoopa Valley Reservation and fished from early October through mid-November with the objective of removing as many adult hatchery Coho as possible while safely passing natural Coho salmon. Selective removal of hatchery fish shall also

[2] Fish Work Group, TRRP. 5 December 2013 Management Linkages to Means Objectives Excel worksheet.

result in a greater proportion of natural adults among the hatchery brood stock.

This plan calls upon hatchery co-managers to incorporate no less than 50% natural broodstock at TRH. Achieving this objective would likely require off-site capture of natural adult Coho salmon. An additional benefit of an off-site collection facility, such as a sorting weir in vicinity of Lewiston, CA, would be the ability to further restrict hatchery parents from spawning in natural areas within proximity of TRH. This area is also the focus of major habitat restoration actions by TRRP.

III. Management Action:

The objective of this management plan is to increase harvest opportunity for members of the Hoopa Valley Tribe while advancing Coho salmon recovery through selective harvest of TRH fish. The plan anticipates full mitigation of 500,000 yearlings planted by TRH and an 80% exploitation of hatchery Coho salmon relative to the 1997-2010 run estimates at Willow Creek Weir (Table 1). Conservation of natural Coho is affected through selective removal of hatchery adults, operation of a weir in vicinity of Lewiston for brood stock collection, and implementation of co-manager approved[3] CA HSRG recommendations for Coho program at TRH.

The HVT intends to construct and operate a selective capture weir positioned low in the Trinity River Basin, within the Hoopa Valley Reservation (HVR). The weir is intended to harvest TRH adult Coho, recognized by the absence of the right maxillary-bone. The objective for the fishery is to enable the Tribe to exercise its fishing rights while lessening impacts upon naturally produced Coho.

Conservation objectives of this plan are to maximize natural area spawning of natural Coho by reducing the proportion of TRH fish in natural areas while ensuring adequate adult Coho returns to TRH to meet mitigation objectives. The plan also recommends incorporating 50% natural Coho broodstock at TRH with potential need to gather natural broodstock offsite.

Exclusion of hatchery fish in natural spawning areas is initially achieved through selective weir harvest on HVR. In the years 1997 through 2010 an estimated average of 12,489 TRH and 1,703 natural adult Coho salmon have returned to Trinity River above Willow Creek weir to spawn in natural areas and TRH. Hence, in any given year, a selective harvest weir trapping seven days per week, day and night, within HVR may encounter an average of 14,193 adult fish with as many as 12,489 being hatchery origin assuming the weir were 100% effective. Realistically, any weir will be less than 100% effective. However, adjustments to assure meeting hatchery broodstock needs could include manually passing some hatchery fish to escape above the facility. Another alternative would be to transport needed broodstock to TRH by truck directly from the facility there by furthering the objective of excluding hatchery fish from natural spawning areas. To further conserve needed broodstock, the selective fishery would target an 80% harvest rate of the average run of hatchery spawners. This would result in an expected harvest of 10,000 adult hatchery Coho on average, conserving approximately 2,500 hatchery adults for brood stock.

[3] Trinity Hatchery Memorandum of Agreement, July 2014, co-managers include HVT, YT, CDFW, and USBoR

The cost for the operation would be personnel needed to operate the weir (six full time staff for 8 weeks to include weir installation/removal and operation; two staff each trapping day on alternating schedules resulting in four staff to cover seven trapping days per week with an additional two staff to cover night shifts. Total is six full time staff). A processing facility capable of processing 10,000-20,000 adult coho salmon over a six week period would need to be constructed to convert the fish into consumable product. This proposal accomplishes two parallel objectives, improving the prospects for species recovery while maximizing the mitigation function of the hatchery as part of the federal trust responsibility to protect reserved tribal fishing rights.

Ensuring adequate broodstock of both hatchery and natural Coho at TRH is of concern. Given there is no basis for annual run size forecasting, this plan limits the impact to TRH- Coho to 80% of the historic run size. The objective is to ensure a minimum of 1,000 adult Coho would return to TRH annually. Over the period 1997-2010, an average 6,300 adult Coho of both hatchery and natural volitionally entered TRH. Placement of a sorting weir in the Lewiston reach would further ensure adequate broodstock collection with an assumed objective of no less than 50% natural brood stock.

IV. Biological Concerns:

The selective weir fishery will target non-listed hatchery Coho who's recent abundance levels have significantly surpassed the abundance of natural Coho in the Trinity River. Natural Coho would be passed unharmed above the weir to continue their spawning migration. Removal of hatchery coho from the spawning migration above HVR is supportive of elevating pNI for the integrated hatchery/natural Coho population in Trinity River. Accordingly, biological impacts of the proposed action are viewed as positive with respect to advancing recovery of SONCC Coho. This plan sets a maximum mortality of 2% on natural Coho which are passed above the weir recognizing that some stress induced mortality may occur.

V. Management and Monitoring of the Fishery

Consistent with the Hoopa-Yurok Settlement Act, Public Law 100-580 participation in the selective-weir fishery will be limited to enrolled members of the Hoopa Valley Tribe and will occur within the boundaries of the Hoopa Valley Reservation. The weir fishery will commence approximately on 20 October and continue through 30 November unless biological data warrants early closure of the fishery (e.g. unanticipated stress related mortality of natural Coho). The fishery is intended to operate 7 days/week and under the general guidelines of the HVTC Fishing Ordinance.

The Tribal weir fishery will be constrained to removal of no-more than 10,000 hatchery adult Coho salmon and a 2% impact level on natural Coho relative to the numbers that are passed above the weir.

Hoopa Valley Tribal Fisheries Department (HVTFD) will summarize weekly estimates of harvest and report results to the HVTC on a weekly basis. Careful

attention will be placed on discriminating hatchery from natural fish. Further, the HVTFD will perform routine reconnaissance in the vicinity of the selective harvest weir to detect environmental and/or man-induced stress mortality to natural Coho. These results will be provided to the HVTC on a weekly, or more frequent basis if mortality exceeds 2% of the total number natural Coho passed above the weir.

Logistic Considerations for Hoopa Selective Harvest Weir

1. Weir would be deployed at a point nearest the Hoopa South boundary to avoid interactions with the gill net fishery. This reach also has favorable characteristics for weir deployment such as minimal valley constraint, relatively shallow contour and gravel substrate.
2. Dates for operation are approximately 20 October through 30 November. Installation date could vary to minimize conflict with the tribal member gill net fishery.
3. Hours of weir operation are 24 hours each day.
4. The weir will be operated by Hoopa Valley Tribal Members engaged in private contract with the HVTC (9 weeks total, which includes 1 week for installing, 6 weeks of fishing, one week for removal and storage). Contract fishers will observe a rotation of three-8-hour shifts with 4 fishers per shift.
5. Hoopa Tribal Fisheries Department staff will monitor and provide scientific support only during harvest and possible weir installation.
6. Fish will be captured in the weir "corral", marked fish will be removed to totes on trailers and unmarked fish will be delivered back to the river for upstream migration.

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