

State of California  
The Resources Agency  
DEPARTMENT OF FISH AND WILDLIFE

ANNUAL REPORT

2020 ANGLER CREEL SURVEYS IN THE LOWER KLAMATH RIVER



On the cover: Low tide in the Klamath River estuary.



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ANNUAL REPORT  
TRINITY RIVER BASIN SALMON AND STEELHEAD MONITORING PROJECT:

2020 ANGLER CREEL SURVEYS IN THE LOWER KLAMATH RIVER

by

Dan Troxel and Ken Lindke

Northern Region  
Klamath - Trinity Program

601 Locust Street  
Redding, CA 96001

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**ANNUAL REPORT  
TRINITY RIVER BASIN SALMON AND STEELHEAD MONITORING PROJECT  
2019-20 SEASON**

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**ABSTRACT**

A creel survey was conducted along the lower Klamath River (Pacific Ocean to Hwy 96 Bridge in Weitchpec) August 6, 2020 through November 4, 2020 to estimate the recreational fishery effort, catch and harvest of fall Chinook Salmon (*Oncorhynchus tshawytscha*), Coho Salmon (*Oncorhynchus kisutch*) and steelhead (*Oncorhynchus mykiss*). A goal of the creel survey is to help determine the contributions made by Trinity River Hatchery, Iron Gate Hatchery and naturally produced salmonids to the annual recreational harvest in the lower Klamath River. Information provided by the creel survey will help assess the production and harvest goals of the California Department of Fish and Wildlife and the Trinity River Restoration Program, in addition to providing real-time monitoring needed for in-season recreational harvest management.

In 2020, the fall Chinook Salmon fishery was open to recreational fishing. Results from the 2020 creel survey and subsequent Klamath River Technical Team meeting indicate an estimated harvest of 3,534 (3,152 adult and 382 jack) fall Chinook Salmon and 49 (35 adults and 14 half-pounders) steelhead for the lower Klamath River. The 2020 in-river recreational quota was 1,296 adult fall Chinook Salmon for the entire basin, with a lower Klamath River sector quota of 648 adult fall Chinook Salmon. Hatchery-origin fall Chinook Salmon represent an estimated 481 fish (13.61 percent) of the estimated harvest in the lower Klamath River, comprised entirely of Trinity River Hatchery (447 fish) and Iron Gate Hatchery (34) fish. Seasonal summaries and interannual comparisons of angler effort, angler harvest, harvest timing, length frequencies, hatchery compositions and coded-wire tag recoveries are presented.

## TASK OBJECTIVES

- Quantify total recreational harvest, angler effort, catch-and-release, and catch per effort of salmonids in the lower Klamath River.
- Determine the contribution to recreational harvest from fish produced at Trinity River and Iron Gate hatcheries.

## INTRODUCTION

The Klamath River basin is regarded as one of the most important contributors of Chinook Salmon (*Oncorhynchus tshawytscha*) to California's commercial, tribal and recreational fisheries. The salmonid resources are composed of both naturally produced and hatchery produced salmonids originating from the Klamath and Trinity Rivers. Angler harvest of Chinook Salmon has been monitored by the California Department of Fish and Wildlife (Department/CDFW) to provide data for run-size estimates since 1978 (Boydston 1979, 1980; Lee 1984a, 1984b, 1985, Lau 1992-1997; Pisano 1998; Borok 1999-2004, Hanson 2005-2009). This report presents the recreational creel survey results collected from the lower Klamath River between the river mouth at the Pacific Ocean and the Hwy 96 Bridge in Weitchpec from August 6, 2020 through November 4, 2020. The 2020 recreational fall creel survey continues CDFW's annual monitoring efforts and adds to existing recreational harvest baseline information.

A goal of the creel survey is to estimate the contributions made to the annual recreational fish harvest in the lower Klamath River by fish produced at Trinity River Hatchery (TRH), Iron Gate Hatchery (IGH) and in natural spawning areas. In addition, annual creel survey data helps measure progress towards meeting production and harvest objectives of the Trinity River Restoration Program and contributes to the management of fall Chinook Salmon stocks across the west coast by the Pacific Fishery Management Council. Information provided by the creel survey is also used by CDFW to determine, in real time, when recreational anglers have reached the in-river recreational harvest sub-quota of adult fall Chinook Salmon for each section of the lower Klamath River.

### Recreational Quotas and Harvest Management

Each year an annual harvest quota for adult (age  $\geq 3$ ) fall Chinook Salmon returning to the Klamath Basin is recommended by the Pacific Fisheries Management Council, which includes the non-tribal in-river recreational fishery. The quota is then considered and adopted by the California Fish and Game Commission. Of this quota, 50% is allocated to the lower Klamath River extending from the ocean to the Hwy 96 Bridge in

Weitchpec [river kilometers (rkm) 0.0 to 68.8], and the remaining 50% is allocated to the mid Klamath River (17%) (rkm 68.8 to 306.0) and the Trinity River (33%). No quota is assigned to jacks (age 2). The Department monitors or models each of these areas for fall Chinook Salmon harvest and determines when the quota of each portion has been met. Once a sub-quota in any of the sections is met, an adult Chinook Salmon harvest closure goes into effect in that section of river. Within the lower Klamath River sub-quota area, a closure is enacted at the mouth of the river (spit area) when 15% of the basin quota is caught downstream of the Hwy 101 Bridge. Under current regulations, anglers are also required to cease fishing in this area when the adult component of their daily bag limit is met. Anglers would still be permitted to fish in other areas but must release any adult Chinook Salmon (>23 inches, total length) caught. Note that a regulation change was implemented in 2020 to increase the jack/adult size cut-off from 22" to 23" total length. Meanwhile, anglers in other portions of the river are still permitted to catch and release adult Chinook Salmon in the process of catching the jack component of the daily bag. After all sub-quotas are met, fishing for jack Chinook Salmon and other legal species is still permitted, but the entire river is closed to the harvest of adult Chinook Salmon. However, once TRH and IGH have reached mitigation egg take goals, special exempted fisheries for adult Chinook Salmon are permitted in the Klamath River between Iron Gate Dam and Interstate 5, and in the Trinity River between the Old Lewiston Bridge and the mouth of Indian Creek.

During the 2020 season, fishing regulations allowed for the harvest of up to two Chinook Salmon per day, with no more than one adult. Possession limits were equal to three daily bag limits, or six Chinook Salmon, with no more than three adults. These regulations went into effect on August 15, 2020 in the Klamath River and September 1, 2020 in the Trinity River. Anglers were also permitted to harvest two hatchery trout or two hatchery steelhead (*Oncorhynchus mykiss*) per day. The limit of hatchery steelhead for the Trinity River was also two per day and four in possession. No harvest of Coho Salmon (*Oncorhynchus kisutch*) was permitted in the entire Klamath basin due to their current threatened status. Regulations stated that "hatchery" trout or "hatchery" steelhead could be harvested, which eliminates the harvest of cutthroat trout.

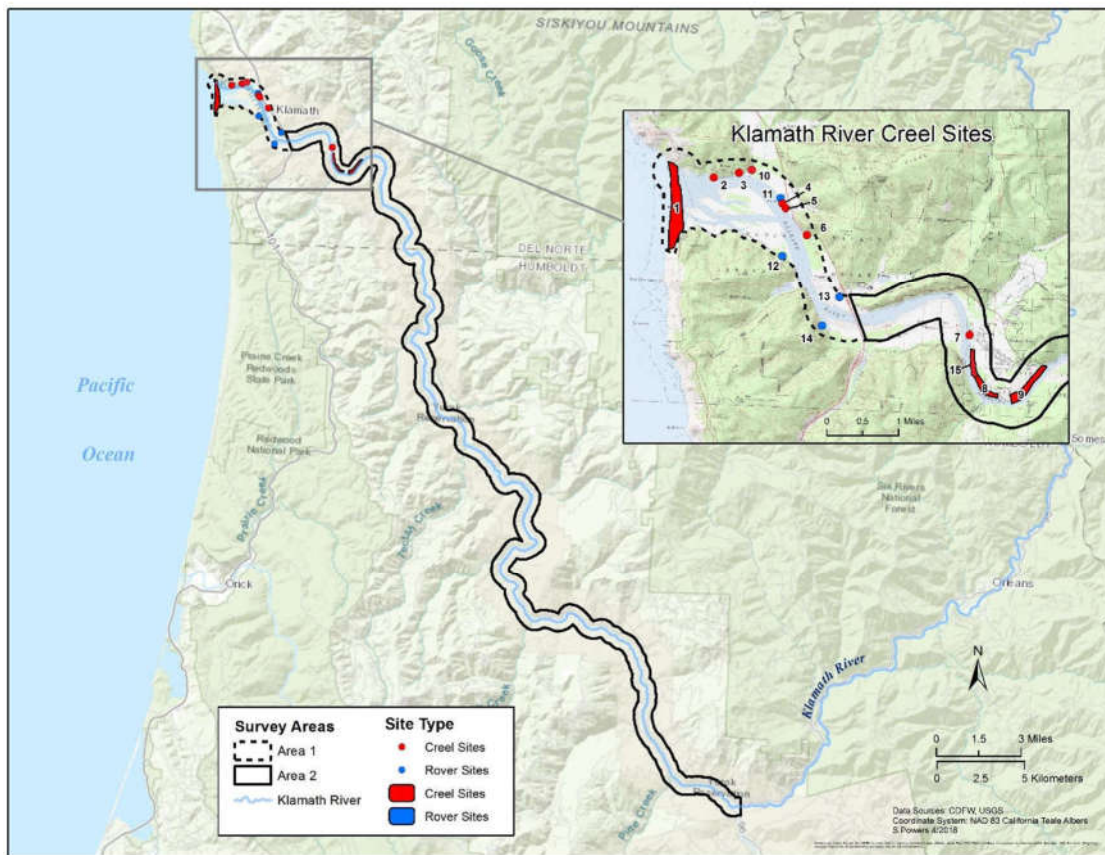
## **METHODS**

### Description of the Fishery and Creel Sample Areas

To estimate angler catch and effort, CDFW divides the mainstem Klamath River, from the mouth to Iron Gate Dam, into three areas. The mouth of the river to the Hwy 96 Bridge in Weitchpec (Areas 1 and 2) is included in this report. Areas upstream of the Hwy 96 bridge to Iron Gate Dam (Area 3) were not surveyed by CDFW in 2020. Chinook Salmon harvest in Area 3 is estimated using a ratio estimator based on catch



in Areas 1 and 2. Additionally, the lower Trinity River sector is estimated from Hoopa Valley Tribe creel survey estimates, and the upper Trinity sector harvest estimates are derived from tag returns from fish originally tagged at the Willow Creek weir operated by CDFW's Trinity River Project. Note that this report does not include these sectors, and only provides estimates for the lower Klamath River creel survey. For 2020, sites denoted in red in Figure 1 were active "creel" sites for stationary or roving components of the survey. Sites denoted in blue were inactive "rover" sites, indicating that samplers could periodically check them throughout the season to see if effort and/or ability to access the site develops. No rover sites were sampled in 2020.



**FIGURE 1. Map of lower Klamath River creel survey sites for 2020. Location names can be found in Table 1.**

**TABLE 1. Active and inactive sampling locations for the lower Klamath River fall creel survey.**

Site Name	Site #	Area	Active (Y/N)
Mouth (North and South)	1	1	Y
Requa Boat Ramp	2	1	Y
Panther Glen <sup>1</sup>	3	1	Y
*Riverside RV Park <sup>2</sup>	4	1	Y
Golden Bear RV Park <sup>2</sup>	5	1	Y
Townsite Ramp	6	1	Y
Roy Rook Boat Ramp	7	2	Y
Upper Klamath Glen <sup>3</sup>	8	2	Y
Blakes Riffle <sup>3</sup>	9	2	Y
Anglers Cove <sup>1</sup>	10	1	Y
Chinook RV Park	11	1	N
Kamp Klamath	12	1	N
Klamath RV Corral	13	1	N
Klamath River RV Park	14	1	N
Lower Klamath Glen <sup>3</sup>	15	2	Y

<sup>1,2,3</sup> = Adjacent sites; sampled concurrently

\* = Riverside RV Park was not sampled in 2020 due to Yurok Reservation closure

Area 1: This area consists of the 4.5 rkm between the mouth of the Klamath River and the Highway 101 bridge and is referred to as the estuary. Essentially all shore angling effort in this area took place at the mouth of the river. River mouth configuration, which changes annually, determines which side (north or south) affords better shore angling. Creel sampling of shore anglers was conducted primarily at the South Mouth, but anglers who accessed the mouth from the North side could be interviewed when intercepted by creel samplers.

Boat access locations in Area 1 include private resort docks and both public and private boat ramps below Highway 101 bridge. These include three resort docks (Golden Bear RV Park, Riverside RV Park, and Panther Creek RV Park) and two boat ramps (Old Townsite Boat Ramp and Requa Boat Ramp). All sites were sampled this season except Riverside RV Park, which was not sampled due to the Yurok Reservation COVID-19 closure.

Area 2: This area extends from the Highway 96 Bridge (rkm 68.0) in Weitchpec downstream to the Highway 101 Bridge at Klamath (rkm 4.5). The division between areas 2 and 3 was historically the falls at Coon Creek (rkm 54.4) near the community of Johnson's Riffle (Pecwan Creek), but it was moved to its current location in 1999 to make the distinction clearer for anglers.

Shore angling in the lower 5 rkm of Area 2 is generally confined to three popular and easily accessed riffles (Lower Klamath Glen, Upper Klamath Glen and Blake's Riffle). Angler access to these locations are limited to specific, well defined routes, which enables a complete accounting of angler effort and catch during a sample day at these

locations. Shore angling access upstream of Blake's Riffle is limited to three access points: the mouth of Blue Creek (rkm 26.3), the mouth of Ah Pah Creek (rkm 27.5), and Bear Riffle (rkm 29.8). Some of these points can be accessed by vehicle (some of which require access through private land) but have accounted for less than one percent of angling effort according to estimates in past surveys (Hopelain 2001). Boat traffic comprises the majority of effort in this area and is accounted for by data collected at the Roy Rook boat ramp.

Boat access in Area 2 is essentially confined to one public boat launch (Roy Rook Ramp), which enables complete sampling of angler effort and catch for each sample day. Occasional primitive boat launching occurs at the shore sites as well. During each sampling day in Area 2, creel surveys were conducted at all shore angling locations above Highway 101 bridge, and the boat access location (Figure 1 and Table 1).

### Creel Survey Methods

Study methods and procedures used in Areas 1 and 2 during the 2020 season were essentially the same as those described for the 1983 - 1987 seasons (Hopelain 2001). Data are presented in standard Julian week (JW) format throughout this report. During the 2020 survey season, Julian weeks began on Thursdays and ended on Wednesdays (Appendix 1). Catch-and-release data are expanded in the same manner as harvest data in each area.

Selection of sampling days for 2020 was a simple random sample per JW, as no statistically significant difference in effort has been found between weekdays and weekend days. Areas 1 and 2 were each sampled three days per week, with no concurrent sampling of each Area. Beginning with JW 40 (week beginning October 1), two days per JW in each area were randomly selected to be surveyed. As a result of this sampling design, each area was surveyed three times per JW between August 6<sup>th</sup> and September 30<sup>th</sup>, and twice per JW beginning October 1<sup>st</sup>. Survey effort was decreased in October to accommodate personnel needs with concurrently operating field surveys and in response to diminished angling effort later in the season.

Each angling access site was sampled throughout the day to account for total catch and effort for that particular site. CDFW scientific aids interviewed anglers as they departed fishing grounds and recorded the following information:

1. Was the angler or boat finished fishing for the day at this time?
2. What Area did the anglers' effort or catch come from? (Boats only)
3. Total hours spent fishing (to the nearest half hour).

4. The first three numbers of their ZIP Code (to identify general area of origination).
5. Harvested fish were identified to species, inspected for marks, external tags and unusual conditions, and measured to the nearest centimeter fork length. Also, a scale sample was collected for the purpose of aging the fish.
6. For Chinook Salmon missing an adipose fin, indicating presence of a coded wire tag, the head was removed and retained by staff.
7. The number and species of fish caught and released (actually released, not lost) was recorded by age class (grilse or adults) as reported by the angler.

### Stationary and Roving Sampling

As noted above, sampling locations are relatively stable, but the survey does allow for effort shifts. New effort locations can be captured in the roving component of the survey.

In Area 1, stationary samplers were primarily located at three sites, River Mouth (South Access), Golden Bear RV Park, and the paired sites of Panther Glen and Anglers Cove Resorts. These individual access locations (three sampling sites) account for most of the recreational angling effort in Area 1. The roving sampler then primarily surveyed Requa Boat Ramp, Townsite Boat Ramp and River Mouth (North Access).

In Area 2, stationary samplers were located at Roy Rook Ramp, while Blakes Riffle, Klamath Glen, and primitive boat launches in the area were surveyed by a roving sampler.

Addition or subtraction of sampling sites is primarily based upon dominant effort levels as they occur over multiple seasons. Unless dictated by a drastic shift in effort locations, stationary and roving sites remain the same throughout an entire survey season. For 2020, all sampling sites remained constant throughout the season.

### Harvest and Effort Estimating Procedures

Angler harvest, catch and release, and angler effort were estimated for each Julian week, creel survey area, and mode of angling (for Area 1 only) as follows:

$$\hat{Y}_j = \sum_{i=1}^n y_i I_i \left( \frac{N_j}{D_j} \right)$$

where:  $\hat{Y}_j$  = estimated harvest, catch and release, or effort in the  $j^{\text{th}}$  week  
 $y_i$  = total counts of harvest, catch and release, or effort on the  $i^{\text{th}}$  day  
 $N_j$  = number of legal fishing days in week  $j$

$n_j$  = number of sample days in week  $j$

$I_i$  = sampling ratio on day  $i = \frac{\text{Total anglers or boats enumerated on day } i}{\text{number of anglers or boats sampled on day } i}$

Area 1: Angler harvest, catch and release, and angler effort were estimated separately for boat and shore angling groups in Area 1, then added to give an estimate of weekly totals. Estimation methods are the same for “mode of fishing” used by the angler. For shore-based recreational anglers, we record and account for missed anglers, refusals and language barriers, all of which are counted as missed interviews and thus expanded for by  $I_i$  in the above equation. Anglers who access fishing grounds by boat, regardless of whether the boat is used for angling or simply for transport to a shore angling location, are expanded for in a similar manner. The exception is that a missed, refusal or language barrier boat is denoted on the field data with the boat being the sampling unit (as opposed to individual anglers on the boat). Missed boats are then factored into daily expansion within  $I_i$  as described above. Secondly, the roving component of the survey captures additional interviews and missed anglers/boats, refusals and language barrier data. Thirdly, there are some sites in Area 1 that have private boat access but do not allow CDFW staff on site. Samplers at neighboring sites monitor boats at inaccessible sites by recording the number of unsampled boats that return to those locations in a day. Combining all of these sources for daily expansion data, estimates of total effort for the given sampling area can be made for the entire day. It is important to note that there can also be substantial tribal fishing effort in Area 1, and samplers are trained to identify tribal shore anglers and boats using best judgement. Boats used in the tribal gill-net and subsistence angling fisheries are excluded from all counts.

For shore-based anglers, essentially all effort is captured from the River Mouth (South Access). However, the roving sampler collected additional data on shore-based anglers on the North side of the mouth, thus providing complete information for daily expansions of shore-based angling.

Area 2: Harvest estimates for the area upstream of Hwy 101 to the Hwy 96 Bridge at Weitchpec were calculated in the same manner as described above, with minor changes to sampling protocol. Boat access is almost exclusively limited to the one developed boat ramp in Area 2 (Roy Rook Ramp), but anglers may self-launch boats at the shore fishing sites as well. Samplers working the shore sites interview primitive boat launch anglers as available, or may note them as missed, refusal or language barrier as normal. The daily expansions for boat effort are calculated as described above, with the exclusion of any offsite missed boats, as this is unique to Area 1.

For shore-based effort, a roving sampler monitored effort along the three adjacent shore sites. Samplers conduct periodic effort counts to enumerate anglers throughout the day

at each individual site. This, in conjunction with the number of completed interviews and missed anglers, refusals or language barriers is used to estimate the total number of angler trips for the day,  $I_i$ , in the equation above.

### Daily Real-Time Harvest Estimates and Projections

The Klamath River Project monitors harvest rates in near real-time based on data provided from each sampling day. It is necessary to monitor current harvest and effort after each survey day as the fishery approaches an area or sub-area quota to implement fishery closures. The Department can generate one, two, and three-day harvest projections as needed, to allow lead time for potential adult Chinook Salmon fishery closures, as the regulatory process for closure usually takes two to three days. Harvest projections are used for the sub-area quota below Highway 101 bridge which triggers the full closure of the fishery at the mouth of the river, as well as the closure for adult Chinook Salmon harvest for the remaining lower river quota. Additionally, the lower river closure date is used as a guideline for implementing the closure of the mainstem Klamath sector from Iron Gate Hatchery to the Highway 96 bridge at Weitchpec and the upper Trinity River sector from Old Lewiston Bridge to Cedar Flat.

### Age Classification for Chinook Salmon and Steelhead

Recreational fishing regulations identify the size of adult Chinook Salmon as greater than 23 inches (58.4 centimeters) in total length. For management purposes, CDFW uses 22 inches (55.9 cm) fork length (FL) to make adult - jack determinations during the season and for real-time quota monitoring (this measurement is equal to the 23" regulation total length). However, the actual length separating jacks from adults varies among years, and proportions of each age class for Chinook Salmon are determined post season through scale analysis. Scales collected from harvested fish are mounted and read by the Yurok Tribal Fisheries Program and U.S. Fish and Wildlife Service, and proportions of each age class are estimated using bias corrections from known-age coded-wire tagged (CWT) hatchery fish collected within the harvest sample (KRTT 2021). Steelhead less than or equal to 42 cm FL are considered half-pounders, and those larger are considered adults.

### Coded Wire Tag Recoveries, Processing, and Estimation of Hatchery Proportions

Coded-wire tag recovery is an important component in the creel survey. Recovery of CWTs allows for estimation of hatchery proportions and hatchery of origin. Additionally, CWT recovery is important for establishing run-timing during the early part of the season when the fishery transitions from the spring run to the fall run. All heads from adipose fin-clipped fish collected either during angler surveys or as non-random recoveries are assigned individual head tag numbers, which allows tracking of each head through the CWT extraction and decoding process.

Approximately 25% of Chinook Salmon produced at TRH and IGH receive CWTs and are externally marked by removal of the adipose fin. Trinity River hatchery strives to mark 100% of steelhead by removing the adipose fin and both hatcheries strive to mark 100% of Coho Salmon by clipping the right (TRH) or left (IGH) maxillary bone. Successful clipping rates for Coho Salmon generally exceed 99% at TRH and IGH thus we assume a 100% marking rate. Successful marking rates of steelhead at TRH have generally exceeded 98% since 2006 (B. Matilton, Hoopa Valley Tribe Fisheries, unpublished data), so we also assume a 100% marking rate. Steelhead have not been produced at IGH since 2012. The proportion of total harvest attributed to hatchery Chinook Salmon is estimated by expanding recovered CWTs by hatchery production multipliers. Contributions of hatchery Coho Salmon (if illegally harvested) and steelhead to harvest in the lower Klamath River is estimated from the proportion of marked animals recorded by creel surveyors.

## **RESULTS**

Rounding to whole numbers may cause some minor discrepancies in the results. Spring-run Chinook Salmon numbers collected during the first weeks of sampling are included in some tables and are indicated as such.

### Estimated Angler Effort and Harvest

During the 2020 season, the creel survey for the lower Klamath River began on August 6 and ended November 4 (JWs 32 through 44). We estimate anglers made a total of 10,852 trips in Areas 1 and 2 combined, 3,437 in Area 1 and 7,415 in Area 2 (Table 2). These trips resulted in a total effort of 47,794 fishing hours.

Recreational fishery regulations for 2020 defined a cut-off date of August 14 as the end of the spring Chinook Salmon fishery. As the creel survey begins August 6, sometimes fall Chinook Salmon are harvested prior to the regulatory start of the fall fishery (August 15), or spring Chinook Salmon are caught after the fall quota begins. Estimated harvest of Chinook Salmon from August 6 to November 4 was 3,562 (Table 2). These data reflect the estimated harvest based upon length, which is used for in-season quota management as it relates to current fishery regulations. However, based upon post-season analysis of CWT recoveries and scale-age data, August 15 was designated as the cutoff between spring and fall Chinook Salmon harvest (KRTT 2021). This resulted in a corrected total harvest of fall Chinook Salmon being 3,534 (3,152 adults and 382 jacks) from August 15 through November 4, 2020, for the lower Klamath River (Table 3), and are the estimates used in the federal management process. Additionally, 49

Steelhead (35 adults and 14 half-pounders) were harvested during the creel survey. Zero Coho Salmon were estimated to have been harvested this season.

**TABLE 2. Summary of estimated angler effort and harvest of spring and fall Chinook Salmon and steelhead during the 2020 lower Klamath River creel survey; 2019 and 2018 for comparison.**

	Angler		Steelhead		Chinook Salmon*	
	Trips	Hours	Half-pounders	Adults	Jacks	Adults
Area 1 - Mouth to Highway 101 Bridge						
Shore	1,230	3,503	0	3	13	41
Boats	2,207	7,194	3	8	77	140
<b>Total</b>	<b>3,437</b>	<b>10,697</b>	<b>3</b>	<b>11</b>	<b>89</b>	<b>181</b>
Area 2 - Highway 101 to Highway 96						
Shore	2,028	6,169	3	9	189	201
Boats	5,386	30,927	8	15	2,486	416
<b>Total</b>	<b>7,415</b>	<b>37,097</b>	<b>11</b>	<b>24</b>	<b>2,675</b>	<b>617</b>
<b>Grand Total</b>	<b>10,852</b>	<b>47,794</b>	<b>14</b>	<b>35</b>	<b>2,764</b>	<b>798</b>
2019	14,339	60,747	15	82	3,366	2,542
2018	10,158	44,172	14	81	2,131	2,062

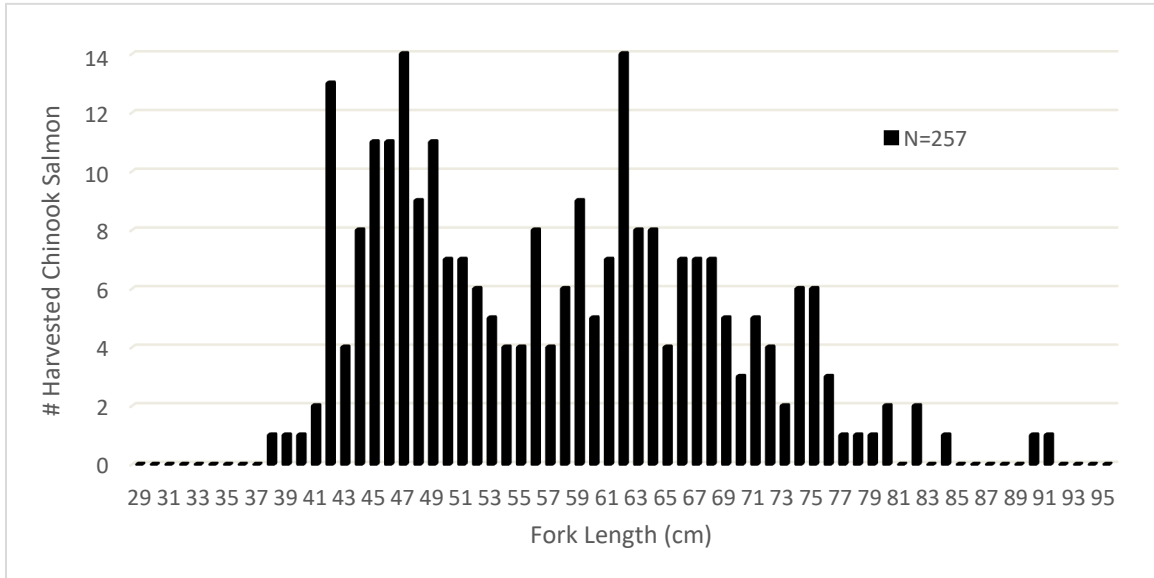
\*Chinook Salmon counts prior to KRTT scale age adjustments

**TABLE 3. Scale-based age composition of fall Chinook Salmon harvested in the 2020 lower Klamath River recreational fishery (KRTT 2021).**

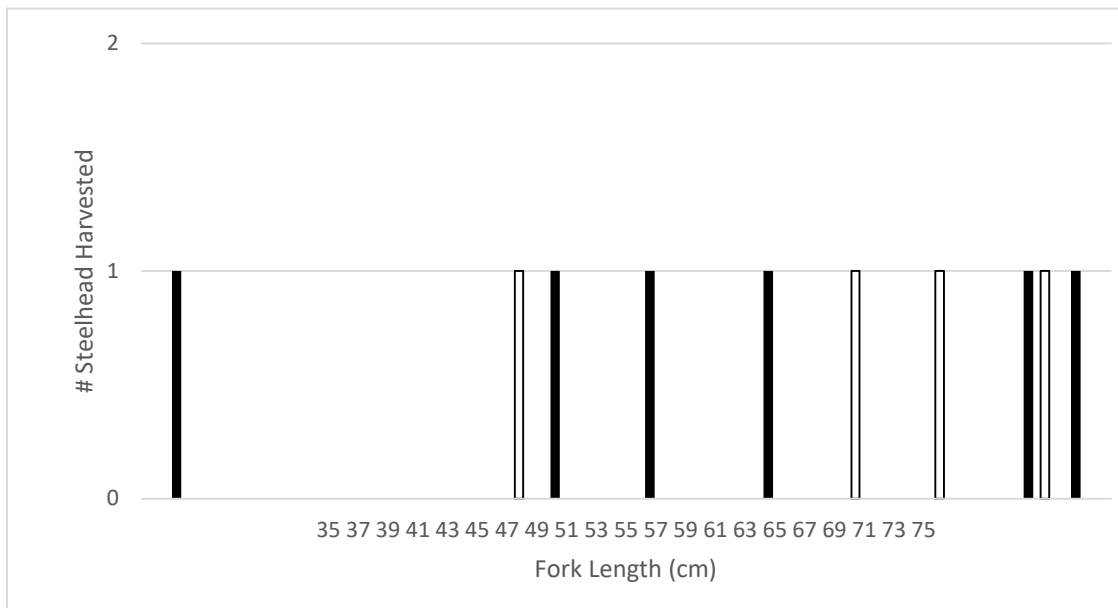
Recreational Harvest	Age				Total Adults	Total Run
	2	3	4	5		
Area 1 (below Hwy 101 bridge)	39	168	38	0	206	245
Area 2 (Hwy 101 to Weitchpec)	343	2,718	228	0	2,946	3,289
<b>Total Harvest</b>	<b>382</b>	<b>2,886</b>	<b>266</b>	<b>0</b>	<b>3,152</b>	<b>3,534</b>

A total of 257 harvested Chinook Salmon were observed and measured by samplers in the lower Klamath creel survey. They ranged in size from 38 to 91 cm (Figure 2). Harvested Chinook Salmon sampled in 2019 ranged from 29 to 96 cm FL (Troxel and Lindke, 2020), and in 2018 they ranged from 36 to 90 cm FL (Troxel and Lindke, 2019). Additionally, six harvested steelhead were observed and measured in the lower Klamath River creel survey ranging from 36 to 74 cm FL (Figure 3).





**FIGURE 2. Fork length frequency of Chinook Salmon harvested in the lower Klamath River during the 2020 season.**



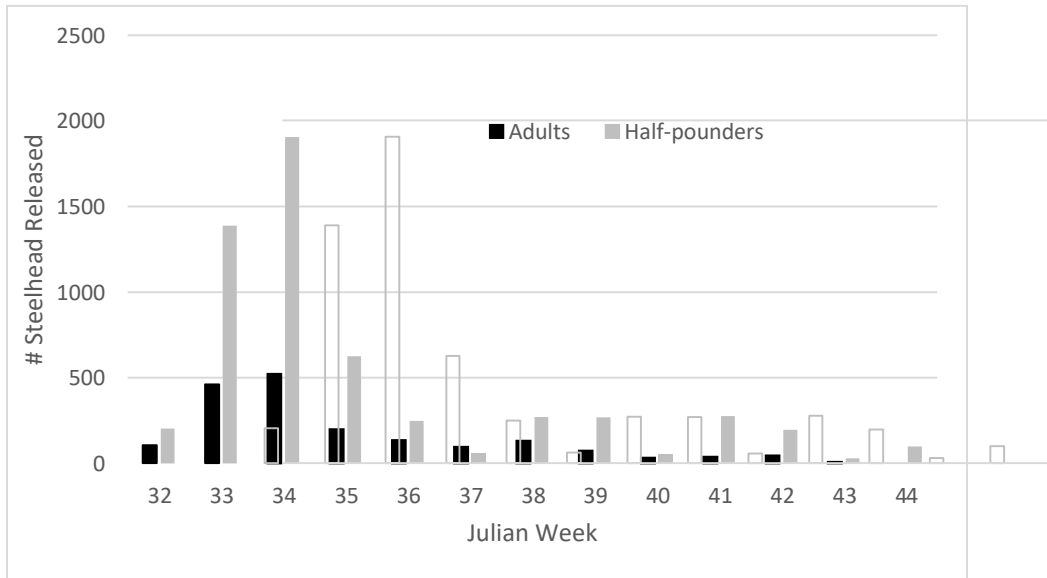
**FIGURE 3. Fork length frequency of steelhead harvested in the lower Klamath River during the 2020 season.**

## Catch and Release

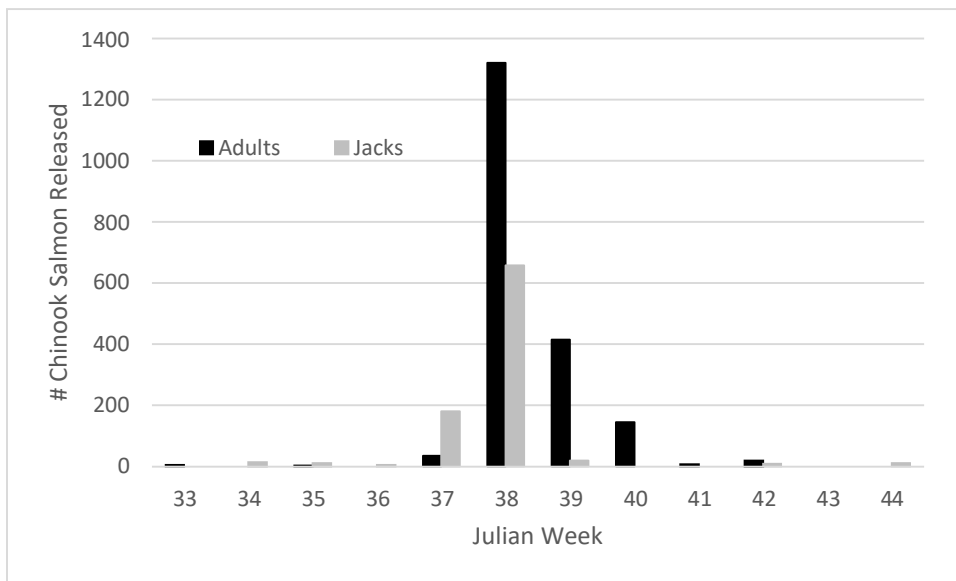
Catch-and-release information was recorded as part of the creel interview and is expanded by the weekly expansion factors in the same manner as harvest and angler effort data. Anglers were specifically asked if fish were released rather than lost. Because of the subjective nature of these data (relying on memory of anglers instead of direct observations made by trained observers), results should be considered with some caution. An estimated 5,627 half-pounders steelhead, 1,850 adult steelhead, and 905 jack and 1,948 adult Chinook Salmon were caught and released by anglers in 2020 (Table 4; Figures 4 and 5). Additionally, there were an estimated 116 Coho Salmon (68 jacks and 48 adults) reported caught and released this season.

**TABLE 4. Summary of estimated angler catch-and-release effort for Chinook Salmon and steelhead during the 2020 lower Klamath River creel survey with 2019 and 2018 for comparison.**

	Angler		Steelhead		Chinook Salmon	
	Trips	Hours	Half-pounders	Adults	Jacks	Adults
Area 1 - Mouth to Highway 101 Bridge						
Shore	1,230	3,503	37	77	0	0
Boats	2,207	7,194	197	86	0	5
<b>Total</b>	<b>3,437</b>	<b>10,697</b>	<b>234</b>	<b>163</b>	<b>0</b>	<b>5</b>
Area 2 - Highway 101 to Highway 96						
Shore	2,028	6,169	645	144	26	115
Boats	5,386	30,927	4748	1,543	879	1,828
<b>Total</b>	<b>7,415</b>	<b>37,097</b>	<b>5,393</b>	<b>1,687</b>	<b>905</b>	<b>1,943</b>
<b>Grand Total</b>	<b>10,852</b>	<b>47,794</b>	<b>5,627</b>	<b>1,850</b>	<b>905</b>	<b>1,948</b>
2019	14,339	60,747	4,192	2,966	2,961	1,161
2018	10,158	44,172	7,193	1,742	965	5,558



**FIGURE 4. Estimates of steelhead caught and released by Julian week in the lower Klamath River during the 2020 season.**



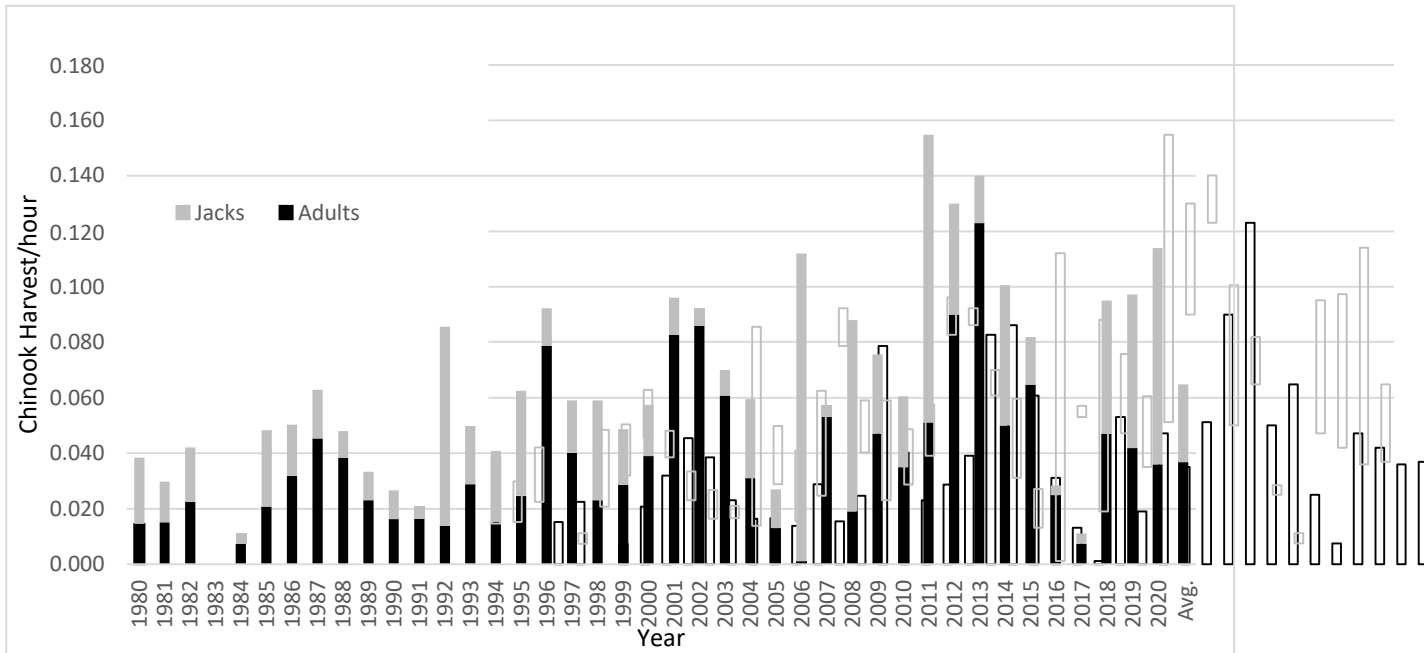
**FIGURE 5. Estimate of Chinook Salmon caught and released by Julian week in the lower Klamath River during the 2020 season.**

Angler Effort, Harvest Patterns and Demographics

The average fishing trip length during the 2020 season was 4.4 hours. This is 0.2 hours longer than the 1992-2020 long-term average (Table 5). Catch per unit effort increased from 2019, with a combined jack/adult CPUE of 0.114 fish per hour (Figure 6).

**TABLE 5. Number of angler trips, total angler hours, and average angler hours per trip in the lower Klamath River recreational fishery 1992 – 2020.**

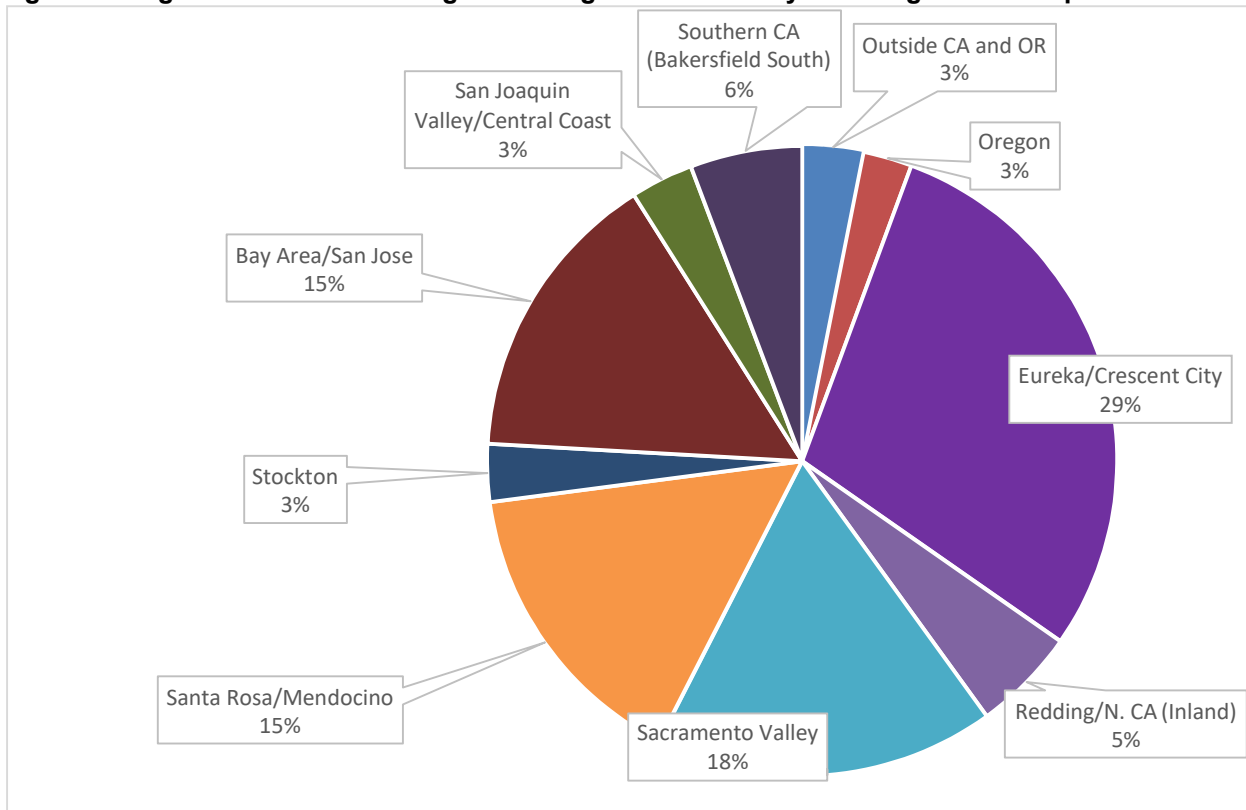
Year	Total Angler		Average Hours/Trip
	Trips	Hours	
1992	11,190	33,080	3.0
1993	16,081	51,889	3.2
1994	15,100	54,748	3.6
1995	19,881	63,369	3.2
1996	27,929	91,019	3.3
1997	18,402	67,154	3.6
1998	17,606	52,145	3.0
1999	11,852	45,109	3.8
2000	14,150	57,184	4.0
2001	20,116	88,053	4.4
2002	18,376	85,925	4.7
2003	16,514	79,228	4.8
2004	15,180	71,397	4.7
2005	12,629	61,000	4.8
2006	8,902	41,792	4.7
2007	13,913	64,101	4.6
2008	10,827	56,005	5.2
2009	14,736	67,160	4.6
2010	11,516	58,842	5.1
2011	11,833	56,759	4.8
2012	17,641	87,748	5.0
2013	22,402	102,381	4.6
2014	12,616	60,376	4.8
2015	16,756	77,228	4.6
2016	7,981	36,651	4.6
2017	4,070	16,678	4.1
2018	10,181	44,204	4.3
2019	14,339	60,747	4.2
2020	10,852	47,794	4.4
<b>Average</b>	<b>14,606</b>	<b>61,371</b>	<b>4.2</b>



**FIGURE 6. Chinook Salmon harvested per hour of angler effort during the lower Klamath River fall creel survey 1980-2020. Harvest occurred but no effort data was recorded in 1983, thus an HPUE cannot be generated. The fall Chinook Salmon fishery was closed in 2017 starting August 15.**

As with previous years' surveys, anglers were asked for their home ZIP code. First reported in the 2018 annual report, this provides broad scale indications of the geographic distribution of recreational anglers participating in the fishery. In 2020, anglers from the local 955 ZIP prefix (Eureka, Crescent City, Arcata, etc.) accounted for 29% of anglers participating in the survey. In total, an estimated 94% of anglers originated in California, 3% were from Oregon, and an additional 3% originated from elsewhere (Figure 7).

**Figure 7. Origins of recreational anglers during 2020 season by three-digit ZIP code prefix.**

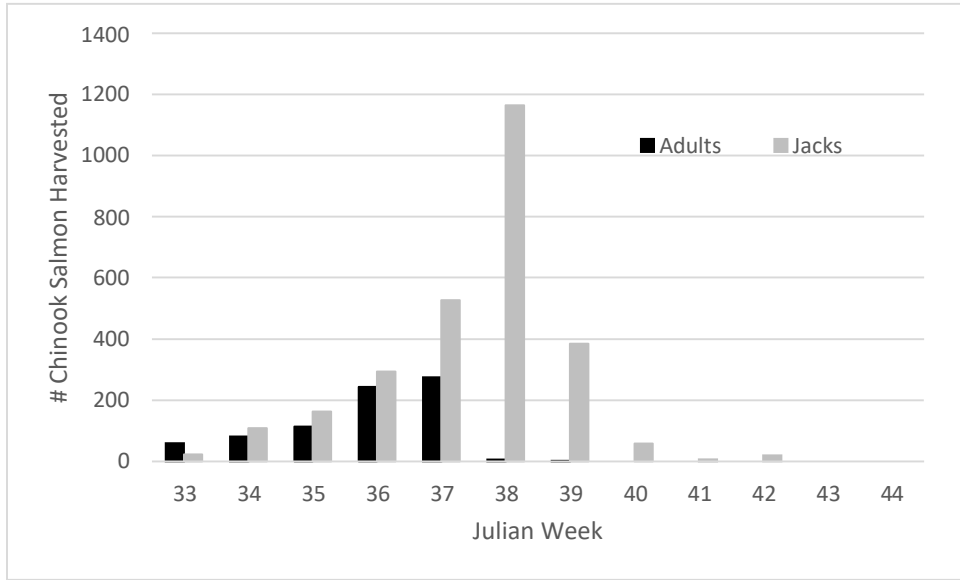


## Harvest Timing

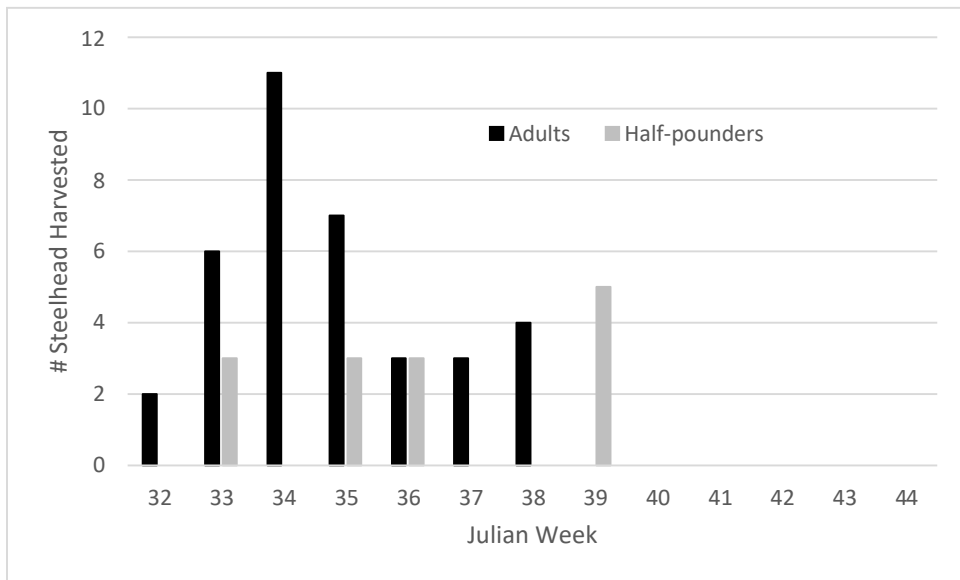
For the 2020 season, Chinook Salmon harvest increased steadily from the start of the season up through JW 37, which coincided with the closure of the adult fishery. Starting JW 37, jack harvest increased dramatically for about one week and then declined precipitously, with harvest persisting through JW 42. Adult Chinook catch and release increased more than 3000% in JW 38 following the closure of the adult fishery, and then tapered off quickly in the following two weeks. Steelhead harvest was minimal up through JW 39 (Table 6; Figures 8 and 9).

**TABLE 6. Harvest, catch-and-release and angler effort by Julian week during the 2020 lower Klamath River creel survey.**

J Week	Angler		Harvest				Release			
			Steelhead		Chinook		Steelhead		Chinook	
			Trips	Hours	Half-pounders	Adult	Grilse	Adult	Half-pounders	Adult
32	618	1697	0	2	13	15	203	107	0	0
33	937	3474	3	6	23	60	1387	459	2	5
34	1708	6676	0	11	109	82	1905	523	15	0
35	1582	6560	3	7	163	114	626	199	11	3
36	1991	8565	3	3	294	244	249	136	5	0
37	1020	5200	0	3	527	275	61	97	179	35
38	1550	7938	0	4	1164	6	270	132	656	1319
39	804	4269	5	0	384	3	268	72	19	414
40	295	1608	0	0	59	0	55	33	0	145
41	151	802	0	0	7	0	277	39	0	7
42	119	637	0	0	20	0	197	44	8	20
43	44	197	0	0	0	0	30	9	0	0
44	33	171	0	0	0	0	99	0	11	0
<b>Total</b>	<b>10,852</b>	<b>47,794</b>	<b>14</b>	<b>35</b>	<b>2,764</b>	<b>798</b>	<b>5,627</b>	<b>1,850</b>	<b>905</b>	<b>1,948</b>



**FIGURE 8. Estimated harvest of Chinook Salmon by Julian week in the lower Klamath River during the 2020 season.**



**FIGURE 9. Estimated harvest of steelhead by Julian week in the lower Klamath River during the 2020 season.**



## Age Classification of Chinook Salmon

The scale-based age structure of fall Chinook Salmon harvested in the 2020 lower Klamath River recreational fishery is presented here by request of the Trinity River Restoration Program (see Table 3). As noted earlier, the fall Chinook Salmon harvest estimate was 3,534 fish (3,152 adults and 382 jacks). These scale-based age data were used to make final post-season estimates of harvest for jacks and adults in this report and are also reported to the Klamath River Technical Team and the Pacific Fishery Management Council as fall Chinook Salmon age structured abundance estimates used for annual ocean abundance forecasts (KRTT 2021). Scales collected from harvested Chinook Salmon during the season were mounted and aged by the Yurok Tribal Fisheries Department and U.S Fish and Wildlife Service.

## Coded-Wire Tag Recovery

Over the course of the creel survey, 57 Chinook Salmon heads were recovered for extraction of CWTs. Among these, there were 13 non-random recoveries collected on non-sampling days that are not used in apportionment but are used to validate run-timing and hatchery origin. Of the remaining 44 random heads, there was one head in which a CWT was not present (designated 100,000s); zero tags were lost during the recovery process (200,000s); zero were observed by surveyors but not recovered (300,000s); and zero tags were unreadable during laboratory processing (400,000s).

We recovered 43 valid tags, all of which were from fall Chinook Salmon, originating from either IGH or TRH (Table 7). All tags were recovered following the start of the fall Chinook Salmon quota fishery (after August 15) and were used for hatchery apportionment as normal.

**TABLE 7.** Coded Wire Tag counts and juvenile release information recovered from Chinook Salmon during the 2020 fall creel survey. (Release Stage: Y=Yearlings, G = Fingerlings). Total estimates include expansion for sampling and hatchery production multipliers.

CWT	Count	Hatch	Brood Yr	Run	Rel Stage	ProdX	Total Est
060962	2	TRH	2016	Fall	Y	4.129662	18.484249
061497	7	TRH	2017	Fall	Y	4.247159	79.571597
061501	1	IGH	2017	Fall	G	4.013409	7.804006
061506	3	IGH	2017	Fall	Y	4.080467	26.279688
061547	4	TRH	2018	Fall	G	4.065899	46.019545
061548	3	TRH	2018	Fall	G	4.057340	36.285462
061903	2	TRH	2018	Fall	G	4.352589	27.541496
062018	4	TRH	2018	Fall	G	4.102338	41.310081
062019	2	TRH	2018	Fall	G	4.096636	21.448537
062020	2	TRH	2018	Fall	G	4.086529	22.298875
062021	2	TRH	2018	Fall	G	4.113814	28.791273
062022	11	TRH	2018	Fall	Y	4.103921	125.221925
	43						481

### Hatchery Contribution

After expanding CWT recoveries for sampling and hatchery production multipliers, IGH fall Chinook Salmon accounted for an estimated 34 harvested fish. TRH fall Chinook Salmon accounted for an estimated 447 harvested fish. The Department recovered and decoded 4 tags from IGH fall Chinook Salmon, representing CWT release groups from brood year 2017 (Table 7). The Department recovered and decoded 39 tags from TRH fall Chinook Salmon, representing release groups from brood years 2016 (2 tags), 2017 (7 tags) and 2018 (30 tags) (Table 7). When expanded for sampling and hatchery production multipliers, hatchery-origin fish account for 13.61 percent (481/3,534) of the total recreational harvest (Table 8).

**TABLE 8.** Fall Chinook Salmon harvest proportioned by hatchery of origin in the 2020 lower Klamath River recreational fishery, expanded for creel sampling and hatchery production multipliers.

Chinook Salmon Age Class	Count	Fall IGH Expanded	Fall TRH Expanded	Estimated Total Hatchery	Percent Hatchery
Jacks	382	0	349	349	91.36
Adults	3,152	34	98	132	4.19
Total	3,534	34	447	481	13.61
% Total Harvest by Hatchery		0.96	12.65		

## DISCUSSION

The lower Klamath River recreational Chinook Salmon fishery is comprised of fish produced naturally in the Klamath and Trinity River basins and fish produced at IGH and TRH. Based on creel sampling and hatchery production multipliers, the estimated 2020 recreational harvest was comprised of approximately 13.61% hatchery-origin and 86.39% natural-origin fall Chinook Salmon. Historically, proportions of hatchery fall Chinook Salmon within lower Klamath River Chinook Salmon recreational harvest have averaged 59% IGH Chinook Salmon and 41% TRH. In 2020, the hatchery component of estimated recreational harvest in the lower Klamath River was comprised of 7% IGH and 93% TRH fall Chinook Salmon. The 2020 hatchery component of the total run was substantially less than the average, with 11,559 fish returning to Klamath basin hatcheries (4,455 and 7,104 at IGH and TRH, respectively) compared to the 1978-2020 average of 25,234 (KRTT, 2021). Identifying the contribution of natural-origin Trinity stocks to the recreational fishery is beyond the scope of this report. Methods to produce quantitative estimates of natural-origin Chinook Salmon contributions from each of the Klamath and Trinity basins to the recreational fishery are being investigated. Addressing the contribution to the recreational fishery from Trinity River natural-origin Chinook Salmon will contribute to assessments of the goals and objectives of the Trinity River Restoration Program.

Recreational harvest of fall Chinook Salmon in the lower Klamath River in 2020 was open for the third year, following a closure in 2017. There is overlap in the run timing of spring and fall Chinook Salmon, and the temporal extent of the overlap varies from year to year. A hard cut-off date (currently August 15) is necessary for development of annual regulations. In 2020, there was no apparent overlap in harvest of spring and fall Chinook Salmon based on CWT recoveries, as no spring CWTs were recovered during the fall fishery and no fall tags were recovered during the spring fishery. This indicates that the timing of the spring and fall runs in 2020 were consistent with the regulatory guidelines.

At its June 2021 meeting, the California Fish and Game Commission unanimously voted to list Upper Klamath-Trinity Spring Chinook Salmon as “threatened” under the California Endangered Species Act. Official listing is still pending, and spring Chinook Salmon fishing regulations are still under review. It is possible that Spring Chinook Salmon regulatory decisions may affect the fall Chinook Salmon fishery as well. Additionally, Spring Chinook Salmon were recently under review for federal ESA listing, however it was decided that listing was not warranted, therefore no additional federal protections are in place (Federal Register, 2021). Potential future changes (e.g., closure of the spring Chinook Salmon fishery) could impact the fall Chinook Salmon creel survey, as monitoring adjustments would likely be required. For example, the fall Chinook Salmon fishery may have to be pushed to a later start date to provide more temporal separation between the spring and fall fisheries. Real-time CWT analysis

could provide a tool for managing fishery timing. Although this tool may be difficult to implement into a regulatory package, it would allow for immediate identification of the end and beginning of spring and fall runs. Elements of real-time CWT processing and analysis will be evaluated during and after the 2021 season for efficacy and applicability during harvest management.

The smaller size of returning 3 year-olds in recent years has presented challenges for harvest monitoring and post-season analysis. A substantial portion of adult fish have been shorter than the regulatory jack /adult size cut-off of 23" TL, which has led to higher estimates of adult harvest in post season analysis compared to preliminary in-season estimates. In 2020 this resulted in substantially more in-river recreational harvest of adult fall Chinook Salmon than was allocated in the quota for that sector. Real-time CWT analysis may also help us better assess age structure during in-season monitoring. Improved in-season estimates of age structure and sizes at age should improve the accuracy of adult quota harvest management.

From year to year the in-river recreational harvest typically follows a pattern with TRH spring Chinook Salmon comprising the majority of harvest up to JW 33, then IGH fall Chinook Salmon are present JW 33 to 39 peaking in JW 37. The bulk of TRH fall Chinook Salmon tags are collected JWs 34 through 39. The 2020 season somewhat conformed to this general pattern. Throughout the spring and fall creel surveys, we only collected one TRH spring Chinook Salmon CWT (a non-random recovery during the spring creel, JW 28). The first fall Chinook Salmon CWT was recovered in JW 35, and the last was recovered in JW 39. The apparently late arrival of the fall Chinook Salmon run exhibits the annual variability in run timing. We assume the ~six-week gap between the last spring Chinook Salmon CWT collected and the first fall CWT is representative of temporal stratification of the two runs.

In years in which the fishery is open, a ratio estimator is used to estimate harvest in the non-surveyed area above Highway 96 bridge (Area 3). Area 3 was surveyed from 1999-2002. For each year, a ratio of lower river (Areas 1 and 2 combined) to upper river (Area 3) adult fall Chinook Salmon harvest was generated, and these ratios were averaged across the four years to generate a ratio estimator for adult harvest in Area 3 of 50.4% of the lower river adult harvest. For 2020, KRTT applied this estimator as normal, thus estimating 1,589 adult fall Chinook Salmon harvested in Area 3. Jack harvest is estimated by expanding adult harvest by the proportion of jacks observed in upper Klamath River sectors (KRTT 2021). Staff have been assessing the feasibility of implementing a creel survey in Area 3 to update this estimator. As of this time, survey implementation is unlikely due to lack of funding, but staff are considering other data sets that may provide updated information for this method (e.g., salmon report cards).

Average trip length since 1992 is 4.2 hours. Prior to 2001, trip lengths were less than the average, ranging from 3.0 to 4.0 hours, while the trend over the last several years

(2001 to 2020) has been mostly above average trip lengths (4.1 to 5.2 hours). In 2020, average trip length was 4.4 hours, slightly longer than the long-term average.

It is important to note that the 2020 fall creel season took place during the Covid-19 pandemic. Due to this, field protocols and methods had to be altered to align with CDFW Covid prevention protocols, including social distancing, wearing of face coverings, and eliminating contact with boats, coolers, fish bags, and other personal items. Department samplers depended upon the increased participation of anglers during the interview process, insofar that anglers were specifically asked if they would present their fish to CDFW staff for examination and biological sampling. Consequently, significantly fewer fish were measured and scale sampled. While biological sampling rate was reduced, scales were collected from a sufficient number of fish to allow for scale-based age classification to be used in post-season analysis. If hatchery fish were identified, the fish would be processed as normal: measured to fork length, recover CWT via snout removal, and scale sampled.

The results of the 2020 fall Chinook Salmon run-size estimate were approximately equal to what was expected this time last year (KRTT, 2020). The late arrival of the fall run paired with diminished returns and small adult size yielded an all-around lackluster season for recreational anglers, tribal fishers and spawning grounds surveyors alike. The 2021 season (PFMC 2021) on Klamath fall-run will allow for only very limited harvest. The approved quota for 2021 in-river recreational harvest is 1,221 adult fall Chinook Salmon for the entire Klamath River Basin, slightly less than in 2020. Bag and possession limits for 2021 will remain unchanged from 2020, indicating the 2021 season will be very similar to 2020.

*Note: The lower Klamath River fall creel survey was removed from Trinity River Restoration Program funding sources as of October 1, 2020, thus, annual reporting to the Program will cease following this report. Subsequent reports will be modified to reflect reporting requirements under a new funding source and will be made publicly available on the CDFW website.*

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## APPENDICIES

### APPENDIX A. List of Julian weeks and their calendar equivalents.

Julian week	Inclusive dates			Julian week	Inclusive dates		
1	01-Jan	-	07-Jan	27	02-Jul	-	08-Jul
2	08-Jan	-	14-Jan	28	09-Jul	-	15-Jul
3	15-Jan	-	21-Jan	29	16-Jul	-	22-Jul
4	22-Jan	-	28-Jan	30	23-Jul	-	29-Jul
5	29-Jan	-	04-Feb	31	30-Jul	-	05-Aug
6	05-Feb	-	11-Feb	32	06-Aug	-	12-Aug
7	12-Feb	-	18-Feb	33	13-Aug	-	19-Aug
8	19-Feb	-	25-Feb	34	20-Aug	-	26-Aug
9 a/	26-Feb	-	04-Mar	35	27-Aug	-	02-Sep
10	05-Mar	-	11-Mar	36	03-Sep	-	09-Sep
11	12-Mar	-	18-Mar	37	10-Sep	-	16-Sep
12	19-Mar	-	25-Mar	38	17-Sep	-	23-Sep
13	26-Mar	-	01-Apr	39	24-Sep	-	30-Sep
14	02-Apr	-	08-Apr	40	01-Oct	-	07-Oct
15	09-Apr	-	15-Apr	41	08-Oct	-	14-Oct
16	16-Apr	-	22-Apr	42	15-Oct	-	21-Oct
17	23-Apr	-	29-Apr	43	22-Oct	-	28-Oct
18	30-Apr	-	06-May	44	29-Oct	-	04-Nov
19	07-May	-	13-May	45	05-Nov	-	11-Nov
20	14-May	-	20-May	46	12-Nov	-	18-Nov
21	21-May	-	27-May	47	19-Nov	-	25-Nov
22	28-May	-	03-Jun	48	26-Nov	-	02-Dec
23	04-Jun	-	10-Jun	49	03-Dec	-	09-Dec
24	11-Jun	-	17-Jun	50	10-Dec	-	16-Dec
25	18-Jun	-	24-Jun	51	17-Dec	-	23-Dec
26	25-Jun	-	01-Jul	52 b/	24-Dec	-	31-Dec

a/ Eight-day week in each leap year (years divisible by 4).

b/ Eight-day week every year.