2014 OCEAN SELECTIVE FISHERY SAMPLING REPORT

SUBMITTED BY:

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1. INTRODUCTION

The Pacific Fishery Management Council (PFMC) adopted 2014 recreational and commercial troll fisheries for all salmon species in the area between Cape Falcon, Oregon and the U.S./Canada border. Recreational mark-selective fisheries (MSFs) for Chinook and coho and commercial MSFs for coho were included in all four Catch Record Card (CRC) areas of coastal Washington (Areas 1, 2, 3, and 4). Council-area fisheries were adopted based on assumptions regarding coho and Chinook abundance, distribution of stocks, Chinook age class distributions, coho mark rates, compliance with selective fishery regulations, and incidental mortality.

The PFMC adopted an ocean recreational Chinook MSF in Marine Areas 1 through 4 for the fifth consecutive year, following state-tribal agreement during the North of Falcon process. The fishery was open for 18 total days in May and June in the northern coastal areas and for 14 days in the southern coastal areas. Consistent with the Washington Department of Fish and Wildlife's (WDFW) intent of Puget Sound/Strait of Juan de Fuca Chinook MSFs as well as the prior ocean pilot Chinook MSFs, the primary goal for this selective fishery was to provide meaningful opportunity to the recreational angling public while minimally impacting ESA-listed Chinook salmon encountered in the mixed-stock ocean fisheries. WDFW's Ocean Sampling Program (OSP) continued its intensive monitoring program in all ocean ports during the season to collect data to estimate key parameters characterizing the fishery and its impacts on unmarked salmon. Sampling activities included on-water observation, a Voluntary Trip Report (VTR) system, and dockside creel sampling. Among other parameters, sampling activities emphasized data collection needs for the estimation of: *i*) the mark rate of the targeted Chinook population, *ii*) the total number of Chinook salmon harvested (by size [legal or sublegal] and mark-status [marked or unmarked]), *iii*) the total number of Chinook salmon released (by size/mark-status), *iv*) the coded-wire tag (CWT) and/or DNA-based stock composition of marked and unmarked Chinook mortalities, and *v*) the total mortality of marked and unmarked double index tag (DIT) CWT stocks.

Additionally, coho MSFs were adopted in 2014 for the sixteenth consecutive year, and the OSP continued its intensive monitoring program in all ocean ports. Sampling activities were identical to those employed during the Chinook MSF. Sampling activities during the coho MSF emphasized data collection needs for the estimation of: *i*) the mark rate of the targeted coho population, *ii*) the total number of coho harvested by mark-status, including an estimate of angler compliance rate with coho MSF regulations, *iii*) the total number of coho released (by mark-status), *iv*) the coded-wire tag (CWT) stock composition of landed coho, and *v*) the total mortality of marked and unmarked coho.

2. SEASON DESCRIPTION

2.1 Ocean Recreational Chinook MSF

CRC Areas 1 (from Cape Falcon, OR to Leadbetter Point, WA) and 2 (from Leadbetter Point to the Queets River) were open for all salmon except coho seven days per week from May 31 through June 13. A daily bag limit of two salmon was in effect. All retained Chinook were required to have a healed adipose fin clip, and the minimum size limit was 24 inches total length for Chinook. A total of 14 fishing days were available during this fishery.

CRC Areas 3 (from the Queets River to Cape Alava) and 4 (from Cape Alava to the U.S./Canada border) were open for all salmon except coho May 16 and 17, May 23 and 24, then seven days per week from May 31 through June 13. A daily bag limit of two salmon was in effect. All retained Chinook were required to have a healed adipose fin clip, and the minimum size limit was 24 inches total length for Chinook. A total of 18 fishing days were available during this fishery.

The fishery operated under a coastwide landed quota of 9,000 marked Chinook. **Figure 1** shows the Washington ocean CRC areas.

2.2 Ocean Recreational All-Species Fisheries (Coho Mark-Selective)

CRC Area 1: The ocean recreational fishery in CRC Area 1 was open for all salmon species seven days per week from June 14 through September 21. A daily bag limit of two salmon, one of which could be a Chinook, was in effect June 14 – September 5; the bag limit was modified in-season to two salmon from September 6 – September 21. All retained coho were required to have a healed adipose fin clip from June 14 – September 5. The fishery was modified to allow retention of unmarked coho beginning September 6 through the season with a bag limit of two salmon. The Columbia Control Zone was closed. A total of 100 fishing days were available in the area (84 days coho MSF, 16 days coho non-selective).

CRC Area 2: The ocean recreational fishery in CRC Area 2 was open for all salmon species seven days per week from June 14 through September 19. A daily bag limit of two salmon, one of which could be a Chinook, was in effect June 14 - August 17; the bag limit was modified in-season to two salmon from August 18 – September 19. From June 14 – August 31, all retained coho were required to have a healed adipose fin clip. The fishery was modified to allow retention of unmarked coho beginning September 1 with a bag limit of two salmon. A total of 98 fishing days were available in the area (79 days coho MSF, 19 days coho non-selective).

CRC Area 3: The ocean recreational fishery in CRC Area 3 was open for all salmon species seven days per week from June 14 through September 21. From September 27 - October 12, salmon fishing was open but restricted to the part of Area 3 north of 47°50’00” north latitude and south of 48°00’00” north latitude, seven days per week. A daily bag limit of two salmon was in effect throughout the fishery. From June 14 – August 31 and from September 27 – October 12, all retained coho were required to have a healed adipose fin clip. The fishery was modified to

allow retention of unmarked coho from September 1 - 21 with a bag limit of two salmon. A total of 116 fishing days were available in the area (95 days coho MSF, 21 days coho non-selective).

CRC Area 4: The ocean recreational fishery in CRC Area 4 was open for all salmon species seven days per week from June 14 through September 21. A daily bag limit of two salmon was in effect throughout the fishery. From June 14 – August 31, all retained coho were required to have a healed adipose fin clip. The fishery was modified to allow retention of unmarked coho beginning September 1 with a bag limit of two salmon. A total of 100 fishing days were available in the area (79 days coho MSF, 21 days coho non-selective).

The all-species fishery operated under preseason quotas of 50,100 landed Chinook and 184,800 landed marked coho. The portions of the all-species fishery that were mark-selective for coho are described in this report.

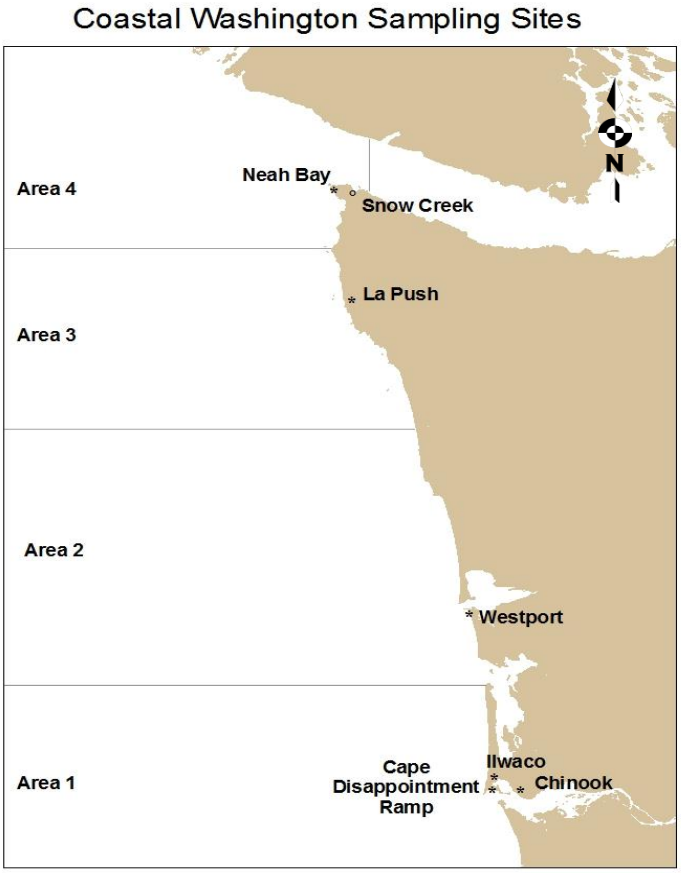

Figure 1. Map of coastal Washington showing the ocean catch record card areas (Areas 1 through 4) and major sampling sites**.**

2.3 Non-Treaty Commercial Troll Fisheries (Coho Mark-Selective)

The non-Treaty troll fishery was open from Cape Falcon, Oregon to the Queets River for 45 days in May and June, and from the Queets River to the U.S.-Canada border for 43 days for all salmon except coho. The fishery reopened for all salmon species except no chum retention north

of Cape Alava, WA in August on July 1 for 58 available fishing days in all areas between Cape Falcon, Oregon and the U.S.-Canada border. All retained coho were required to have a healed adipose fin clip except that retention of unmarked coho was allowed from September 5 – 16 in the area between Cape Falcon, OR and the Queets River. Specific open dates and regulations are available in the PFMC Review of 2014 Ocean Salmon Fisheries (http://www.pcouncil.org/salmon/stock-assessment-and-fishery-evaluation-safe-documents/).

The portion of the all-species fishery that was mark-selective for coho is described in this report.

3. METHODS

WDFW's Ocean Sampling Program (OSP) implemented a comprehensive monitoring program in all ocean ports during the Chinook and coho MSF seasons in Washington ocean CRC Areas 1-4. OSP collected data to estimate key fishery parameters characterizing the ocean MSFs and associated impacts on unmarked salmon. Sampling activities included dockside angler interviews (with catch sampling), total boat counts via exit or entrance counts at each major coastal port, direct on-the-water observations of salmon encounters during charter ride-along trips, and voluntary trip reports of completed trips provided by charter boat skippers and the angling public.

3.1 On-Board Observation

WDFW samplers conducted direct on-water observation of salmon encounters aboard charter vessels during both the recreational Chinook MSF and the recreational all-species coho MSF. Data collected aboard charter boats were used to estimate the encounter rates of Chinook by size class and mark group (legal-size and marked [LM], legal-size and unmarked [LU], sublegal-size and marked [SM], and sublegal-size and unmarked [SU]), as well as encounter rates of marked and unmarked coho, and drop-offs. In addition, samplers collected DNA samples from legal sized and sublegal sized Chinook while aboard charter vessels.

WDFW observers rode along on charter vessels and recorded all hook-ups aboard the vessel; for each hook-up, the following information was recorded: result of the hook-up (fish kept, released, or dropped off), species, mark status (marked or unmarked), and size class (legal or sublegal). A sampling protocol was established for the observers so that the most important information relative to this study was collected first. The first priority for the observers was to record the species, mark status, size category, and result of each hook-up aboard the vessel. Collection of these data enabled estimation of encounter rates for Chinook and coho by size/mark status, and drop-off numbers. The second priority was to collect DNA samples (a small non-lethal clipping from the tip of the dorsal fin), lengths, and scale samples from all Chinook during the Chinook MSF and from sublegal-sized Chinook during the all-species fishery. DNA from sublegal-sized Chinook was prioritized above that from legal-sized Chinook when Chinook retention was not mark-selective since legal-sized fish were available on the dock as well as at sea. The third priority was to collect DNA, lengths, and scale samples from legal-sized Chinook.

Direct on-water observation of salmon encounters was the primary method used in CRC Areas 1 and 2 where charter vessel salmon fishing trips are numerous to determine mark rates, encounter

rates, and drop-off rates. The Voluntary Trip Report (VTR) system (see Section 3.2 below) was the secondary method used to collect encounter data in these two areas.

In CRC Areas 3 and 4, where few charter vessels take salmon fishing trips, and those who do are very small, the VTR system was the primary method used to collect on-water encounter data; the charter ride-along method was used secondarily in these areas.

3.2 Voluntary Trip Reports

Selective fishery encounter statistics were also acquired through Voluntary Trip Reports that WDFW samplers distributed and collected from the angling public in all ocean CRC Areas. The VTR form is designed to capture information identical to that collected by on-board observers. Anglers complete the information on the form as they fish, minimizing recall error.

Samplers distributed VTRs beginning at 5:00 AM five days per week in La Push (CRC Area 3) and Neah Bay (CRC Area 4) during the Chinook MSF; during the all-species fishery, VTRs were distributed daily during the sampling day. In Ilwaco (CRC Area 1) and Westport (CRC Area 2), samplers were dedicated to distributing VTRs most weekend days and one to two days per week during weekdays. These samplers approached anglers preparing to depart for fishing or after returning from fishing, explained the purpose of the VTR and how to complete it, and encouraged anglers to record all encounters and return the form to a dockside sampler at the end of the fishing day. Anglers could also mail these forms to the WDFW Region 6 office postage-paid.

In 2013, a new, simpler VTR form was developed to meet the needs of north coast charter boats that do not have sufficient time while fishing to complete the traditional VTR form. The new forms ask anglers simply to tally encountered salmon in the appropriate species/size class/mark status/result of encounter category, ie for each species, kept legal marked, kept legal unmarked, released legal marked, released legal unmarked, kept sublegal marked, kept sublegal unmarked, released sublegal marked, or released sublegal unmarked. They are also asked to tally drop offs and kept/released pink. These new forms, which received positive angler feedback in 2013, were distributed more widely in 2014; both north coast and Ilwaco charter skippers along with private boat anglers with a history of completing traditional VTRs were given binders with these forms. Traditional VTRs were distributed to all other anglers.

Collection of VTR data was the primary method used in CRC Areas 3 and 4 to estimate mark rates, encounter rates, and drop-off rates. The VTR method was the secondary method used in CRC Areas 1 and 2.

3.3 Dockside Sampling

Dockside samplers were stationed in the four major landing ports for the ocean fisheries: Neah Bay (including Snow Creek Resort), La Push, Westport, and Ilwaco (including the port of Chinook). The recreational fisheries in each port were sampled a minimum of 4 to 5 days per week, with weekend (Saturday, Sunday, and holidays) and weekday days (non-holiday Monday

through Friday) stratified. Typically, all weekend days and a randomly-selected 3 of 5 weekdays were sampled. Total fishery catch and effort estimates were generated by the OSP using three types of data obtained during dockside sampling: effort counts, interview data, and examination of catch. Each is described below.

Effort Counts

On each sample day, a total recreational boat count was obtained either by counting boats exiting the port or entering the port. A minimum of 20% of the boats returning to the port within each boat type (charter and private) was sampled. An exit count (a count of boats leaving the port) typically began at 4:30AM and continued through the end of the sampling day (exact time was port-specific). An entrance count (a count of boats entering the port) usually began near 8:00AM and continued through dusk. Whether OSP samplers conducted exit or entrance counts varied based on specific considerations for each port. Regardless of the method used, this effort count, taken on every sampled day, provided the total counts of charter and private boats to which sample data were expanded.

Angler Interviews and Catch Sampling

WDFW samplers stationed in coastal ports collected catch and effort information during dockside angler interviews from boats returning from fishing. Information collected during each sample included number of anglers, target species, area fished, landed catch by species, mark status of landed salmon, identification and recovery of coded wire tags, and angler estimates of released salmon by species and mark status and of released groundfish by species. Additionally, dockside samplers collected DNA samples, lengths, and scale samples from landed Chinook as time allowed.

3.4 Estimating Catch and Effort

3.4.i Estimated Stratum Totals (Primary Stage)

Combined (total) catch estimates are typically stratified by weekend/holiday and weekday. In some strata, every day is sampled. In those strata the combined estimates are simply sums of the daily catches. In other strata, where some days are not sampled, the average catch per day over all sampled days is multiplied by the number of days in the stratum to estimate the total catch.

Let:

a = the marine catch area,

i = trip type,

t = Weekend/holiday or Weekday stratum,

N_t = the number of days in stratum t,

T_t = collection of all days in stratum t,

n_t = the number of days sampled in stratum t,

S_t = collection of sampled days in stratum t (when $S=T$, $n=N$),

Y_{taik} = estimated catch (or effort) on day k for stratum t in area a from trip type i,

C_{tai} = catch for stratum t in area a from trip type i,

Then

$$\hat{C}_{tai} = N_t \frac{\sum_{k \in S_t} \hat{Y}_{taik}}{n_t}$$

with estimated variance (see Thompson 1992, p. 129):

$$\hat{V}\left(\hat{C}_{tai}\right) = \frac{N_t (N_t - n_t)}{n_t} \frac{\sum_{k \in S_t} \left(\hat{Y}_{taik} - \hat{\bar{Y}}_{tai}\right)^2}{n_t - 1} + \frac{N_t}{n_t} \sum_{k \in S_t} \hat{V}\left(\hat{Y}_{taik}\right)$$

where

$$\hat{\bar{Y}}_{tai} = \frac{\sum_{k \in S_t} \hat{Y}_{taik}}{n_t}.$$

For strata with all days sampled, $n_t = N_t$, and the catch and variance estimators reduce to:

$$\hat{C}_{tai} = \sum_{k \in T_t} \hat{Y}_{taik}$$

and

$$\hat{V}\left(\hat{C}_{tai}\right) = \sum_{k \in T_t} \hat{V}\left(\hat{Y}_{taik}\right).$$

3.4.ii Daily Catch and Effort Estimation (Secondary Stage)

Both catch and effort are post-stratified by trip-type and area fished. Effort in terms of boat-trips is simply the sample number of boats for each trip-type and area expanded by the appropriate boat-type (charter or private) exit/entrance count. Effort in terms of angler-trips is calculated as the mean number of anglers per boat (indexed by trip-type and area) expanded by the counted total population of boats.

The total catch for a given species on a sampled day is the product of the population of boats and the estimated catch per boat, again post-stratified by trip-type and area fished. Key assumptions in the current estimation procedures are that:

1) All boats exiting/entering a port are included in the exit/entrance count
2) Exit/entrance counts are made without error

3) The approximate systematic sample of boats can be treated as a simple random sample

4) Anglers answer questions accurately and do not conceal fish

In the following discussion, subscripts referring to port and boat-type are suppressed. Let:

M_t = total exit or entrance count for a given port on day *t* (assumed known without error),

m_t = total boats sampled on day *t*,

m_{tai} = number of boats sampled of trip type *i* fishing in area *a* on day *t*,

a_{taij} = number of anglers on the *j*th boat from trip type *i* fishing in area *a* on day *t*,

y_{taij} = number of species specific fish caught on the *j*th boat from trip type *i* in area *a* on day *t*, and

Y_{tai} = total catch of specific species caught from trip type *i* in area *a* on day *t*.

The estimate of the number of boat-trips of trip-type *i* and area *a* follows the procedure outlined in Lai et. al. (1991) where the proportion of boats in each category is estimated by:

$$\hat{p}_{tai} = \frac{m_{tai}}{m_t}$$

with estimated variance (see Cochran 1977, p. 52):

$$V(\hat{p}_{tai}) = \frac{\hat{p}_{tai} \cdot (1 - \hat{p}_{tai})}{(m_t - 1)} \cdot (\frac{M_t - m_t}{M_t})$$

The estimated total boat-trips is then obtained by:

$$\hat{M}_{tai} = M_t \cdot \hat{p}_{tai}$$

with estimated variance:

$$\hat{V}(\hat{M}_{tai}) = M^2{}_t \cdot \hat{V}(\hat{p}_{tai})$$

Effort expressed in terms of angler-trips is the product of the average anglers per boat-trip times the total number of boat-trips. The mean number of anglers per boat-trip (for trip-type *i* and fishing area *a*) is estimated as:

$$\hat{\bar{a}}_{tai} = \frac{\sum_j a_{taij}}{m_t}$$

with variance:

$$\hat{V}(\hat{\bar{a}}_{tai}) = \frac{\sum_j (a_{taij} - \hat{\bar{a}}_{tai})^2}{m_t(m_t - 1)} \cdot (\frac{M_t - m_t}{M_t})$$

Thus the estimated total number of angler-trips is:

$$\hat{a}_{tai} = M_t \cdot \hat{\bar{a}}_{tai}$$

with variance:

$$\hat{V}(\hat{a}_{tai}) = M^2{}_t \cdot \hat{V}(\hat{\bar{a}}_{tai})$$

The catch (or number released) for a specific species on sampled day *t* in area *a* from trip type *i* is similarly estimated by:

$$\hat{Y}_{tai} = \frac{\sum_j y_{taij}}{m_t} M_t$$

with estimated variance:

$$\hat{V}\left(\hat{Y}_{tai}\right) = \frac{\sum_j \left(y_{taij} - \hat{\bar{y}}_{tai}\right)^2}{m_t\left(m_t - 1\right)} M_t\left(M_t - m_t\right)$$

This estimate and its variance differs somewhat from that described in Lai et al. (1991) since the total count, M_t (assumed to be a known quantity), is used to expand the estimated CPUE (calculated over all sampled boats) rather than the estimated boat-trips by trip-type and area fished.

3.5 Estimating Chinook Encounters and Mortalities

The overall impacts of the May - June 2014 recreational Chinook MSF in ocean CRC Areas 1-4 are characterized in terms of grand-total estimates of Chinook encounters and mortalities and by using estimates specific to each of the four size/mark-status groups (i.e., legal-marked [LM], sublegal-marked [SM], legal-unmarked [LU], and sublegal-unmarked [SU]; **Table 1**). The method described above in section 3.4 was used to generate total estimates of angler effort, retained catch by species, and releases of all fish species except for Chinook salmon released during the Chinook MSF in Areas 1-4. To estimate Chinook salmon releases (and thus, total encounters) by size/mark group, we applied Conrad and McHugh's (2008) bias-corrected approach, the same method that the Puget Sound Sampling Unit (PSSU) has used since 2008 to estimate Chinook releases in Puget Sound Chinook MSFs (e.g., WDFW 2011).

Prior to summer 2008, PSSU had generated two different Chinook encounters estimates based on two separate estimation methods ("Method 1" and "Method 2"; see WDFW 2011 and Conrad and McHugh 2008 for details). Method 1 estimates of total Chinook encounters were derived

from the combination of dockside observations of landed catch and angler interview responses about salmon releases; thus, as Conrad and McHugh explain, the accuracy of Method 1 estimates depended heavily on the ability of anglers to correctly recall and report the number of Chinook they actually encountered and released. Method 2 estimates of Chinook encounters were obtained using the creel survey estimates of the total number of legal-size, marked Chinook harvested in combination with the on-water observation or VTR data to estimate both the total number of Chinook encounters and to apportion the encounters to four size/mark status categories (LM, LU, SM, SU). The Method 2 estimator was derived assuming that anglers retain all LM Chinook encountered; therefore, its accuracy depended on the extent to which angler behavior deviates from this idealized case. Based on their analyses and practical considerations regarding the most feasible bias correction approaches, Conrad and McHugh ultimately recommended using Method 2 with a correction for the release of legal-size marked Chinook as the preferred method for estimating total Chinook encounters in Chinook MSFs. After a thorough state-tribal technical review of Conrad and McHugh's method in August 2008, state and tribal technical representatives agreed to use this bias-corrected approach to produce a "best estimate" of Chinook encounters.

Thus, we estimated Chinook releases in the 2014 Chinook MSF as the difference between retained catch (i.e., from the dockside creel survey) and total Chinook encounters (i.e., releases = encounters – retained catch) generated using the Conrad and McHugh (2008) approach. We first divided the creel estimate of legal-marked Chinook harvest by the onboard observer-based estimate of the proportion of the fishable Chinook population that was of legal size and marked (i.e., the former "Method 2" approach; WDFW 2011). Given that this approach yields negatively biased estimates if anglers release any of the legal-marked Chinook they encounter, we then applied Conrad and McHugh's bias correction factor to account for this phenomenon (13%) and incorporated it into the estimator (See **Appendix A** for complete computational details).

We estimated total Chinook mortality resulting from the 2014 Chinook MSF by applying assumed mortality rates to the total harvest and release estimates for the four size/mark-status groups (LM, LU, SM, and SU). For retained Chinook, the mortality estimate was equivalent to the total harvest estimate for the applicable size/mark-status group. We applied a selective fishing mortality (*sfm*) rate of 14% to legal (marked and unmarked) and sublegal (marked and unmarked) release totals, to estimate release mortality in the ocean (the same ocean *sfm* value used in FRAM). See **Appendix A** for a complete description of our impact estimation procedure, including formulae for total and variance estimators.

The final step of our overall impacts assessment involved comparing fishery outcomes to pre-season expectations. To do this, we compared season-total estimates of Chinook encounters and mortalities to pre-season modeled values (FRAM model run no. 2714) for each size and mark status category.

Table 1. Sampling/estimation details on target parameters associated with the overall Chinook MSF monitoring program in Washington coastal Areas 1 through 4.

Activity	Focal Parameter(s)	Secondary Parameter(s)	Sample Unit(s)	Finest Estimation Time Step	Comments
Dockside Creel Sampling	Fishing effort (boat & angler trips); retained and released fish[1]	Catch rates (CPUE); length, age, and CWT composition of harvest	Boat trip; kept fish; reported fish release	Week	Within weeks, estimates are also produced by strata (weekday/weekend).
Onboard observation and VTRs	Size (legal/sublegal) and mark-status composition (marked, unmarked) of encountered Chinook	Chinook length, age, and DNA-based stock composition; species composition of non-Chinook encounters	Fish encounter	Season	Too few encounters occurred to assess mark rates on a finer time scale.
Overall Fishery Impacts Estimation	Total Chinook encounters and mortalities, by size/mark-status group	Ratios of encounters and mortalities per kept Chinook	N/A	Season	The temporal resolution of impact estimates is constrained by that of the observer encounters data.
Coded-wire tag (CWT) Impacts Estimation	Marked/unmarked double-index tag (DIT) encounters and mortalities	N/A	N/A	Season	The temporal resolution of DIT impacts is constrained by the total number of tags recovered.

[1/] Under the "bias-corrected Method-2" approach, Chinook releases can be estimated only as finely as onboard observer data allow.

3.6 CWT Impacts

To understand the potential effects of the 2014 ocean recreational Chinook MSF on the CWT program, we estimated the total number of marked and unmarked double index tagged (DIT) Chinook mortalities that may have occurred during the course of the fishery. To do this, we acquired information for all marked CWT DIT groups present in landed catch from the Pacific States Marine Fisheries Commission's Regional Mark Information System (RMIS) and then applied the methods described by the Pacific Salmon Commission's Selective Fisheries Evaluation Committee–Analytical Work Group (SFEC-AWG 2002) to estimate the number of unmarked DIT fish encountered[1]. We subsequently estimated the number of these fish that may have died due to hook-and-release impacts using an *sfm* analogous to that used in FRAM modeling. Given our interest in characterizing the impacts of MSF regulations on the CWT program and not recreational fishing in general, we used an *sfm* of 14% in all unmarked-DIT mortality calculations. The *sfm* value of 14% did not include unseen drop-off mortality (assumed to be 5% in FRAM) because drop-off mortality occurs in both selective and non-selective recreational Chinook fisheries.

[1] For all unmarked-DIT encounters and mortalities calculations, we relied on the unmarked-to-marked abundance ratio (λ) estimated for DIT groups at the time of juvenile release.

We estimated Chinook encounters and mortalities for each recovered DIT individually and then summed estimates for each hatchery, brood year, and area based on the methods described by SFEC-AWG 2002. Thus, the estimated number of unmarked mortalities was calculated as:

$$\hat{U}_a^{MSF} = \lambda^{REL} \hat{M}_a^{MSF} sfm$$

with associated variance:

$$Var(\hat{U}_a^{MSF}) \approx \left(\lambda^{REL}\right)^2 sfm^2 \hat{M}_a^{MSF} \frac{1-s}{s}.$$

where:

sfm = selective fishing mortality rate (14%, *excludes drop-off mortality*),
$U_{a,i}^{MSF}$ = aged a unmarked DIT mortalities from stock i in the selective fishery,
$M_{a,i}^{MSF}$ = aged a marked DIT mortalities from stock i in the selective fishery,
s = sampling rate of the catch,
λ^{REL} = unmarked-to-marked ratio *at release* for fish in a DIT group
$Var(U_{a,i}^{MSF})$ = variance of $U_{a,i}^{MSF}$.

In addition to estimating unmarked-DIT mortalities, we pooled all CWTs (DIT and otherwise) recovered during the fishery and, based on this total, report the proportional contribution (unexpanded recoveries) of different hatcheries to the total Chinook harvest (See CWT Results below).

4. RESULTS IN 2014 CHINOOK MARK SELECTIVE RECREATIONAL FISHERY

4.1 Dockside Sampling Results

WDFW dockside samplers interviewed an estimated 46% of all anglers fishing in Washington CRC Areas 1 through 4 during the 2014 Chinook MSF; a total of 2,170 anglers in 652 boat trips were enumerated in-sample (**Table 2**). In addition, an estimated 49% (986) of all Chinook harvested in Washington ocean areas were sampled, and 148 coded wire tags (CWTs) were collected. (**Table 2**).

Estimates of Fishing Effort and Chinook Catch

An estimated 4,980 angler trips (4,748 from Washington, 232 from Oregon) were completed by private and charter anglers during the 2014 coastwide Chinook MSF. These anglers harvested a total of 2,099 Chinook coastwide (2,006 WA, 93 OR) (**Table 3**). Landed Chinook catch totaled 23% of the overall fishery quota of 9,000.

A total of 4,961 Chinook encounters were estimated in Washington waters during the 2014 Chinook MSF for CRC Areas 1 through 4 combined (**Table 4**). This total consisted of an estimated 2,006 retained (2,003 marked, 3 unmarked) and 2,954 released (1,588 marked, 1,366 unmarked) Chinook.

CWT Samples

Of a total of 148 CWTs recovered from Chinook sampled dockside during the 2014 Chinook MSF in Washington CRC Areas 1 through 4, a total of 142 proved readable. Observed (unexpanded) stock composition results for these in-sample tag recoveries are presented by area in **Tables 5A** through **5D** for Areas 1 through 4, respectively.

In Area 1, samplers recovered a total of 67 readable CWTs, 47% of the CWTs recovered in all four areas combined. The majority of these recoveries (88%) were from the Columbia River, with 33% from Upper Columbia River hatcheries, 18% from Central Columbia River hatcheries, 31% from Lower Columbia River hatcheries and 6% from Snake River hatcheries. The remaining recoveries were from California (10.5%) and British Columbia (1.5%) hatcheries (**Table 5A**). Twenty of the CWT recoveries in Area 1 were from double index tag (DIT) release groups.

In Area 2, samplers recovered a total of 62 readable CWTs, 44% of the CWTs recovered in all four areas combined. The majority of these recoveries (81%) were from Columbia River hatcheries, with 24% from Upper Columbia River hatcheries, 18% from Central Columbia River hatcheries, 29% from Lower Columbia River hatcheries, and 10% from Snake River hatcheries. The remaining recoveries were from California (16%), Washington (2%) and British Columbia (2%) hatcheries (**Table 5B**). Fourteen of the CWT recoveries in Area 2 were from DIT release groups.

In Area 3, samplers recovered a total of 1 readable CWT, <1% of the CWTs recovered in all four areas combined. This single recovery was from the Snake River and was not from a DIT release group.

In Area 4, samplers recovered a total of 12 readable CWTs, 8% of the CWTs recovered in all four areas combined. Of these recoveries, 42% were from Columbia River hatcheries, with 25% from Upper Columbia River hatcheries, 8% from Central Columbia River hatcheries, and 8% from Lower Columbia River hatcheries. The remaining recoveries were from Washington (42%) and British Columbia (17%) hatcheries (**Table 5D)**. Four of the CWT recoveries in Area 4 were from a DIT release group.

Table 2. Dockside sampling statistics during the 2014 recreational Chinook MSF in Washington CRC Areas 1 through 4.

	Boats Sampled	Sample Rate	Anglers Sampled	Sample Rate	Landed Chinook Sampled	Sample Rate	Coded wire tags collected
Area 4	162	34%	410	33%	119	36%	12
Area 3	26	72%	72	76%	7	100%	1
Area 2	308	39%	1,128	43%	467	41%	64
Area 1	156	73%	560	73%	393	75%	71
Total WA	**652**	**43%**	**2,170**	**46%**	**986**	**49%**	**148**

Table 3. Estimates of total fishing effort and number of Chinook retained during the 2014 recreational Chinook MSF in Washington CRC Areas 1 through 4.

	Total	Total	**Estimated Chinook Retained**		
	Boat Trips	Angler Trips	Marked	Unmarked	TOTAL
Area 4	472	1,240	326	2	328
Area 3	36	95	7	0	7
Area 2	787	2,647	1,146	0	1,146
Area 1	215	766	524	1	525
TOTAL WA	**1,510**	**4,748**	**2,003**	**3**	**2,006**
TOTAL OR	N/A	232	93	0	93
Season Total:	**1,510**	**4,980**	**2,096**	**3**	**2,099**
Variance: [1/]	5,131	41,218	10,385	38	10,423
WA Standard Error:	72	203	102	6	102
WA CV (%):	5%	4%	5%	206%	5%
WA 95% CI:	1,370-1,650	4,350-5,146	1,803-2,203	-9-15	1,806-2,206

[1/] Variance estimates are unavailable for Oregon statistics.

Table 4. Total estimates of fishing effort and the number of Chinook retained and released by mark status and by week, during the 2014 recreational Chinook MSF in Washington CRC Areas 1 through 4 combined.

Open Dates	Stat Week	Stratum Start Date	Stratum End Date	Effort		Retained Chinook		Released Chinook [1/]		Chinook Encounters Total
				Boats	Anglers	AD	UM	AD	UM	
May 16 - June 13, 2014 (See area-specific regs)	20	16-May	17-May	155	449	63	0	50	43	156
	21	23-May	24-May	120	348	77	0	61	53	192
	22	31-May	1-Jun	306	1,024	611	1	484	416	1,512
	23	2-Jun	8-Jun	573	1,794	582	2	461	396	1,441
	24	9-Jun	13-Jun	356	1,132	671	0	532	458	1,661
Season Total:				1,510	4,748	2,003	3	1,589	1,366	4,961
Variance:				5,131	41,218	10,385	38	78,494	21,112	139,218
Standard Error:				72	203	102	6	280	145	373
CV (%):				4.7%	4.3%	5.1%	213.5%	17.6%	10.6%	7.5%
95% CI:				1,370-1,651	4,350-5,146	1,804-2,203	-9-15	1,040-2,138	1,081-1,650	4,229-5,692

[1/] Released Chinook were estimated as the difference between total Chinook encounters generated using the bias-corrected "Method 2" estimator (see Conrad and McHugh 2008) and creel-based estimates of retained Chinook.

Table 5. Summary of coded-wire tags recovered from Chinook salmon harvested in Washington coastal areas during the 2014 recreational Chinook MSF. The field "Number DITs" corresponds to the number of tags that belonged to double-index tag groups. Percentages in parentheses indicate the proportional contribution (unexpanded recoveries) of different hatcheries to the total Chinook harvest.

Table 5A. Area 1 CWT recoveries.

Release Domain	Release Region	Release Site	Rearing Location	CWTs Recovered	Number DITs
B.C. (1.5%)	Fraser-Thompson River (1.5%)	Chilliwack R	Chilliwack River H	1 (1.5%)	1
Columbia River (88%)	Upper Col R (above McNary Dam; excludes Snake River) (32.8%)	Col R @ Turtle Rock	Turtle Rock Hatchery	1 (1.5%)	0
		Entiat R 46.0042	Entiat NFH	2 (3%)	0
		Chelan R 47.0052	Chelan River NP	1 (1.5%)	0
		Chelan R 47.0052	Chelan Falls Hatchery	9 (13.4%)	0
		Columbia Near Wells	Wells Hatchery	4 (6%)	0
		Jack Cr Accl Ponds	Cle Elum Hatchery	1 (1.5%)	0
		Methow R 48.0002	Carlton Accl Pond	1 (1.5%)	0
		Similkameen R 490325	Similkameen Hatchery	3 (4.5%)	0
	Central Col R (Bonneville to McNary) (17.9%)	Spring Cr 29.0159	Spring Cr NFH	11 (16.4%)	11
		Ltl White Salmon @ NFH	Ltl White Salmon NFH	1 (1.5%)	0
	Lower Col R (mouth to Bonneville Dam) (31.3%)	Big Cr (Lwr Col R)	Big Cr Hatchery	8 (11.9%)	8
		McKenzie R 1	McKenzie Hatchery	1 (1.5%)	0
		Santiam R S Fk	South Santiam Hatchery	2 (3%)	0
		Santiam R N FK-1	Marion Forks Hatchery	3 (4.5%)	0
		Clackamas R	Clackamas Hatchery	1 (1.5%)	0
		Cowlitz R 26.0002	Cowlitz Salmon Hatchery	3 (4.5%)	0
		Tanner Cr (Bonneville)	Bonneville Hatchery	3 (4.5%)	0
	Snake River (6%)	Lyons Ferry Rel Site	Lyons Ferry Hatchery	2 (3%)	0
		Snake @ Hells Canyon Dam	Oxbow Hatchery	1 (1.5%)	0
		Snake R-1 (Hells Canyon)	Irrigon Hatchery	1 (1.5%)	0
CA (10.5%)	Central CA Coast (4.5%)	San Pablo Bay Net Pens	Feather Hatchery	3 (4.5%)	0
	Sacramento River (6%)	Coleman NFH	Coleman NFH	2 (3%)	0
		Feather Boyds Pump Ramp	Feather R Hatchery	2 (3%)	0
			Total	**67**	**20**

Table 5B. Area 2 CWT recoveries.

Release Domain	Release Region	Release Site	Rearing Location	CWTs Recovered	Number DITs
B.C. (1.6%)	Fraser-Thompson River (1.6%)	Shuswap R Low	Shuswap River, Middle	1 (1.6%)	0
WA (1.6%)	N WA Coast (1.6%)	Sol Duc R 20.0096	Lonesome Cr Hatchery	1 (1.6%)	0
Columbia River (80.6%)	Upper Col R (above McNary Dam; excludes Snake River) (24.2%)	Columbia Near Wells	Wells Hatchery	4 (6.5%)	0
		Hanford Reach (36)	NA	1 (1.6%)	0
		Chelan R 47.0052	Chelan Falls Hatchery	3 (4.8%)	0
		Methow R 48.0002	Carlton Accl Pond	1 (1.6%)	0
		Wenatchee R 45.0030	Dryden Pond	1 (1.6%)	0
		Similkameen R 490325	Similkameen Hatchery	4 (6.5%)	0
		Springs Cr 36.0114	Ringold Springs Hatchery	1 (1.6%)	0
	Central Col R (Bonneville to McNary) (17.7%)	Spring Cr 29.0159	Spring Cr NFH	3 (4.8%)	3
		Ltl White Salmon @ NFH	Ltl White Salmon NFH	8 (12.9%)	0
	Lower Col R (mouth to Bonneville Dam) (29%)	McKenzie R 1	McKenzie Hatchery	1 (1.6%)	0
		Big Cr (Lwr Col R)	Big Cr Hatchery	11 (17.7%)	11
		Santiam R S Fk	South Santiam Hatchery	1 (1.6%)	0
		Cowlitz R 26.0002	Cowlitz Salmon Hatchery	1 (1.6%)	0
		Santiam R N Fk-1	Marion Forks Hatchery	1 (1.6%)	0
		Willamette R Cst Fk	McKenzie Hatchery	1 (1.6%)	0
		Tanner Cr (Bonneville)	Bonneville Hatchery	2 (3.2%)	0
	Snake River (9.7%)	Big Canyon Accl Pond	Lyons Ferry Hatchery	1 (1.6%)	0
		Captain Johns PD	Lyons Ferry Hatchery	1 (1.6%)	0
		Lyons Ferry Rel Site	Lyons Ferry Hatchery	3 (4.8%)	0
		Snake R-1 (Hells Canyon)	Irrigon Hatchery	1 (1.6%)	0
CA (16.1%)	Central California Coast (4.8%)	Fort Baker Minor PT	Feather R Hatchery	1 (1.6%)	0
		San Pablo Bay Net Pens	Feather R Hatchery	1 (1.6%)	0
		Santa Cruz Hrbr Net Pen	Feather R Hatchery	1 (1.6%)	0
	Sacramento River (9.7%)	Feather Boyds Pump Ramp	Feather R Hatchery	2 (3.2%)	0
		Coleman NFH	Coleman NFH	3 (4.8%)	0
		Sac R @ Discovery Park	Nimbus Fish Hatchery	1 (1.6%)	0
	San Joaquin River (1.6%)	San Joaq Shrm Isl Net Pen	Mok R F ish Ins	1 (1.6%)	0
			Total	**62**	**14**

Table 5C. Area 3 CWT recoveries.

Release Domain	Release Region	Release Site	Rearing Location	CWTs Recovered	Number DITs
Col R (100%)	Snake River (100%)	Captain Johns PD	Lyons Ferry Hatchery	1 (100%)	0
			Total	**1**	**0**

Table 5D. Area 4 CWT recoveries.

Release Domain	Release Region	Release Site	Rearing Location	CWTs Recovered	Number DITs
B.C. (16.7%)	Fraser-Thompson River (16.7%)	Shuswap R Middle	Shuswap River, Middle	1 (8.3%)	0
		Chilliwack R	Chilliwack River H	1 (8.3%)	1
WA (41.7%)	N WA (16.7%)	Friday Cr 03.0017	Samish Hatchery	1 (8.3%)	1
		East Sound Bay (SAN)	Glenwood Springs	1 (8.3%)	0
	Hood Canal (8.3%)	Purdy Cr 16.0005	George Adams Hatchery	1 (8.3%)	1
	N Puget Sound (16.7%)	Whitehorse Springs	Stillaguamish Hatchery	1 (8.3%)	0
		Wallace R 07.0940	Wallace R Hatchery	1 (8.3%)	0
Columbia River (41.6%)	Upper Col R (above McNary Dam; excludes Snake River) (25%)	Wenatchee R 45.0030	Dryden Pond	1 (8.3%)	0
		Similkameen R 490325	Similkameen Hatchery	2 (16.7%)	0
	Central Col R (Bonneville to McNary) (8.3%)	Spring Cr 29.0159	Spring Cr NFH	1 (8.3%)	1
	Lower Col R (mouth to Bonneville Dam) (8.3%)	Santiam R N FK-1	Marion Forks Hatchery	1 (8.3%)	0
			Total	**12**	**4**

4.2 On-water Observations of Chinook Encounters

On-Board Observer Data

WDFW's observer staff conducted 9 on-the-water catch surveys onboard charter boats during the 2014 Chinook MSF. Observers recorded a total of 87 encountered Chinook salmon in all four ocean areas combined. The size/mark status composition of these Chinook encounters is presented in **Table 6**. The following size/mark group composition was estimated from 86 encounters of known size/mark status: 34% LM, 29% LU, 29% SM, and 8% SU.

These estimated size/mark group proportions based on onboard observer data were combined with those estimated from VTR data and used in subsequent impact estimation steps, as discussed further in the section below titled *Estimated Chinook Encounters and Mortalities* (see **Table 10** and **Appendix A)**. The decision to combine these data was based on *i)* the short duration of the fishery and the limited numbers of fish encountered during on-water observer trips, *ii)* the potential for differences in fishing patterns between charter and private vessels and the desire to represent both patterns, and *iii)* the lack of representation of catch in Areas 3 and 4 in the observer data.

DNA Results

Chinook DNA samples were collected only by onboard observers who had access to both marked and unmarked Chinook encounters during the 2014 Chinook MSF. A total of 54 DNA samples were collected from legal sized Chinook and 30 from sublegal sized Chinook during the fishery (**Table 7**).

Voluntary Trip Report (VTR) Data

Additional on-the-water encounters data were provided via angler-completed VTRs. Dockside samplers collected 75 completed and useable VTRs containing 294 Chinook encounters (**Table 8**). Chinook encounters of unknown size and/or unknown mark status were excluded in determining the size/mark status composition results based on VTR data, yielding a useable sample size of 291 Chinook encounters for CRC Areas 1-4 combined. The following size/mark group composition was estimated from these 291 useable encounters: 50% LM, 15% LU, 25% SM, and 10% SU. The VTR data were used in conjunction with observer data in subsequent fishery-wide impacts estimation steps (i.e., **Appendix A**).

We also combined the onboard observer- and VTR-based encounters data to compare observed (field-estimated) mark rates in each area with preseason FRAM-predicted values. The combined onboard observer and VTR data indicated mark rates of 72% for legal sized Chinook and 74% for sublegal sized Chinook coast-wide (**Table 9**).

Table 6. Summary of on-water Chinook encounters data by size and mark group, collected by WDFW observers sampling onboard charter boats during the 2014 recreational Chinook MSF in Washington CRC Areas 1 through 4.

		OBSERVER DATA								
	Total Observer Trips	LEGAL SIZED			SUBLEGAL SIZED			UNKNOWN SIZE		
		Marked	Unmarked	Unknown	Marked	Unmarked	Unknown	Marked	Unmarked	Unknown
Area 4	2	7	4	0	9	2	0	0	0	0
Area 3	0	-	-	-	-	-	-	-	-	-
Area 2	6	17	19	0	6	3	0	0	0	0
Area 1	1	5	2	0	10	2	0	0	1	0
TOTAL	**9**	**29**	**25**	**0**	**25**	**7**	**0**	**0**	**1**	**0**
Size/Mark Comp [1/]		33.7%	29.1%	-	29.1%	8.1%	-	-	-	-

[1/] Chinook encounters of unknown size and/or unknown mark status were excluded in determining the overall size/mark status composition.

Table 7. Number of Chinook DNA samples collected by WDFW observers onboard charter vessels during the 2014 recreational Chinook MSF in Washington CRC Areas 1 through 4.

	LEGAL SIZED			SUBLEGAL SIZED		
	Marked	Unmarked	Total	Marked	Unmarked	Total
Area 4	7	4	11	8	2	10
Area 3	0	0	0	0	0	0
Area 2	17	19	36	6	3	9
Area 1	5	2	7	9	2	11
TOTAL	**29**	**25**	**54**	**23**	**7**	**30**

Table 8. Summary of on-water Chinook encounters by size class and mark status, as reported on angler-completed voluntary trip reports (VTRs) during the 2014 recreational Chinook MSF in Washington CRC Areas 1 through 4.

		VOLUNTARY TRIP REPORT DATA								
	Total VTRs Collected	LEGAL SIZED			SUBLEGAL SIZED			UNKNOWN SIZE		
		Marked	Unmarked	Unknown	Marked	Unmarked	Unknown	Marked	Unmarked	Unknown
Area 4	20	26	7	1	35	15	2	0	0	0
Area 3	3	0	1	0	3	3	0	0	0	0
Area 2	37	67	27	0	7	7	1	0	0	0
Area 1	15	53	9	0	28	3	0	0	3	0
TOTAL	**75**	**146**	**44**	**1**	**73**	**28**	**3**	**0**	**3**	**0**
Size/Mark Comp [1/]		50.2%	15.1%	-	25.1%	9.6%	-	-	-	-

[1/] Chinook encounters of unknown size and/or unknown mark status were excluded in determining the overall size/mark status composition based on VTR data.

Table 9. Estimated mark rates for legal- and sublegal-sized Chinook during 2014 recreational Chinook MSF in Washington CRC Areas 1 through 4, based on onboard observer and VTR data combined, compared with FRAM preseason predicted values.

	LEGAL SIZED			SUBLEGAL SIZED			FRAM preseason projected mark rate (legal sized)
	Marked	Unmarked	Mark Rate	Marked	Unmarked	Mark Rate	
Area 4	33	11	75%	44	17	72%	88%
Area 3	0	1	0%	3	3	-	88%
Area 2	84	46	65%	13	10	57%	63%
Area 1	58	11	84%	38	5	88%	80%
TOTAL	**175**	**69**	**72%**	**98**	**35**	**74%**	

4.3 Overall Fishery Impacts

Estimated Total Chinook Encounters and Mortalities

We derived size/mark-status group-specific estimates of Chinook encounters from a combination of the dockside sampling results (i.e., retained harvest estimates presented in **Tables 2** and **4**) and the on-water observer and VTR based size/mark-status composition data (**Tables 6 and 8**; see **Appendix A** for computational details). In total, we estimated that anglers fishing in Washington CRC Areas 1 through 4 (combined) encountered 2,303 LM, 908 LU, 1,289 SM, and 461 SU Chinook during the 2014 Chinook MSF (**Table 10**). Given the estimates of harvest and the assumed selective fishing mortality (*sfm*) mortality rate of 0.14 for both legal-sized and sublegal-sized Chinook, these encounters translated into a total of 2,420 estimated Chinook mortalities (2,006 retained and 414 released; 2,045 LM, 130 LU, 181 SM, and 64 SU) in ocean CRC Areas 1 through 4 combined (**Table 10**). Of the total estimated mortalities, 83% were attributed to retention of legal-size marked Chinook.

FRAM versus Creel Comparison

Field estimated Chinook encounters and mortalities are compared with those projected in the final preseason FRAM model run (FRAM number 2714) in **Tables 11** and **12**. These comparisons are illustrated in **Figure 2**. FRAM projections include encounters and mortalities in Oregon waters; however, field estimated total encounters and mortalities are not available for Oregon waters. Oregon landed catch comprised 4% of the total landed catch in the ocean Chinook MSF. Both field estimates of encounters and mortalities were less than those projected in preseason FRAM model run 2714 for both legal and sublegal marked and unmarked Chinook (**Tables 11** and **12**, **Figure 2**).

Estimated CWT-DIT Impacts

Of the 142 decoded CWTs recovered during the 2014 Chinook MSF in Areas 1-4 combined, a total of 38 belonged to DIT release groups (**Table 13**). Based on the release details associated with these tags and their unmarked sister groups, we obtained an estimate of the unmarked-to-marked ratio (λ) at juvenile release for each applicable hatchery of origin and brood year, and we used this value to estimate total unmarked DIT encounters for the entirety of the 2014 selective Chinook fishery in the four areas. In total, we estimated that 45 unmarked-DIT Chinook were encountered during the fishery. Given an assumed *sfm* rate of 0.14 for the estimated unmarked

DIT fish that were encountered and released, we estimate that 7 unmarked DIT fish may have died as a result of the 2014 Chinook MSF(**Table 13**).

Summary of ocean Chinook MSFs in ocean areas north of Cape Falcon

Table 14 summarizes effort, retained and released Chinook catch, and total Chinook encounters in the ocean Chinook MSFs since their inception in 2010. The 2014 fishery produced the lowest effort, retained catch, and total encounters in the history of this fishery thus far.

Table 10. Summary of the fishery impact estimates for the 2014 recreational Chinook MSF in Washington coastal Areas 1 through 4.

Size/Mark Group	Encounters	Number Retained	Number Released	Release Mortality Rate	Release Mortality	Total Mortality	Variance	SE	95% CI	CV (%)
Legal Marked	2,303	2,003	299	0.14	42	2,045	11,494	107	1,835-2,255	5%
Legal Unmarked	908	3	905	0.14	127	130	321	18	94-165	14%
Sublegal Marked	1,289	0	1,289	0.14	181	181	430	21	140-221	11%
Sublegal Unmarked	461	0	461	0.14	64	64	131	11	42-87	18%
TOTAL ALL GROUPS	4,961	2,006	2,954	0.14	414	2,420	12,375	111	2,202-2,638	5%

Table 11. Comparison of modeled (FRAM model run #2714) and estimated total Chinook encounters in the 2014 recreational Chinook MSF in Washington coastal Areas 1 through 4.

Data Source	Group	Total Encounters [1/]	Legal	Sublegal	Landed Only (WA + OR)
FRAM Encounters (WA and OR)	Unmarked	10,152	5,209	4,943	104
	Marked	18,346	10,225	8,121	8,896
	Total	28,498	15,434	13,064	9,000
	% Marked	64%	66%	62%	99%
Estimated (Creel) Encounters (WA only)	Unmarked	1,368	908	461	3
	Marked	3,592	2,303	1,289	2,096
	Total	4,961	3,211	1,750	2,099
	% Marked	72%	72%	74%	100%

[1/] Field estimates of Chinook encounters by size class and mark status are not available for Oregon waters; landed catch includes Oregon.

Table 12. Comparison of modeled (FRAM model run #2714) and estimated total Chinook mortalities in the 2014 recreational Chinook MSF in Washington coastal Areas 1 through 4.

	FRAM Chinook Mortalities (WA + OR)			**Estimated Chinook Mortalities [1/] (WA only)**		
Mortality Category	Unmarked	Marked	Total	Unmarked	Marked	Total
Total (Landed + Released)	1,510	10,220	11,730	194	2,318	2,513
Released Legal	714	187	901	127	42	169
Released Sublegal	692	1,137	1,829	64	181	245
Landed Only (WA + OR)	104	8,896	9,000	3	2,096	2,099

[1/] Field estimates of Chinook mortalities by size class and mark status are not available for Oregon waters; landed catch includes Oregon.

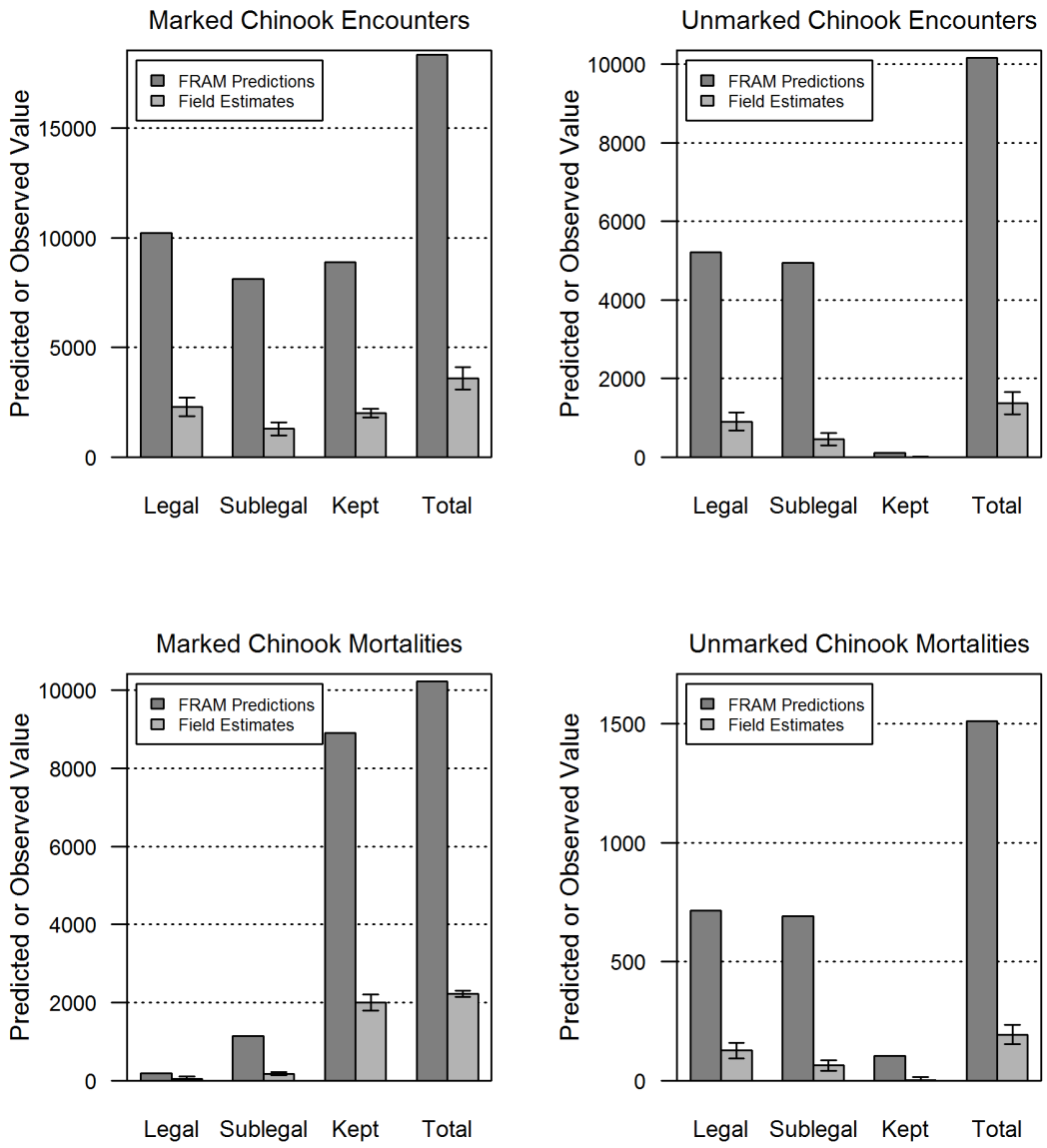

Figure 2. Comparison of modeled (FRAM model run 2714) and estimated total Chinook encounters (*top panel*) and mortalities (*bottom panel*) for the 2014 recreational Chinook MSF in Washington coastal Areas 1 through 4.

Table 13. Summary of double-index tagged (DIT) Chinook kept by anglers, and estimated total mortality of unmarked DIT Chinook due to hook-and-release impacts resulting from the 2014 recreational Chinook MSF in Washington coastal Areas 1 through 4.

Area	Hatchery	Brood Year	DITs Obs	AD DIT Harvest		UM DIT Enc	UM DIT Mortality		
				Est	var(Est)		Est	var(Est)	SE(Est)
1	Big Creek Hatchery	2011	8	10.7	3.6	3.6	0.5	0.008	0.3
	Chilliwack River Hatchery	2010	1	1.3	0.4	0.7	0.1	0.002	0.05
	Spring Creek NFH	2011	10	12.0	4.0	13.1	3.0	0.524	1.5
	Spring Creek NFH	2012	1	1.3	0.4	1.4	0.2	0.010	0.1
	Total		**20**	**25.4**	**8.5**	**18.8**	**3.8**	**0.545**	**1.9**
2	Big Creek Hatchery	2011	11	27	39.2	9.1	1.3	0.088	1
	Spring Creek NFH	2011	3	7.4	10.7	7.2	1	0.201	0.8
	Total		**14**	**34.4**	**50**	**16.3**	**2.3**	**0.288**	**1.8**
4	George Adams Hatchery	2010	1	2.8	4.8	2.8	0.4	0.098	0.3
	Chilliwack River Hatchery	2011	1	2.8	4.8	1.4	0.2	0.024	0.2
	Samish Hatchery	2011	1	2.8	4.8	2.7	0.4	0.093	0.3
	Spring Creek NFH	2011	1	2.8	4.8	2.7	0.4	0.091	0.3
	Total		**4**	**11**	**19.4**	**9.6**	**1.3**	**0.307**	**1.1**
Grand Total (All WA Ocean Areas)			**38**	**70.8**	**77.9**	**44.7**	**7.4**	**1.140**	**4.8**

Table 14. Season-total (WA only) estimates of Chinook encounters by size/mark status, and total estimates of angler effort, summarized for all seasons to date in the recreational Chinook MSFs in Washington CRC Areas 1 through 4.

Year	Effort (Angler Trips)	Retained Chinook				Released Chinook				Total Encounters
		LM	LU	SM	SU	LM	LU	SM	SU	
2010	10,004	4,981	19	0	0	744	2,620	1,892	946	11,202
2011	4,895	2,301	35	0	0	344	1,247	2,759	1,462	8,146
2012	7,853	7,339	43	0	0	1,097	3,531	1,771	1,453	15,234
2013	7,976	2,563	23	0	0	383	2,616	2,084	1,417	9,087
2014	4,748	2,003	3	0	0	299	905	1,289	461	4,961

5. RESULTS IN THE ALL-SPECIES COHO MARK SELECTIVE RECREATIONAL FISHERY

5.1 Dockside Sampling Results

An estimated 108,886 angler trips (98,276 from Washington, 10,610 from Oregon) were completed by private and charter anglers during the 2014 coastwide all-species coho MSF. These anglers harvested a total of 38,640 Chinook coastwide (36,514 WA, 2,126 OR) and 112,366 coho (98,005 WA, 14,361 OR). **Table 15** shows effort and catch by month and area during the 2014 coho MSF. Note that effort and catch from the non-selective fishery in September in all areas are not included in this analysis.

WDFW dockside samplers interviewed an estimated 44% of all anglers fishing from WA coastwide during the coho MSF. A total of 35% of all Chinook and 36% of all coho harvested in WA were sampled; 1,746 CWTs were collected from sampled Chinook and 5,832 were collected from sampled coho in WA ports (**Table 16**).

5.2 On-water Observation and VTR Results

Tables 17 and 18 detail on-water data collected during on-board observation and from VTRs submitted by charter and private fishing vessels. OSP observer staff combined with charter boat VTRs provided on-water catch and encounter data from a total of 157 charter boat trips during the all-species coho MSF documenting a total of 769 legal sized Chinook, 381 sublegal sized Chinook, 2,999 legal sized coho, and 37 sublegal sized coho. Dockside samplers also collected 487 completed and useable VTRs from private vessels containing 688 legal sized Chinook encounters, 452 sublegal sized Chinook encounters, 2,272 legal sized coho encounters, and 87 sublegal sized coho encounters. Mark rates calculated from onboard observer and VTR data are shown in **Table 19** and compared to pre-season FRAM coho mark rate projections.

5.3 Overall Fishery Impacts

Estimated Total Coho Encounters and Mortalities

FRAM pre-season projections of coho encounters (Washington and Oregon) in the 2014 ocean recreational all-species coho MSFs are compared with field estimated encounters (Washington only) in **Table 20**. **Table 21** compares total coho mortality projected pre-season by FRAM (Washington and Oregon) with field estimated coho mortality (Washington only).

The overall impacts of the 2014 recreational coho MSF in ocean CRC Areas 1-4 are characterized in terms of grand-total estimates of coho encounters and mortalities and by using estimates specific to mark group (i.e., marked and unmarked). The method described in section 3.4 was used to generate total estimates of retained catch by mark group. To estimate coho salmon encounters and releases by mark group, we applied Conrad's (2012) alternative method for estimating coho encounters and release mortalities in ocean MSFs, which independently calculates charter and private vessel totals based on observer and VTR data. This method differs from that used prior to 2012.

Field estimated marked and unmarked coho retention is calculated from dockside sampling data as described in Section 3.4; note that since catch estimates are stratified by week, monthly total proportions of marked and unmarked retained estimated catch may vary slightly from monthly total proportions of marked and unmarked sampled coho. Encounters are calculated by boat type and CRC Area based on landed catch of legal sized marked coho, the proportion of observed encounters that were legal sized marked coho, and the proportion of observed encounters that were legal sized marked coho retained. Mortality was estimated for each mark group based on calculated encounters and the proportion of the legal sized coho of that mark status that were released multiplied by the PFMC ocean *sfm* rate of 14% (Conrad, 2012).

Figure 3 summarizes the projected and field estimated coho encounters and mortality by area in the all-species fishery. Field estimates of both coho encounters and total mortality were lower than projected preseason in all Catch Areas during the coho MSF portion of the all-species fishery. Note that the portion of the all-species fisheries that were non-selective for are not included in this analysis.

Compliance

Table 22 reports compliance rates observed by dockside samplers for the recreational fisheries by area and month. Coastwide, compliance with selective fishery regulations averaged over 99%, similar to that observed in the last ten seasons.

5.4 DNA Data Collection

A total of 2,113 DNA samples were collected from Chinook by onboard and dockside samplers during the summer all-species recreational fishery, including both the coho MSF and non-selective portions of the fishery. **Table 23** describes the numbers of samples by size class, mark status, and method of collection.

Table 15. Estimates of total fishing effort and number of Chinook and coho retained during the 2014 all-species recreational fishery (coho MSF only) between Cape Falcon, Oregon and the U.S.-Canada border.

	TOTAL ANGLER TRIPS						CHINOOK RETAINED						COHO RETAINED					
	June	July	August	Sept	Oct	**TOTAL**	June	July	August	Sept	Oct	**TOTAL**	June	July	August	Sept	Oct	**TOTAL**
Area 4	1,922	8,102	3,547			**13,571**	778	3,975	806			**5,559**	188	1,734	2,244			**4,165**
Area 3	293	1,422	2,007	91	365	**4,177**	220	725	406	42	110	**1,503**	102	922	2,265	56	199	**3,543**
Area 2	5,778	19,006	18,838			**43,622**	3,215	8,190	9,944			**21,349**	5,935	17,687	17,874			**41,495**
Area 1	1,844	11,306	22,617	1,139	-	**36,906**	436	2,570	5,019	78		**8,103**	2,223	14,833	30,029	1,716	-	**48,801**
TOTAL WA	**9,837**	**39,834**	**47,010**	**1,230**	**365**	**98,276**	**4,650**	**15,460**	**16,174**	**120**	**110**	**36,514**	**8,448**	**35,175**	**52,411**	**1,772**	**199**	**98,005**
OREGON (Area 1)	502	3,579	6,279	250	-	**10,610**	77	624	1,393	32	-	**2,126**	392	5,034	8,519	416	-	**14,361**
TOTAL NOF	**10,339**	**43,413**	**53,289**	**1,480**	**365**	**108,886**	**4,727**	**16,084**	**17,567**	**152**	**110**	**38,640**	**8,840**	**40,209**	**60,924**	**2,188**	**199**	**112,366**
WA Variance: [1/]						1,582,409						473,762						3,208,727
WA Standard Error:						1,258						688						1,791
WA CV (%):						1%						2%						2%
WA 95% CI:						95,810-100,742						35,165-37,863						94,494-101,516

[1/] Variance estimates are unavailable for Oregon statistics.

Table 16. WA dockside sampling statistics during the 2014 all-species recreational fishery (coho MSF only) between Cape Falcon, Oregon and the U.S.-Canada border.

	Anglers Sampled	Sample Rate	Landed Chinook Sampled	Sample Rate	Landed Coho Sampled	Sample Rate	Chinook CWTs collected	Coho CWTs collected
Area 4	8,576	63%	2,761	50%	2,258	54%	329	216
Area 3	3,886	93%	1,088	72%	2,299	65%	118	274
Area 2	15,843	36%	6,105	29%	12,584	30%	894	2,076
Area 1	14,606	40%	2,909	36%	18,224	37%	405	3,266
TOTAL WA	**42,911**	**44%**	**12,863**	**35%**	**35,364**	**36%**	**1,746**	**5,832**

Table 17. On-board and VTR Chinook encounters by size class and mark status in the 2014 all-species recreational fishery (coho MSF only) between Cape Falcon, Oregon and the U.S.-Canada border.

		On-board observation/Charter boat VTRs							Private boat VTRs						
		Total Observer Trips/ VTRs	LEGAL-SIZED			SUBLEGAL-SIZED			Total VTRs Collected	LEGAL-SIZED			SUBLEGAL-SIZED		
			Marked	Unmarked	Unknown	Marked	Unmarked	Unknown		Marked	Unmarked	Unknown	Marked	Unmarked	Unknown
Area 4	June	3	8	14	0	2	1	0	12	14	2	0	13	5	4
	July	12	92	90	0	14	16	0	42	49	18	0	33	19	4
	August	2	10	3	0	4	1	0	26	10	10	0	18	9	5
	TOTAL	**17**	**110**	**107**	**0**	**20**	**18**	**0**	**80**	**73**	**30**	**0**	**64**	**33**	**13**
Area 3	June	7	22	37	0	6	2	0	5	1	22	0	0	0	0
	July	10	38	45	0	6	4	0	18	8	7	0	3	11	9
	August	19	29	59	0	14	1	0	25	5	4	0	19	9	0
	TOTAL	**36**	**89**	**141**	**0**	**26**	**7**	**0**	**48**	**14**	**33**	**0**	**22**	**20**	**9**
Area 2	June	6	21	18	1	18	8	0	26	39	50	1	20	15	2
	July	8	29	19	0	21	8	3	75	102	38	1	50	31	3
	August	9	64	23	1	34	15	6	80	133	36	1	12	7	16
	TOTAL	**23**	**114**	**60**	**2**	**73**	**31**	**9**	**181**	**274**	**124**	**3**	**82**	**53**	**21**
Area 1	June	11	4	5	0	11	11	1	22	13	2	0	5	13	3
	July	34	67	18	0	69	46	1	57	49	12	0	40	20	5
	August	36	40	12	0	44	14	0	99	40	20	1	19	22	8
	TOTAL	**81**	**111**	**35**	**0**	**124**	**71**	**2**	**178**	**102**	**34**	**1**	**64**	**55**	**16**

Table 18. On-board and VTR coho encounters by size class and mark status in the 2014 all-species recreational fishery (coho MSF only) between Cape Falcon, Oregon and the U.S.-Canada border.

		On-board observation/Charter boat VTRs							Private boat VTRs						
		Total Observer Trips/ VTRs	LEGAL-SIZED			SUBLEGAL-SIZED			Total VTRs Collected	LEGAL-SIZED			SUBLEGAL-SIZED		
			Marked	Unmarked	Unknown	Marked	Unmarked	Unknown		Marked	Unmarked	Unknown	Marked	Unmarked	Unknown
Area 4	June	3	5	9	0	1	3	0	12	12	16	0	1	0	0
	July	12	29	13	0	0	2	0	42	30	25	0	2	2	0
	August	2	7	0	0	1	0	0	26	34	30	0	6	8	3
	TOTAL	**17**	**41**	**22**	**0**	**2**	**5**	**0**	**80**	**76**	**71**	**0**	**9**	**10**	**3**
Area 3	June	7	3	0	0	5	6	0	5	1	1	0	0	0	0
	July	10	37	27	0	0	0	0	18	22	33	0	2	0	0
	August	19	164	163	0	0	0	0	25	64	48	0	1	3	0
	TOTAL	**36**	**204**	**190**	**0**	**5**	**6**	**0**	**48**	**87**	**82**	**0**	**3**	**3**	**0**
Area 2	June	6	99	61	0	0	0	0	26	99	73	0	2	5	0
	July	8	199	119	1	3	1	0	75	225	162	0	5	6	1
	August	9	197	107	0	3	0	1	80	188	80	1	2	9	1
	TOTAL	**23**	**495**	**287**	**1**	**6**	**1**	**1**	**181**	**512**	**315**	**1**	**9**	**20**	**2**
Area 1	June	11	178	59	0	1	1	0	22	78	23	0	1	5	1
	July	34	506	198	0	4	4	0	57	270	81	2	5	5	0
	August	36	562	256	0	1	0	0	99	504	170	0	6	2	3
	TOTAL	**81**	**1246**	**513**	**0**	**6**	**5**	**0**	**178**	**852**	**274**	**2**	**12**	**12**	**4**

Table 19. Estimated Chinook and coho mark rates during the 2014 all-species recreational fishery (coho MSF only) by boat type and size class using onboard observer and VTR encounters.

		LEGAL SIZED CHINOOK			SUBLEGAL SIZED CHINOOK			LEGAL SIZED COHO			FRAM Projected Coho Mark Rate
		Charter	Private	Combined	Charter	Private	Combined	Charter	Private	Combined	
Area 4	June	36%	88%	58%	67%	72%	71%	36%	43%	40%	40%
	July	51%	73%	57%	47%	63%	57%	69%	55%	61%	56%
	August	77%	50%	61%	80%	67%	69%	100%	53%	58%	51%
	TOTAL	**51%**	**71%**	**57%**	**53%**	**66%**	**62%**	**65%**	**52%**	**56%**	**53%**
Area 3	June	37%	4%	28%	75%	-	75%	100%	50%	80%	66%
	July	46%	53%	47%	60%	21%	38%	58%	40%	50%	61%
	August	33%	56%	35%	93%	68%	77%	50%	57%	52%	65%
	TOTAL	**39%**	**30%**	**37%**	**79%**	**52%**	**64%**	**52%**	**51%**	**52%**	**59%**
Area 2	June	54%	44%	47%	69%	57%	62%	62%	58%	60%	72%
	July	60%	73%	70%	72%	62%	65%	63%	58%	60%	69%
	August	74%	79%	77%	69%	63%	68%	65%	70%	67%	65%
	TOTAL	**66%**	**69%**	**68%**	**70%**	**61%**	**65%**	**63%**	**62%**	**63%**	**64%**
Area 1	June	44%	87%	71%	50%	28%	40%	75%	77%	76%	78%
	July	79%	80%	79%	60%	67%	62%	72%	77%	74%	76%
	August	77%	67%	71%	76%	46%	64%	69%	75%	71%	71%
	TOTAL	**76%**	**75%**	**76%**	**64%**	**54%**	**60%**	**71%**	**76%**	**73%**	**72%**

Table 20. Comparison of modeled (FRAM model run #1416) and estimated total coho encounters in the 2014 ocean coho MSF.

Data Source	Area	Marked	Unmarked	Total Encounters	Landed Catch
FRAM (WA and OR)	Area 4	19,998	17,990	37,988	19,221
	Area 3	5,008	3,492	8,500	4,800
	Area 2	71,501	40,814	112,315	68,381
	Area 1	96,942	37,841	134,783	92,401
	TOTAL	**193,449**	**100,137**	**293,586**	**184,803**
Estimated Actual Encounters	Area 4	5,149	4,327	9,476	4,165
	Area 3	3,990	3,784	7,774	3,543
	Area 2	44,815	26,772	71,588	41,495
	Area 1	64,612	22,368	86,980	63,162
	TOTAL	**118,566**	**57,251**	**175,817**	**112,366**
	Variance[1/]:	5,463,808	1,297,623	11,746,567	3,208,727
	Standard Error:	2,337	1,139	3,427	1,791
	CV (%):	2%	2%	2%	2%
	95% CI:	113,984-123,147	55,019-59,484	169,100-182,535	94,494-101,516

[1/] Variance estimates for landed catch are unavailable for Oregon

Table 21. Comparison of modeled (FRAM model run #1416) and estimated total coho mortalities in the 2014 ocean coho MSF.

		Release Mortality		**Drop Off Mortality** [1/]		**Landed Catch**		Total
Data Source	Area	Marked	Unmarked	Marked	Unmarked	Marked	Unmarked	Mortality
FRAM (WA and OR)	Area 4	169	2,552	1,002	931	18,848	373	23,875
	Area 3	43	499	251	182	4,727	73	5,775
	Area 2	603	5,926	3,592	2,159	67,517	864	80,661
	Area 1	819	5,589	4,871	2,037	91,586	815	105,717
	TOTAL	**1,634**	**14,566**	**9,716**	**5,309**	**182,678**	**2,125**	**216,028**
Estimated Actual Mortality	Area 4	153	606	257	216	4,054	112	5,398
	Area 3	68	530	199	189	3,504	39	4,529
	Area 2	488	3,742	2,241	1,339	41,329	166	49,305
	Area 1	235	3,124	3,231	1,118	62,934	228	70,870
	TOTAL	**944**	**8,001**	**5,928**	**2,863**	**111,820**	**545**	**130,102**
Variance[2]/:		6,232	56,661	13,660	3,244	3,181,925	26,802	-
Standard Error:		79	238	117	57	1,784	164	-
CV (%):		8%	3%	2%	2%	2%	30%	-
95% CI:		790-1,099	7,535-8,468	5,699-6,157	2,751-2,974	108,324-115,316	224-866	-

1/ Estimated drop off mortality calculated as 5% of estimated encounters.

2/ Variance estimates for landed catch are unavailable for Oregon

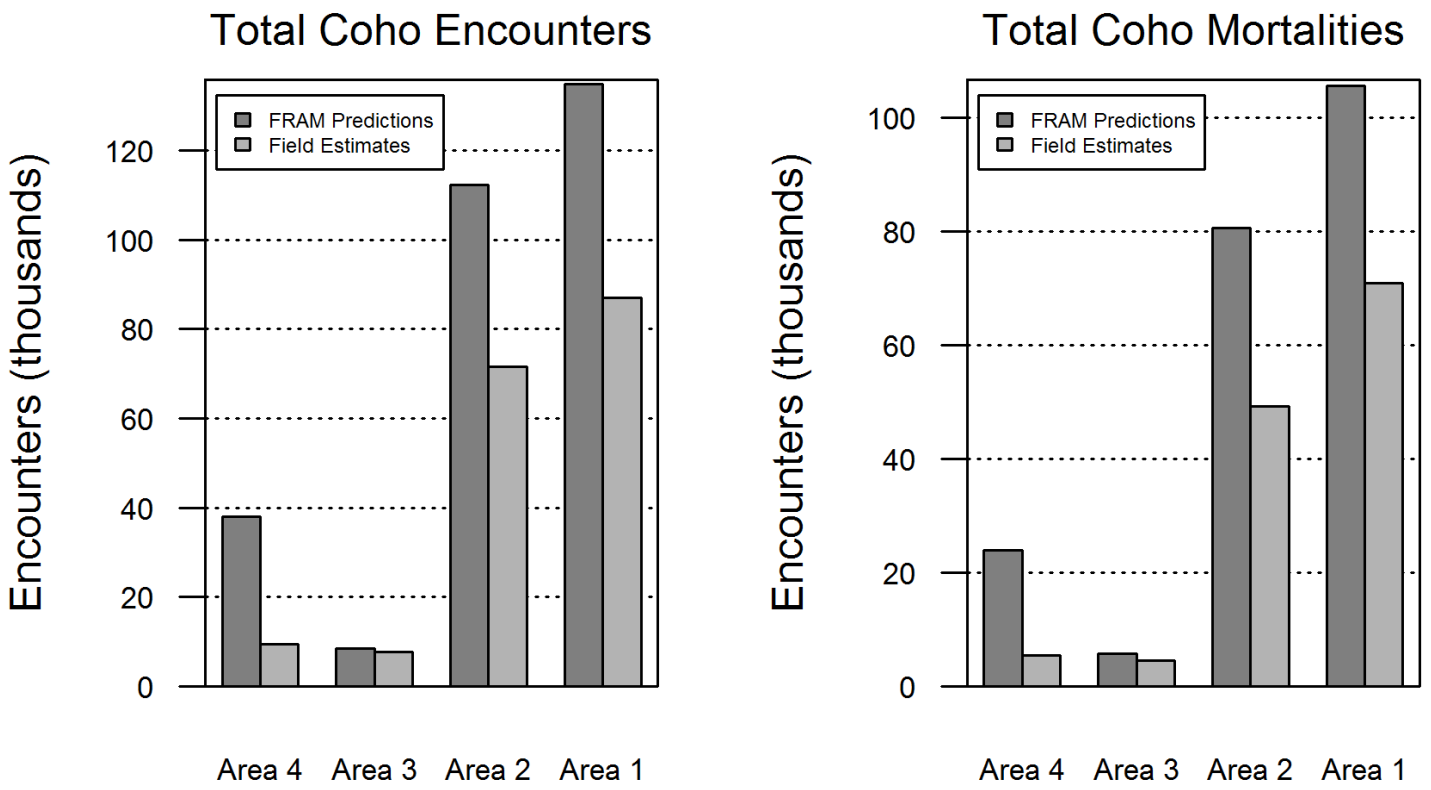

Figure 3. Comparison of modeled (FRAM model run #1416) and estimated total coho encounters and mortality in the 2014 ocean coho MSF.

Table 22. Compliance with coho selective fishery regulations observed during dockside sampling interviews in the 2014 ocean coho MSF between Cape Falcon, Oregon and the U.S.-Canada border.

		Total Coho Sampled	Marked Coho Sampled	Unmarked Coho Sampled	% Sampled Coho Marked
Area 4	June	102	101	1	99.0%
	July	658	635	23	96.5%
	August	1,498	1,467	31	97.9%
	Total	**2,258**	**2,203**	**55**	**97.6%**
Area 3	June	82	82	0	100.0%
	July	553	544	9	98.4%
	August	1,664	1,648	16	99.0%
	Total	**2,299**	**2,274**	**25**	**98.9%**
Area 2	June	2,251	2,245	6	99.7%
	July	4,236	4,225	11	99.7%
	August	6,097	6,067	30	99.5%
	Total	**12,584**	**12,537**	**47**	**99.6%**
Area 1	June	1,731	1,707	24	98.6%
	July	5,960	5,953	7	99.9%
	August	9,817	9,780	37	99.6%
	September	716	715	1	99.9%
	Total	**18,224**	**18,155**	**69**	**99.6%**

Table 23. Number of Chinook DNA samples collected by onboard and dockside samplers from the 2014 ocean recreational all-species fishery (both coho MSF and non-selective), by size class, mark status, and sample type.

		On-Board Sampling						Dockside Sampling			Total Number of DNA Samples
		Legal Sized			Sublegal Sized			Legal-Sized			
		Marked	Unmarked	Unknown	Marked	Unmarked	Unknown	Marked	Unmarked	Unknown	
Area 4	June	-	-	-	-	-	-	68	34	1	103
	July	-	-	-	-	-	-	140	99	9	248
	August	-	-	-	-	-	-	71	55	0	126
	September	-	-	-	-	-	-	3	4	0	7
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**282**	**192**	**10**	**484**
Area 3	June	-	-	-	-	-	-	13	35	0	48
	July	-	-	-	-	-	-	27	34	0	61
	August	-	-	-	-	-	-	24	34	0	58
	Sept./Oct.	-	-	-	-	-	-	14	32	0	46
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**78**	**135**	**0**	**213**
Area 2	June	16	17	0	14	5	0	86	67	0	205
	July	27	16	0	15	4	0	218	76	0	356
	August	48	19	0	25	13	0	217	71	1	394
	September	-	-	-	-	-	-	25	31	0	56
	Total	**91**	**52**	**0**	**54**	**22**	**0**	**546**	**245**	**1**	**1,011**
Area 1	June	1	3	0	4	3	0	45	19	0	75
	July	13	3	0	21	7	0	121	37	0	202
	August	7	1	0	5	1	0	72	32	0	118
	September	0	0	0	0	0	0	3	7	0	10
	Total	**21**	**7**	**0**	**30**	**11**	**0**	**241**	**95**	**0**	**405**

6. RESULTS IN THE ALL-SPECIES COHO MARK SELECTIVE NON-TREATY COMMERCIAL TROLL FISHERY

The non-Treaty commercial troll fishery harvested a total of 18,020 Chinook (15,371 WA, 2,649 OR) and 15,184 coho (10,970 WA, 4,214 OR) during the 2014 coastwide all-species coho MSF operating July 1 through September 4. **Table 24** shows catch by month and area. The fishery continued September 5 – 16 non-selective for coho; this report includes only the MSF portion of the fishery.

WDFW dockside samplers sampled a total of 37% of all Chinook and 31% of all coho harvested and landed in WA. Coded wire tag collections totaled 842 from Chinook and 465 from coho in WA ports (**Table 25**).

Table 26 details numbers of Chinook DNA samples collected in WA by month and area, including during the non-selective spring Chinook fishery and the non -selective portion of the all-species fishery. A total of 1,437 DNA samples were collected from Chinook by dockside samplers throughout the May – September non-Treaty troll fishery (994 in May-June, 443 in July-September).

Table 24. Total Chinook and coho retained during the 2014 all-species non-Treaty commercial troll fishery (coho mark-selective only) between Cape Falcon, Oregon and the U.S.-Canada border.

	Chinook				**Coho**			
	July	August	September	TOTAL	July	August	September	TOTAL
Area 4	168	56	-	224	19	22	-	41
Area 3	3,208	1,672	201	5,081	1,149	3,069	384	4,602
Area 2	4,722	3,936	419	9,077	1,739	2,959	141	4,839
Area 1	598	297	94	989	534	822	132	1,488
TOTAL WA	**8,696**	**5,961**	**714**	**15,371**	**3,441**	**6,872**	**657**	**10,970**
OREGON (Area 1)	2,278	175	196	2,649	2,427	1,570	217	4,214
TOTAL NOF	**10,974**	**6,136**	**910**	**18,020**	**5,868**	**8,442**	**874**	**15,184**

Table 25. Chinook and coho sampled in WA during the 2014 all-species non-Treaty commercial troll fishery (coho mark-selective only) between Cape Falcon, Oregon and the U.S.-Canada border.

	Chinook			**Coho**		
	Total Sampled	Sample Rate	CWTs Collected	Total Sampled	Sample Rate	CWTs Collected
Area 4	56	25%	2	12	29%	1
Area 3	301	6%	38	283	6%	37
Area 2	5,152	57%	767	2,527	52%	334
Area 1	237	24%	35	589	40%	93
TOTAL WA	**5,746**	**37%**	**842**	**3,411**	**31%**	**465**

Table 26. Number of chinook DNA samples collected from the 2014 non-treaty troll fishery by size class, mark status.

AREA	MONTH	Dockside Sampling			Total Number of DNA Samples
		Legal-Sized			
		Marked	Unmarked	Unknown	
Area 4	May	6	23	0	29
	June	0	0	0	0
	July	0	3	0	3
	August	0	0	0	0
	September	0	0	0	0
	Total	**6**	**26**	**0**	**32**
Area 3	May	68	122	1	191
	June	24	76	0	100
	July	6	59	0	65
	August	4	11	0	15
	September	0	0	0	0
	Total	**102**	**268**	**1**	**371**
Area 2	May	64	19	0	83
	June	90	101	0	191
	July	88	79	0	167
	August	36	29	0	65
	September	5	5	0	10
	Total	**283**	**233**	**0**	**516**
Area 1	May	127	86	0	213
	June	110	77	0	187
	July	27	28	0	55
	August	18	10	0	28
	September	8	27	0	35
	Total	**290**	**228**	**0**	**518**

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APPENDICES

Appendix A. Mark-selective fishery impact estimation details for the pilot recreational selective Chinook fishery in Washington coastal Areas 1 through 4.

Below are definitions and equations for all quantities used in estimating mark-selective fishery impacts from the combination of dockside creel survey information, on-water observer data, and/or voluntary trip report (VTR) results as applicable. The estimation sequence builds from monthly[2] estimators of encounters-by-class (i.e., the four size [legal, sublegal] × mark-status [marked, unmarked] groups) to season-wide impact estimates.

A. Total and Class-specific Encounters Estimation

The first step towards quantifying mark-selective fishery impacts by size/mark-status class is to estimate total Chinook encounters ($\hat{E}_i$, includes retained + released Chinook; See *Monthly Encounters* below) for each month of the fishery. Secondarily, encounters are apportioned to the appropriate size/mark-status group using encounters-composition data collected from onboard sampling on charter boats (See *Estimating Chinook Encounter Composition* on following page).

Monthly Encounters

$\hat{E}_i$ = Total Chinook encounters for month *i*, which is estimated by combining creel estimates of legal-marked Chinook harvest ($\hat{K}_{LM\,i}$, defined on subsequent page) with an estimate of the proportion of the fishable Chinook population that is of legal size and marked ($\hat{p}_{LM\,i}$, defined on subsequent page). Given the potential for negative bias in $\hat{E}_i$ if anglers release any of the legal-marked Chinook that they encounter, the $\hat{E}_i$ estimator also includes a "correction" to account for this phenomenon (i.e., 1-$p_{\text{LM-R}}$, where $p_{\text{LM-R}}$ is the estimated legal-marked Chinook release rate)[3]. $\hat{E}_i$ and its variance are estimated as:

$$(1) \qquad \hat{E}_i = \frac{\hat{K}_{LM}}{[\hat{p}_{LM}(1-p_{LM-R})]}$$

$$(2) \qquad \text{var}(\hat{E}_i) = \frac{1}{[(1-p_{LM-R})^2]} * \left[\frac{\hat{K}_{LM\,i}^{\,2}}{\hat{p}_{LM\,i}^{\,2}} * \left(\frac{\text{var}(\hat{K}_{LM\,i})}{\hat{K}_{LM\,i}^{\,2}} + \frac{\text{var}(\hat{p}_{LM\,i})}{\hat{p}_{LM\,i}^{\,2}} \right) \right]$$

[2] **Note:** For fisheries characterized by short-duration seasons (i.e., ~ 1 month), the "monthly" estimators described in this appendix are synonymous season-total estimators.

[3] Equations 1 and 2 were modified based on a 2008 state–tribal evaluation of sources of bias in estimates of total Chinook encounters in mark-selective fisheries. Based on a review of relevant data, the current operational $p_{\text{LM-R}}$ (combined intentional and unintentional LM Chinook release rate) applied in the bias-corrected $\hat{E}_i$ estimator is 0.13. See Conrad and McHugh (2008) for further detail.

Estimating Chinook Encounter Composition

$\hat{p}_{LM\,i}$ = the onboard observer (charter ride-along)-based estimate of the proportion of Chinook encounters that are legal-sized (*L*) and marked (*M*) during month *i*

$\hat{p}_{LU\,i}$ = the estimated proportion of encounters that are legal-sized (*L*) and unmarked (*U*)

$\hat{p}_{SM\,i}$ = the estimated proportion of encounters that are sublegal-sized (*S*) and unmarked (*M*)

$\hat{p}_{LU\,i}$ = the estimated proportion of encounters that are sublegal-sized (*S*) and unmarked (*U*)

For each *XY* combination (where *X* = *L* or *S* and *Y* = *M* or *U*), $\hat{p}_{XY\,i}$ and its variance is estimated as:

(3) $\hat{p}_{XY\,i} = n_{XY\,i} / n_i$, and

(4) $\text{var}(\hat{p}_{XY\,i}) = [\hat{p}_{XY\,i}(1 - \hat{p}_{XY\,i})]/(n_i - 1)$,

Where, n_i = the total number of fish encountered by the onboard observers during month *i*.

Encounters by Size/Mark-status Class

$\hat{E}_{LM\,i}$ = estimated legal (*L*), marked (*M*) encounters during month *i*

$\hat{E}_{LU\,i}$ = estimated legal (*L*), unmarked (*U*) encounters during month *i*

$\hat{E}_{SM\,i}$ = estimated sublegal (*S*), marked (*M*) encounters during month *i*

$\hat{E}_{SU\,i}$ = estimated sublegal (*S*), marked (*U*) encounters during month *i*

For each *XY* combination (where *X* = *L* or *S* and *Y* = *M* or *U*) $\hat{E}_{XY\,i}$ and an estimate of its variance are obtained from:

(5) $\hat{E}_{XY\,i} = \hat{E}_i * \hat{p}_{XY\,i}$

(6) $\text{var}(\hat{E}_{XY\,i}) = \text{var}(\hat{E}_i) * \hat{p}_{XY\,i}^{\,2} + \hat{E}_i^{\,2} * \text{var}(\hat{p}_{XY\,i}) - \text{var}(\hat{E}_i) * \text{var}(\hat{p}_{XY\,i})$

B. Estimating Retained and Released Numbers by Size/Mark-status Class

Before total mortality can be estimated for each class (LM, SM, LU, SU), class-specific encounters must be separated into retention and release categories. First, given that harvest is estimated only to mark-status class for creel survey purposes, estimates of marked and unmarked Chinook retention must be assigned to size classes (See *Apportioned Estimates of Retention to Size Classes* on subsequent page); this is done using mark-status-specific size composition data from dockside sampling (See *Dockside Observations for Apportioning Retained Catch to Class* on subsequent page). Subsequently, size/mark-status group-specific releases are estimated as the difference between class-specific encounters and retention (See *Estimating Release Numbers by Class* on subsequent page).

Dockside Observations for Apportioning Retained Catch to Class

$\hat{d}_{LMK}$ = the estimated proportion of retained (kept, *K*), marked (*M*) Chinook salmon that were legal (*L*); based on *season-wide*[4] dockside observations of marked Chinook (as is $\hat{d}_{SMK}$)

$\hat{d}_{SMK}$ = the estimated proportion of retained (kept, *K*), marked (*M*) Chinook that were sublegal (*S*)

The proportion of retained, marked fish in size class *X* (*X* = *L* or *S*) and its variance are estimated as:

$$(7) \qquad \hat{d}_{XMK} = n_{XMK} / n_{MK}$$

$$(8) \qquad \text{var}(\hat{d}_{XMK}) = [\hat{d}_{XMK} * (1 - \hat{d}_{XMK})] / (n_{MK} - 1),$$

where n_{MK} and n_{XMK} are *season-wide* total dockside counts of marked fish and the subset of marked fish in size-class *X*, respectively.

$\hat{d}_{LUK}$ = the estimated proportion of retained (kept, *K*), unmarked (*U*) Chinook salmon that are legal (*L*); estimated from *season-wide* dockside observations of unmarked Chinook (as is $\hat{d}_{SUK}$)

$\hat{d}_{SUK}$ = the estimated proportion of retained (kept, *K*), unmarked (*U*) Chinook that are sublegal (*S*)

The proportions of retained, unmarked fish belonging to legal and sublegal size classes and their respective variances are estimated as above (Eqns. 7 and 8) but using *season-wide* dockside observations on unmarked (*U*), not marked Chinook salmon.

Apportioned Estimates of Retention to Size Classes

$\hat{K}_{LMi}$ = the estimated number of legal (*L*), marked (*M*) Chinook kept in month *i*

$\hat{K}_{LUi}$ = the estimated number of legal (*L*), unmarked (*U*) Chinook kept in month *i*

The number of kept, marked encounters, marked fish in size class *X* (*L* or *S*) and its variance is estimated as:

$$(9) \qquad \hat{K}_{XMi} = \hat{d}_{XMK} * \hat{N}_{MKi}$$

$$(10) \qquad \text{var}(\hat{K}_{XMi}) = \text{var}(\hat{N}_{MKi}) * \hat{d}_{XMK}^{\,2} + \hat{N}_{MKi}^{\,2} * \text{var}(\hat{d}_{XMK}) - \text{var}(\hat{N}_{MKi}) * \text{var}(\hat{d}_{XMK})$$

where $\hat{d}_{XMK}$ and its variance are from 6 and 7 above and $\hat{N}_{MKi}$ is the survey estimate of retained marked fish for month *i* defined in Eqn. 1.

$\hat{K}_{SMi}$ = estimated number of sublegal (*S*), marked (*M*) Chinook kept in month *i*

$\hat{K}_{SUi}$ = estimated number of sublegal (*S*), unmarked (*U*) Chinook kept in month *i*

[4] Due to small sample sizes for observed, harvested Chinook—particularly for sublegal and/or unmarked classes—dockside length data are pooled across the season to estimate $\hat{d}_{XYK}$.

The number of retained, unmarked fish belonging to legal and sublegal size classes is estimated according to Eqns. 9 and 10 above but using unmarked fish proportions and monthly retention estimates.

Estimating Release Numbers by Class

$\hat{R}_{LM\,i}$ = the estimated number of legal (*L*), marked (*M*) Chinook released in month *i*

$\hat{R}_{LU\,i}$ = the estimated number of legal (*L*), unmarked (*U*) Chinook released in month *i*

$\hat{R}_{SM\,i}$ = the estimated number of sublegal (*S*), marked (*M*) Chinook released in month *i*

$\hat{R}_{SU\,i}$ = the estimated number of sublegal (*S*), unmarked (*U*) Chinook released in month *i*

For each size/mark-status class (i.e., *XY* combination [*X* = *L* or *S* and *Y* = *M* or *U*]), the number of fish encountered and released is estimated as the difference between total size/mark-status class encounters ($\hat{E}_{XY\,i}$) and retention ($\hat{K}_{XY\,i}$) during month *i*. The estimator and its variance are:

$$\hat{R}_{XY\,i} = \hat{E}_{XY\,i} - \hat{K}_{XY\,i} \tag{11}$$

$$\mathrm{var}(\hat{R}_{XY\,i}) = \mathrm{var}(\hat{E}_{XY\,i}) + \mathrm{var}(\hat{K}_{XY\,i}) \tag{12}$$

C. Estimating Total (and Class-specific) Monthly and Season-wide Mortality

The application of assumed mortality rates (See *Assumed Mortality Rates for Retained and Released Chinook* below) to class-specific estimates of total retention and releases constitutes the final step in quantifying mark-selective fishery impacts.

Assumed Mortality Rates for Retained and Released Chinook

m_K = retention mortality rate, 100% for all retained Chinook (reincarnation is rare among fishes)
sfm_L = release mortality rate for legal (*L*) Chinook, assumed to be a constant of 14% in ocean fisheries
sfm_S = release mortality rate for sublegal (*S*) Chinook, assumed to be a constant of 14% in ocean fisheries

Retention-mortality Estimates

$\hat{M}_{LMK\,i}$ = estimated mortality due to legal (*L*), marked (*M*) Chinook harvest in month *i* (= $\hat{K}_{LM\,i}$).

$\hat{M}_{LUK\,i}$ = estimated mortality due to harvest of legal (*L*), unmarked (*U*) Chinook in month *i* (= $\hat{K}_{LU\,i}$).

$\hat{M}_{SMK\,i}$ = estimated mortality due to harvest of sublegal (*S*), marked (*M*) Chinook in month *i* (= $\hat{K}_{SM\,i}$).

$\hat{M}_{SUK\,i}$ = estimated mortality due to harvest of sublegal (*S*), marked (*M*) Chinook in month *i* (= $\hat{K}_{SU\,i}$).

Release-mortality Estimates

$\hat{M}_{LMR\,i}$ = estimated post-release mortality for legal (*L*), marked (*M*) Chinook in month *i*

$\hat{M}_{LUR\,i}$ = estimated post-release mortality for legal (*L*), unmarked (*U*) Chinook in month *i*

$\hat{M}_{SMRi}$ = estimated post-release mortality for sublegal (*S*), marked (*M*) Chinook in month *i*

$\hat{M}_{SURi}$ = estimated post-release mortality for sublegal (*S*), unmarked (*U*) Chinook in month *i*

All class-specific (*XY* [*X* = *L* or *S*, *Y* = *M* or *U*]) release mortality estimates are obtained from:

$$(13) \qquad \hat{M}_{XYRi} = \hat{R}_{XYi} * sfm_Y$$

$$(14) \qquad \text{var}(\hat{M}_{XYRi}) = \text{var}(\hat{R}_{XYi}) * sfm_Y^{\,2}$$

Season-wide Total and Class-specific Mortality Estimation

$\hat{M}_{total}$ = total season-wide Chinook salmon mortality; this parameter and its variance [$\text{var}(\hat{M}_{total})$] are computed as the sum of all monthly retention and release mortality estimates [i.e., $\hat{M}_{total} = \sum_{i=1}^{\max i} (\hat{M}_{XYKi} + \hat{M}_{XYRi})$] and variances [$\text{var}(\hat{M}_{total}) = \sum_{i=1}^{\max i} [\text{var}(\hat{M}_{XYKi}) + \text{var}(\hat{M}_{XYRi})]$], respectively, for all four size/mark-status groups (*X* = *L* or *S*, *Y* = *M* or *U*). Season total estimates for subgroups of interest (e.g., unmarked, sublegal Chinook, $\hat{M}_{SU-total}$) are obtained by summing monthly estimates (and variances) across the season for just that group.

D. Characterizing Precision of Estimates

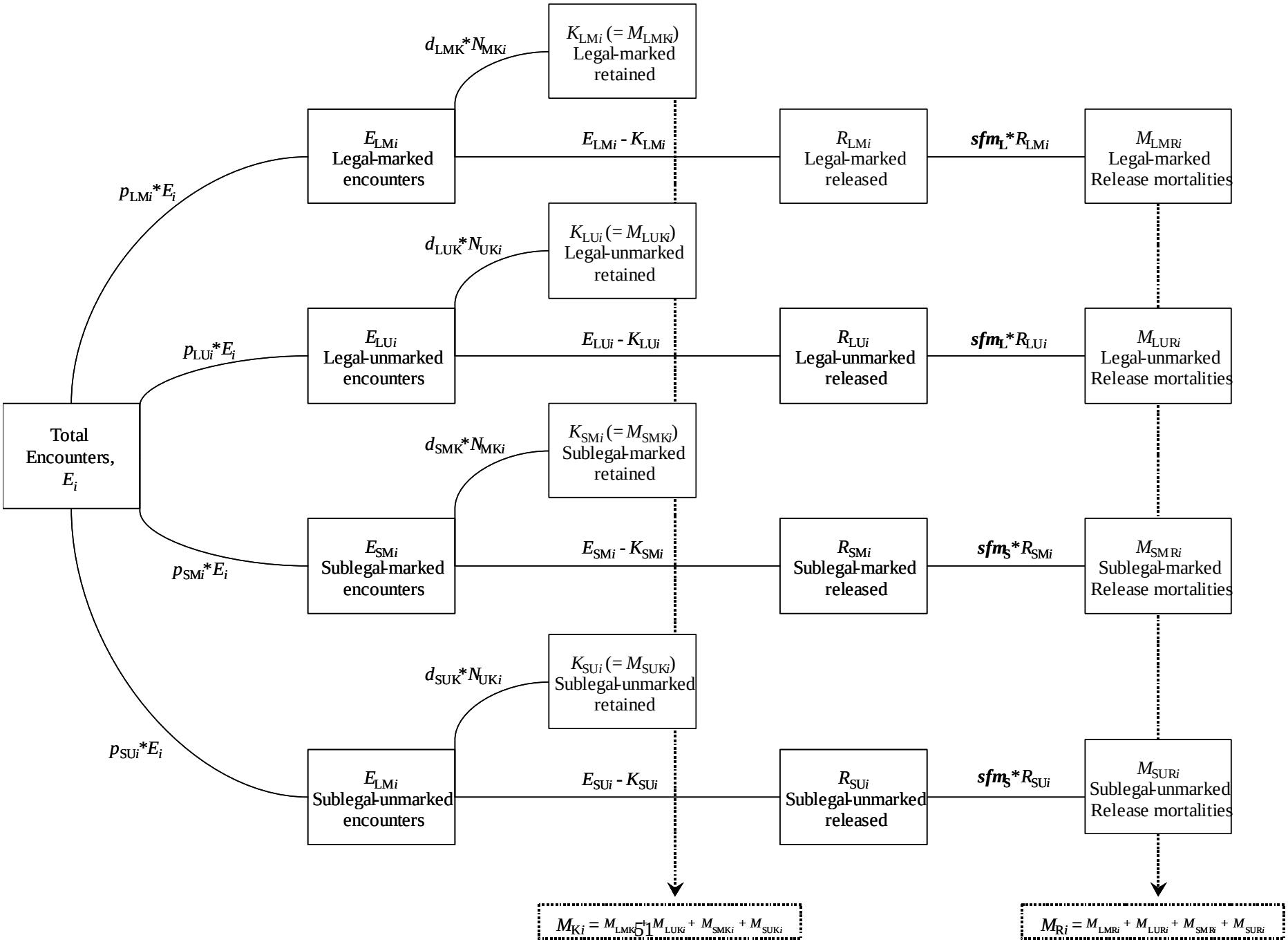
The precision of estimates generated from creel surveys and the preceding fishery impact estimation scheme is characterized using estimates of a parameter's standard error (*SE*), coefficient of variation (*CV* or relative standard error), and approximate 95% confidence interval. For any parameter estimate $\hat{\theta}$ (e.g., $\hat{M}_{total}$, $\hat{K}_{LMi}$, $\hat{E}_i$, etc.), these metrics are estimated using:

$$(15) \qquad SE(\hat{\theta}) = \sqrt{\text{var}(\hat{\theta})}$$

$$(16) \qquad CV(\hat{\theta}) = [SE(\hat{\theta}) / \hat{\theta}] * 100$$

$$(17) \qquad CI = \hat{\theta} \pm 1.96 * SE(\hat{\theta})$$

Figure A1. (*On following page*) Graphical representation of the approach used to estimate monthly encounters and mortalities by size/mark-status category in mark-selective Chinook fisheries. Boxes depict abundance estimates (encounters, mortalities) whereas the mathematical operations depicted on intermediate connector lines are estimator formulae yielding quantities found in subsequent boxes (moving from left to right). Parameter definitions, complete formulae, and variances are defined in the preceding pages. For short-duration fisheries (~ 1 month or less), monthly and season-total values are equivalent; for all others, season-total impacts are equivalent to the sum of monthly impact estimates (and variances).


Total Encounters, E_i
$p_{LMi}*E_i$
E_{LMi} Legal-marked encounters
$E_{LMi} - K_{LMi}$
R_{LMi} Legal-marked released
sfm_L*R_{LMi}
M_{LMRi} Legal-marked Release mortalities
$d_{LMK}*N_{MKi}$
K_{LMi} (= M_{LMKi}) Legal-marked retained
$p_{LUi}*E_i$
E_{LUi} Legal-unmarked encounters
$E_{LUi} - K_{LUi}$
R_{LUi} Legal-unmarked released
sfm_L*R_{LUi}
M_{LURi} Legal-unmarked Release mortalities
$d_{LUK}*N_{UKi}$
K_{LUi} (= M_{LUKi}) Legal-unmarked retained
$p_{SMi}*E_i$
E_{SMi} Sublegal-marked encounters
$E_{SMi} - K_{SMi}$
R_{SMi} Sublegal-marked released
sfm_S*R_{SMi}
M_{SMRi} Sublegal-marked Release mortalities
$d_{SMK}*N_{MKi}$
K_{SMi} (= M_{SMKi}) Sublegal-marked retained
$p_{SUi}*E_i$
E_{LMi} Sublegal-unmarked encounters
$E_{SUi} - K_{SUi}$
R_{SUi} Sublegal-unmarked released
sfm_S*R_{SUi}
M_{SURi} Sublegal-unmarked Release mortalities
$d_{SUK}*N_{UKi}$
K_{SUi} (= M_{SUKi}) Sublegal-unmarked retained
$M_{Ki} = M_{LMKi} + M_{LUKi} + M_{SMKi} + M_{SUKi}$
$M_{Ri} = M_{LMRi} + M_{LURi} + M_{SMRi} + M_{SURi}$

Appendix B. Coded-wire tag (CWT) recovery data collected during dockside sampling activities in the 2014 recreational Chinook MSF in Washington coastal Marine Areas 1, 2, 3 and 4.

Area	Recovery Date	Tag Code	Brood Year	Release Site	RearingHatchery	Release Agency	DIT codes	FL (cm)	Label	Recovery Mark
1	1-Jun-14	90478	2010	SANTIAM R S FK	SOUTH SANTIAM HATCH	ODFW		73	9658	AD
1	7-Jun-14	55399	2011	SPRING CR 29.0159	SPRING CR NFH	FWS	055404; 055527; 055528	72	9659	AD
1	7-Jun-14	635686	2010	CHELAN R 47.0052	CHELAN FALLS HATCHERY	WDFW		72	9660	AD
1	8-Jun-14	60392	2011	SAN PABLO BAY NET PENS	FEATHER R HATCHERY	CDFW		65	9661	AD
1	11-Jun-14	55527	2011	SPRING CR 29.0159	SPRING CR NFH	FWS	055399; 055404; 055528	63	9662	AD
1	13-Jun-14	635691	2010	SIMILKAMEEN R 490325	SIMILKAMEEN HATCHERY	WDFW		69	9663	AD
1	4-Jun-14	90671	2011	SANTIAM R & N FK-1	MARION FORKS HATCH	ODFW		62	19707	AD
1	31-May-14	60390	2011	FEATHER BOYDS PUMP RAMP	FEATHER R HATCHERY	CDFW		69	19708	AD
1	31-May-14	55527	2011	SPRING CR 29.0159	SPRING CR NFH	FWS	055399; 055404; 055528	76	19709	AD
1	31-May-14	635770	2010	COLUMBIA NEAR WELLS	WELLS HATCHERY	WDFW		82	19710	AD
1	1-Jun-14	90582	2011	BIG CR (LWR COL R)	BIG CR HATCHERY	ODFW	090583; 090567; 090566	76	19711	AD
1	8-Jun-14	636080	2010	LYONS FERRY REL.SITE	LYONS FERRY HATCHERY	WDFW		69	19713	AD
1	8-Jun-14	55408	2012	SPRING CR 29.0159	SPRING CR NFH	FWS	55407	56	19714	AD
1	8-Jun-14	100153	2010	SNAKE@ HLLS CNYON DM	OXBOW HATCHERY	IDFG		75	19715	AD
1	8-Jun-14	90567	2011	BIG CR (LWR COL R)	BIG CR HATCHERY	ODFW	090583; 090582; 090566	76	19716	AD
1	8-Jun-14	635774	2010	CHELAN R 47.0052	CHELAN FALLS HATCHERY	WDFW		75	19717	AD
1	8-Jun-14	90567	2011	BIG CR (LWR COL R)	BIG CR HATCHERY	ODFW	090583; 090582; 090566	68	19718	AD
1	12-Jun-14	60388	2011	SAN PABLO BAY NET PENS	FEATHER R HATCHERY	CDFW		76	19719	AD
1	31-May-14	90587	2011	SNAKE R-1 (HELLS CAN	IRRIGON HATCHERY	ODFW		73	21248	AD
1	31-May-14	90571	2011	TANNER CR (BNVILLE)	BONNEVILLE HATCHERY	ODFW		72	21249	AD
1	1-Jun-14	55504	2011	COLEMAN NFH	COLEMAN NFH	FWS		77	21250	AD
1	1-Jun-14	635774	2010	CHELAN R 47.0052	CHELAN FALLS HATCHERY	WDFW		69	21252	AD
1	1-Jun-14	60390	2011	FEATHER BOYDS PUMP RAMP	FEATHER R HATCHERY	CDFW		67	21253	AD
1	1-Jun-14	635968	2010	SIMILKAMEEN R 490325	SIMILKAMEEN HATCHERY	WDFW		71	21254	AD
1	1-Jun-14	55364	2010	ENTIAT R 46.0042	ENTIAT NFH	FWS		76	21255	AD
1	1-Jun-14	636080	2010	LYONS FERRY REL.SITE	LYONS FERRY HATCHERY	WDFW		67	21256	AD

Area	Recovery Date	Tag Code	Brood Year	Release Site	RearingHatchery	Release Agency	DIT codes	FL (cm)	Label	Recovery Mark
1	1-Jun-14	635773	2011	COLUMBIA NEAR WELLS	WELLS HATCHERY	WDFW		56	21257	AD
1	2-Jun-14	636370	2011	COLUMBIA NEAR WELLS	WELLS HATCHERY	WDFW		62	21258	AD
1	5-Jun-14	90571	2011	TANNER CR (BNVILLE)	BONNEVILLE HATCHERY	ODFW		74	21259	AD
1	7-Jun-14	635774	2010	CHELAN R 47.0052	CHELAN FALLS HATCHERY	WDFW		76	21260	AD
1	7-Jun-14	90582	2011	BIG CR (LWR COL R)	BIG CR HATCHERY	ODFW	090583; 090567; 090566	79	21261	AD
1	7-Jun-14	90641	2011	SANTIAM R S FK	SOUTH SANTIAM HATCH	ODFW		67	21262	AD
1	7-Jun-14	635774	2010	CHELAN R 47.0052	CHELAN FALLS HATCHERY	WDFW		70	21263	AD
1	8-Jun-14	635689	2010	METHOW R 48.0002	CARLTON ACCL POND	WDFW		74	21264	AD
1	7-Jun-14	635599	2011	COWLITZ R 26.0002	COWLITZ SALMON HATCH	WDFW		61	21266	AD
1	12-Jun-14	181584	2010	R-Chilliwack R	H-Chilliwack River H	CDFO	181679; 181592; 181588; 181590	76	21278	AD
1	12-Jun-14	635686	2010	CHELAN R 47.0052	CHELAN FALLS HATCHERY	WDFW		59	21279	AD
1	12-Jun-14	90567	2011	BIG CR (LWR COL R)	BIG CR HATCHERY	ODFW	090583; 090582; 090566	79	21280	AD
1	31-May-14	90476	2010	CLACKAMAS R	CLACKAMAS HATCHERY	ODFW		73	24583	AD
1	31-May-14	55233	2011	LTL WHITE SALMON@NFH	LTL WHITE SALMON NFH	FWS		77	24584	AD
1	31-May-14	55399	2011	SPRING CR 29.0159	SPRING CR NFH	FWS	055404; 055527; 055528	65	24585	AD
1	31-May-14	635371	2009	SIMILKAMEEN R 490325	SIMILKAMEEN HATCHERY	WDFW		81	24586	AD
1	31-May-14	90567	2011	BIG CR (LWR COL R)	BIG CR HATCHERY	ODFW	090583; 090582; 090566	79	24587	AD
1	7-Jun-14	635686	2010	CHELAN R 47.0052	CHELAN FALLS HATCHERY	WDFW		78	24596	AD
1	8-Jun-14	55399	2011	SPRING CR 29.0159	SPRING CR NFH	FWS	055404; 055527; 055528	75	24598	AD
1	31-May-14	55527	2011	SPRING CR 29.0159	SPRING CR NFH	FWS	055399; 055404; 055528	83	35007	AD
1	31-May-14	55364	2010	ENTIAT R 46.0042	ENTIAT NFH	FWS		75	35008	AD
1	31-May-14	635599	2011	COWLITZ R 26.0002	COWLITZ SALMON HATCH	WDFW		47	35009	AD
1	31-May-14	635686	2010	CHELAN R 47.0052	CHELAN FALLS HATCHERY	WDFW		68	35010	AD
1	1-Jun-14	55498	2011	COLEMAN NFH	COLEMAN NFH	FWS		75	35011	AD
1	1-Jun-14	55399	2011	SPRING CR 29.0159	SPRING CR NFH	FWS	055404; 055527; 055528	71	35012	AD
1	1-Jun-14	55404	2011	SPRING CR 29.0159	SPRING CR NFH	FWS	055399; 055527; 055528	77	35013	Unmarked
1	1-Jun-14	635087	2009	COL R @ TURTLE ROCK	TURTLE ROCK HATCHERY	WDFW		82	35014	AD

Area	Recovery Date	Tag Code	Brood Year	Release Site	RearingHatchery	Release Agency	DIT codes	FL (cm)	Label	Recovery Mark
1	1-Jun-14	90496	2010	SANTIAM R & N FK-1	MARION FORKS HATCH	ODFW		69	35015	AD
1	1-Jun-14	90495	2010	SANTIAM R & N FK-1	MARION FORKS HATCH	ODFW		76	35016	AD
1	1-Jun-14	90582	2011	BIG CR (LWR COL R)	BIG CR HATCHERY	ODFW	090583; 090567; 090566	79	35017	AD
1	7-Jun-14	635599	2011	COWLITZ R 26.0002	COWLITZ SALMON HATCH	WDFW		56	35018	AD
1	7-Jun-14	190329	2011	JACK CR ACCL. PONDS	CLE ELUM HATCHERY	YAKA		62	35019	AD
1	11-Jun-14	55404	2011	SPRING CR 29.0159	SPRING CR NFH	FWS	055399; 055527; 055528	66	35026	AD
1	11-Jun-14	60395	2011	SAN PABLO BAY NET PENS	FEATHER R HATCHERY	CDFW		71	35032	AD
1	11-Jun-14	90533	2010	MCKENZIE R 1	MCKENZIE HATCHERY	ODFW		79	35033	AD
1	8-Jun-14	90582	2011	BIG CR (LWR COL R)	BIG CR HATCHERY	ODFW	090583; 090567; 090566	78	35201	AD
1	8-Jun-14	635774	2010	CHELAN R 47.0052	CHELAN FALLS HATCHERY	WDFW		69	35202	AD
1	8-Jun-14	90571	2011	TANNER CR (BNVILLE)	BONNEVILLE HATCHERY	ODFW		74	35203	AD
1	8-Jun-14	55527	2011	SPRING CR 29.0159	SPRING CR NFH	FWS	055399; 055404; 055528	73	35204	AD
1	12-Jun-14	635088	2009	CHELAN R 47.0052	CHELAN RIVER NP	WDFW		88	35210	AD
1	12-Jun-14	635964	2010	COLUMBIA NEAR WELLS	WELLS HATCHERY	WDFW		66	35211	AD
2	31-May-14	635770	2010	COLUMBIA NEAR WELLS	WELLS HATCHERY	WDFW		73	8540	AD
2	31-May-14	90582	2011	BIG CR (LWR COL R)	BIG CR HATCHERY	ODFW	090583; 090567; 090566	69	8541	AD
2	6-Jun-14	90566	2011	BIG CR (LWR COL R)	BIG CR HATCHERY	ODFW	090583; 090582; 090567	77	8542	AD
2	7-Jun-14	90571	2011	TANNER CR (BNVILLE)	BONNEVILLE HATCHERY	ODFW		68	8543	AD
2	7-Jun-14	55517	2011	COLEMAN NFH	COLEMAN NFH	FWS		68	8544	AD
2	7-Jun-14	90582	2011	BIG CR (LWR COL R)	BIG CR HATCHERY	ODFW	090583; 090567; 090566	77	8545	AD
2	8-Jun-14	90641	2011	SANTIAM R S FK	SOUTH SANTIAM HATCH	ODFW		63	8546	AD
2	10-Jun-14	55399	2011	SPRING CR 29.0159	SPRING CR NFH	FWS	055404; 055527; 055528	75	8547	AD
2	10-Jun-14	90567	2011	BIG CR (LWR COL R)	BIG CR HATCHERY	ODFW	090583; 090582; 090566	65	8549	AD
2	10-Jun-14	55370	2010	COLEMAN NFH	COLEMAN NFH	FWS		80	8550	AD
2	11-Jun-14	635774	2010	CHELAN R 47.0052	CHELAN FALLS HATCHERY	WDFW		71	8551	AD
2	11-Jun-14	90496	2010	SANTIAM R & N FK-1	MARION FORKS HATCH	ODFW		80	8552	AD
2	11-Jun-14	635773	2011	COLUMBIA NEAR WELLS	WELLS HATCHERY	WDFW		57	8553	AD
2	12-Jun-14	90536	2010	MCKENZIE R 1	MCKENZIE HATCHERY	ODFW		71	8554	AD

Area	Recovery Date	Tag Code	Brood Year	Release Site	RearingHatchery	Release Agency	DIT codes	FL (cm)	Label	Recovery Mark
2	12-Jun-14	635578	2009	WENATCHEE R 45.0030	DRYDEN POND	WDFW		85	8555	AD
2	12-Jun-14	55379	2010	COLEMAN NFH	COLEMAN NFH	FWS		86	8556	AD
2	12-Jun-14	635688	2010	METHOW R 48.0002	CARLTON ACCL POND	WDFW		74	8557	AD
2	12-Jun-14	635773	2011	COLUMBIA NEAR WELLS	WELLS HATCHERY	WDFW		59	8558	AD
2	1-Jun-14	90566	2011	BIG CR (LWR COL R)	BIG CR HATCHERY	ODFW	090583; 090582; 090567	71	18101	AD
2	7-Jun-14	90566	2011	BIG CR (LWR COL R)	BIG CR HATCHERY	ODFW	090583; 090582; 090567	69	18102	AD
2	7-Jun-14	635579	2009	SIMILKAMEEN R 490325	SIMILKAMEEN HATCHERY	WDFW		73	18103	AD
2	7-Jun-14	55260	2011	LTL WHITE SALMON@NFH	LTL WHITE SALMON NFH	FWS		84	18104	AD
2	8-Jun-14	55260	2011	LTL WHITE SALMON@NFH	LTL WHITE SALMON NFH	FWS		72	18105	AD
2	11-Jun-14	55399	2011	SPRING CR 29.0159	SPRING CR NFH	FWS	055404; 055527; 055528	76	18106	AD
2	11-Jun-14	636416	2011	COWLITZ R 26.0002	COWLITZ SALMON HATCH	WDFW		56	18107	AD
2	11-Jun-14	636080	2010	LYONS FERRY REL.SITE	LYONS FERRY HATCHERY	WDFW		64	18108	AD
2	11-Jun-14	90324	2009	SPRINGS CR 36.0114	RINGOLD SPR HATCHERY	WDFW		93	18109	AD
2	11-Jun-14	635774	2010	CHELAN R 47.0052	CHELAN FALLS HATCHERY	WDFW		68	18110	AD
2	11-Jun-14	60429	2011	SANTA CRUZ HRBR NET PEN	FEATHER R HATCHERY	CDFW		71	18111	AD
2	11-Jun-14	68768	2010	SAC R AT DISCOVERY PARK	NIMBUS FISH HATCHERY	CDFW		80	18112	AD
2	12-Jun-14	60390	2011	FEATHER BOYDS PUMP RAMP	FEATHER R HATCHERY	CDFW		60	18113	AD
2	12-Jun-14	90587	2011	SNAKE R-1 (HELLS CAN	IRRIGON HATCHERY	ODFW		54	18114	AD
2	12-Jun-14	90567	2011	BIG CR (LWR COL R)	BIG CR HATCHERY	ODFW	090583; 090582; 090566	68	18115	AD
2	12-Jun-14	610438	2010	HANFORD REACH (36)	NA	CRFC		82	18116	AD
2	12-Jun-14	636080	2010	LYONS FERRY REL.SITE	LYONS FERRY HATCHERY	WDFW		65	18117	AD
2	12-Jun-14	220329	2011	BIG CANYON ACCL POND	LYONS FERRY HATCHERY	NEZP		71	18118	AD
2	12-Jun-14	181586	2010	R-Shuswap R Low	H-Shuswap River, Middle,	CDFO		83	18119	AD
2	6-Jun-14	55527	2011	SPRING CR 29.0159	SPRING CR NFH	FWS	055399; 055404; 055528	NA	18301	AD
2	12-Jun-14	60391	2011	SAN PABLO BAY NET PENS	FEATHER R HATCHERY	CDFW		79	18302	AD
2	31-May-14	635770	2010	COLUMBIA NEAR WELLS	WELLS HATCHERY	WDFW		78	20907	AD
2	31-May-14	635691	2010	SIMILKAMEEN R 490325	SIMILKAMEEN HATCHERY	WDFW		71	20908	AD
2	31-May-14	55260	2011	LTL WHITE SALMON@NFH	LTL WHITE SALMON NFH	FWS		68	20909	AD

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2	31-May-14	60399	2011	SAN JOAQ SHRM ISL NET PEN	MOK R FISH INS	CDFW		71	20910	AD
2	31-May-14	635774	2010	CHELAN R 47.0052	CHELAN FALLS HATCHERY	WDFW		69	20911	AD
2	1-Jun-14	55260	2011	LTL WHITE SALMON@NFH	LTL WHITE SALMON NFH	FWS		71	20912	AD
2	1-Jun-14	90567	2011	BIG CR (LWR COL R)	BIG CR HATCHERY	ODFW	090583; 090582; 090566	71	20913	AD
2	31-May-14	635968	2010	SIMILKAMEEN R 490325	SIMILKAMEEN HATCHERY	WDFW		73	21802	AD
2	1-Jun-14	635691	2010	SIMILKAMEEN R 490325	SIMILKAMEEN HATCHERY	WDFW		70	21804	AD
2	1-Jun-14	90582	2011	BIG CR (LWR COL R)	BIG CR HATCHERY	ODFW	090583; 090567; 090566	72	21805	AD
2	1-Jun-14	55260	2011	LTL WHITE SALMON@NFH	LTL WHITE SALMON NFH	FWS		74	21806	AD
2	6-Jun-14	90571	2011	TANNER CR (BNVILLE)	BONNEVILLE HATCHERY	ODFW		72	21807	AD
2	6-Jun-14	90537	2010	WILLAMETTE R CST FK	MCKENZIE HATCHERY	ODFW		75	21808	AD
2	11-Jun-14	90567	2011	BIG CR (LWR COL R)	BIG CR HATCHERY	ODFW	090583; 090582; 090566	71	21809	AD
2	12-Jun-14	60390	2011	FEATHER BOYDS PUMP RAMP	FEATHER R HATCHERY	CDFW		65	21810	AD
2	1-Jun-14	220321	2010	CAPTAIN JOHNS PD	LYONS FERRY HATCHERY	NEZP		63	24272	AD
2	31-May-14	210978	2010	SOL DUC R 20.0096	LONESOME CR HATCHERY	QUIL		70	24324	AD
2	31-May-14	90566	2011	BIG CR (LWR COL R)	BIG CR HATCHERY	ODFW	090583; 090582; 090567	78	24325	AD
2	6-Jun-14	55260	2011	LTL WHITE SALMON@NFH	LTL WHITE SALMON NFH	FWS		75	24326	AD
2	7-Jun-14	55260	2011	LTL WHITE SALMON@NFH	LTL WHITE SALMON NFH	FWS		75	24327	AD
2	8-Jun-14	55260	2011	LTL WHITE SALMON@NFH	LTL WHITE SALMON NFH	FWS		76	24328	AD
2	10-Jun-14	636417	2011	LYONS FERRY REL.SITE	LYONS FERRY HATCHERY	WDFW		63	24329	AD
2	10-Jun-14	69504	2011	FORT BAKER MINOR PT	FEATHER R HATCHERY	CDFW		70	24330	AD
3	6/8/2014	220321	2010	CAPTAIN JOHNS PD	LYONS FERRY HATCHERY	NEZP		68	97208	AD
4	16-May-14	211005	2011	WHITEHORSE SPRINGS	STILLAGUAMISH HATCH	STIL		56	2852	AD
4	7-Jun-14	635590	2010	WALLACE R 07.0940	WALLACE R HATCHERY	WDFW		81	2853	AD
4	13-Jun-14	635768	2010	PURDY CR 16.0005	GEORGE ADAMS HATCHRY	WDFW	635767	63	2854	AD
4	16-May-14	635776	2010	WENATCHEE R 45.0030	DRYDEN POND	WDFW		67	20601	AD
4	3-Jun-14	181370	2010	R-Shuswap R Middle	H-Shuswap River, Middle,	CDFO		86	20602	AD
4	6-Jun-14	55527	2011	SPRING CR 29.0159	SPRING CR NFH	FWS	055399; 055404; 055528	76	24601	AD
4	7-Jun-14	636069	2010	EAST SOUND BAY (SAN)	GLENWOOD SPRINGS	COOP		68	24650	AD

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4	3-Jun-14	90497	2010	SANTIAM R & N FK-1	MARION FORKS HATCH	ODFW		75	25001	AD
4	23-May-14	635691	2010	SIMILKAMEEN R 490325	SIMILKAMEEN HATCHERY	WDFW		71	25211	AD
4	6-Jun-14	636099	2011	FRIDAY CR 03.0017	SAMISH HATCHERY	WDFW	636098	62	25213	AD
4	17-May-14	635968	2010	SIMILKAMEEN R 490325	SIMILKAMEEN HATCHERY	WDFW		60	32491	AD
4	6-Jun-14	181982	2011	R-Chilliwack R	H-Chilliwack River H	CDFO	182467; 182068; 182385; 180279	60	32498	AD